A Focus on Nutrition

Key Findings of the 2008/09
New Zealand Adult Nutrition Survey

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MINISTRY OF HEALTH
MANATŪ HAUORA

Foreword

I am pleased to bring to you this report, *A Focus on Nutrition, Key findings of the 2008/09 New Zealand Adult Nutrition Survey.*

The Government's overarching goal for health is to enable New Zealanders to live longer, healthier and more independent lives. Lifelong good nutrition is needed to achieve this. The 2008/09 New Zealand Adult Nutrition Survey provides us with a wealth of reliable and up-to-date information about the nutritional health of adult New Zealanders.

There is good news in the survey. Compared to the 1997 National Nutrition Survey, there was a decline in the contribution of saturated fat to total energy intake, a decrease in total blood cholesterol, and an increase in eating the recommended two or more servings of fruit per day. However, the survey also identified areas we need to work on: since 1997, there has been an increase in the prevalence of obesity, and an increase in the prevalence of low food security.

Over time, the survey results will contribute to the development and evaluation of policy, the development of the Ministry of Health Food and Nutrition Guidelines and the review of Nutrient Reference Values. Survey data can also be used in monitoring diabetes, providing information when developing food standards, and monitoring changes in the food supply.

This report represents a significant undertaking by a large group of people over a long period of time. I congratulate the research teams and External Technical Group, and thank them for their time and commitment to this project. I especially want to thank the 4721 New Zealanders who gave their time to take part in the survey – it would not have been possible without them.

Signed by

Acknowledgements

First, thank you to the 4721 New Zealanders who opened their homes to the interviewers and made the 2008/09 New Zealand Adult Nutrition Survey possible.

The survey was funded by the Ministry of Health and conducted by the University of Otago. CBG Health Research Ltd recruited participants into the survey.

The survey was managed in the Ministry of Health, initially by Kirsten McLachlan and then from December 2008 by Sally Mackay. We are grateful to the many colleagues in the Health and Disability Intelligence Unit of the Ministry of Health and across the Ministry who contributed to the development, implementation and analysis of this survey.

The Nutrition Director for the survey was Associate Professor Winsome Parnell of the University of Otago. John Harvey, Project Manager, handled the day-to-day co-ordination of the survey during the data collection phase.

The survey would not have been completed without the dedication of a number of people. These include members of the External Technical Group; the regional supervisors and field staff who collected the data; the University of Otago project office staff who checked and analysed the data; and the members of the academic staff of the Department of Human Nutrition who provided expert advice.

Particular thanks go to Professor David Russell and Dr Noela Wilson for their advice and encouragement throughout the survey, and for their expert editorial assistance in the drafting of the descriptive report.

The Institute of Plant and Food Research Ltd (Palmerston North) provided food composition data and assisted with nutrient matching. The contribution made by Dr Lee Huffmann was crucial in resolving many complex issues.

Canterbury Health Laboratories were responsible for collecting and analysing the biological samples. Special thanks go to Kevin Taylor, who assumed responsibility for this work after the sudden death of Barrie Edwards.

Appendix 1 outlines in more detail the many people who assisted throughout the survey.

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Glossary

24-hour recall	A dietary assessment method that collects information on all foods and drinks consumed in a 24-hour period.
95% confidence interval	An indicator of the accuracy of a survey estimate. The 95% confidence interval (95% CI) is the interval that would be expected to contain the true population value 95% of the time, if many samples were taken. In this report, 95% confidence intervals have been presented in parentheses in tables, and as error bars in graphs.
Acceptable macronutrient distribution range (AMDR)	An estimate of the range of intake for each macronutrient (expressed as percent contribution to energy), which would allow for an adequate intake of all the other nutrients while maximising good health (applies only to adults and young people aged 14 years and over).
Adjustment	This is where rates or results have been adjusted to take account of differences in the distribution of other factors (such as age) between different groups (eg, ethnic groups).
Anthropometry	The measurement of body size (eg, height and weight).
Bioavailability	The degree to which a nutrient (eg, iron) or drug becomes available for use in the body after ingestion or administration.
Blood pressure	The pressure exerted by circulating blood on the walls of blood vessels. Blood pressure is measured as maximum (systolic) and minimum (diastolic) blood pressure.
Body mass index (BMI)	A measure of weight adjusted for height used to classify people as underweight, normal, overweight or obese. BMI is calculated by dividing weight in kilograms by height in metres squared (kg/m^2).
Crude data	An estimate that has not been adjusted for other factors (such as age or ethnicity).
Dietary supplements	Products containing vitamins, minerals, herbs or botanicals, amino acids and various other dietary substances that are intended to supplement the diet rather than be an entire meal or diet. They are intended for ingestion as a pill, capsule, tablet or liquid and do not usually resemble conventional foods.
Estimated average requirement (EAR)	A daily nutrient level estimated to meet the requirements of half of the healthy individuals in a particular life stage and gender group.
Fatty acid	A component of fat consisting of a hydrocarbon chain with a methyl group at one end and a carboxyl group at the other. The three main types of fatty acids in the diet are: saturated, monounsaturated and polyunsaturated.

Folate	A generic term for the various forms of folate found in food. Folate is involved in the metabolism of nucleic and amino acids, and hence the synthesis of deoxyribonucleic acid (DNA), ribonucleic acid and proteins.
Folic acid	A synthetic form of folate, which is found in supplements and fortified foods and beverages. It is more bioavailable and stable than folate in food.
Food security	Access to adequate, safe, affordable and acceptable food. In contrast, food insecurity occurs when the availability of nutritionally adequate and safe foods, or the ability to acquire such foods, is limited or uncertain.
FOODfiles	An electronic subset of the New Zealand Food Composition Database.
Fortification	The addition of permitted nutrients to food. Nutrients can be added to correct a demonstrated deficiency in the population, to replace nutrients lost during processing, storage or handling, or for other reasons.
Glycated haemoglobin (HbA1c)	A measure of average blood glucose over the past four to six weeks. HBA1c is measured as a percentage
Haemoglobin	The protein that carries oxygen in the red blood cells.
LINZ®	Life in New Zealand Nutrition and Activity Research Unit, University of Otago.
LINZ24©	The data capture software package of the LINZ® Nutrition and Activity Research Unit, University of Otago.
Lipoproteins	Clusters of lipids associated with proteins that serve as transport vehicles for lipids in the lymph and blood. Dietary fats circulate in the blood bound to lipoproteins.
Macronutrients	Nutrients needed in larger quantities, such as protein, carbohydrate and fat.
Meshblock	The smallest geographic unit for which statistical data are collected by Statistics New Zealand. Meshblocks vary in size from part of a city block to large areas of rural land. Each meshblock abuts another to cover all of New Zealand.
Micronutrients	Nutrients needed in small amounts, such as vitamins and minerals.
Monounsaturated fatty acid (MUFA)	A type of unsaturated fatty acid in which there is one double bond.
Neighbourhood deprivation	A measure of the socioeconomic status of an area (see New Zealand Deprivation Index 2006).
Neural tube defects (NTDs)	A group of birth defects in which the brain, spinal cord or covering of these organs has not developed properly.

New Zealand Deprivation Index 2006 (NZDep2006)	An area-based index of deprivation, 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. In this report, results are presented as quintiles (each quintile contains approximately 20% of the population).
New Zealand Food Composition Database	A database containing data on the nutrient composition of foods and drinks commonly consumed in New Zealand.
Nutrient reference values (NRVs)	A set of recommendations for intakes of energy and nutrients aimed at avoiding deficiency and excess/toxicity. They also include guidance on the dietary patterns needed to reduce the risk of chronic disease.
Obesity	Excess weight for height to the extent that health may be affected.
PC-SIDE	Computer software used to estimate distribution of usual nutrient intake for a group.
Polyunsaturated fatty acid (PUFA)	An unsaturated fatty acid with two or more double bonds. Dietary sources include most plant oils, particularly sunflower, soybean, safflower and corn, as well as most margarines and spreads.
Prevalence	The proportion of people with a health-related state (typically a disease or risk factor) at a specific period of time within a specific population. It is defined as the total number of cases in the population, divided by the number of individuals in the population.
Retinol equivalent	The recommendation for vitamin A intake is expressed as micrograms of retinol equivalents. Retinol equivalents account for the conversion of some β-carotene to retinol. One microgram (1 µg) of retinol equivalent equals 1 µg of retinol, or 6 µg of β-carotene.
Saturated fatty acid (SAFA)	A fatty acid in which there are no double bonds between the carbon atoms of the fatty acid chain. Diets high in saturated fatty acids increase the risk of atherosclerosis and coronary heart disease.
Total response ethnic group	A categorisation of ethnicity whereby each person is assigned to all those ethnicities they identify with. Total response ethnicity has been used in this publication.
Trans fatty acids	Unsaturated fatty acids with one or more double bonds in the trans configuration. These occur naturally in some ruminant foods, but are also produced by partial hydrogenation of polyunsaturated fats in food processing.

Usual intake	The distribution of observed intakes from a single 24-hour recall, 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.

Abbreviations

AMDR	acceptable macronutrient distribution range
BMI	body mass index
CAPI	computer-assisted personal interview
CI	confidence interval
CNS	National Children's Nutrition Survey (2002)
CURF	confidentialised unit record file
DFE	dietary folate equivalent
EAR	estimated average requirement
HDL	high-density lipoprotein cholesterol
ICCIDD	International Council for Control of Iodine Deficiency Disorders
LDL	low-density lipoprotein cholesterol
LINZ®	Life in New Zealand Nutrition and Activity Research Unit, University of Otago
LINZ24©	data capture software package of the LINZ® Nutrition and Activity Research Unit, University of Otago
MUFA	monounsaturated fatty acid
NHANES	United States National Health and Nutrition Examination Survey
NNS	National Nutrition Survey (1997)
NRV	nutrient reference value
NTDs	neural tube defects
NZANS	New Zealand Adult Nutrition Survey (2008/09)
NZDep2006	New Zealand Deprivation Index 2006
NZEO	New Zealand European and Others ethnic group
NZFCDB	New Zealand Food Composition Database
PUFA	polyunsaturated fatty acid
RE	retinol equivalent
SAFA	saturated fatty acid
USDA	United States Department of Agriculture

Executive Summary

Introduction

The 2008/09 New Zealand Adult Nutrition Survey (NZANS) was carried out from October 2008 to October 2009, collecting information from 4721 adult New Zealanders aged 15 years and over.

The 2008/09 NZANS assessed self-reported food and nutrient intake, dietary habits and eating patterns, dietary supplement use, household food security, and nutrition-related health conditions and risk factors. The survey also included measurements (height, weight, waist circumference and blood pressure) and the collection of blood and urine samples.

A final response rate of 61% was achieved (44% for blood and urine samples). These response rates are considered good for a national nutrition survey. All results have been weighted in order to be representative of New Zealand's estimated resident population aged 15 years and over living in permanent private dwellings at 31 June 2007.

Nutrition is an important determinant of health. This survey provides valuable information for the development, implementation and monitoring of nutrition policies and programmes to improve the health of New Zealanders. Knowledge of New Zealanders' dietary habits, body size and nutrition-related health will assist health professionals to provide nutrition advice that is relevant and will help with planning services for diabetes and cardiovascular disease. Survey data can also be used to inform the development of food standards and monitor changes in the food supply.

The analyses presented in this report are only a small proportion of those that could be undertaken, and in many ways pose more questions than they answer. The Ministry of Health encourages researchers to use 2008/09 NZANS data sets to explore topics of interest. Additional descriptive results are available in the online data tables. Reports presenting results for Māori compared to non-Māori and Pacific compared to non-Pacific will be released in late 2011.

Energy and macronutrient intake

Energy

Energy is required in the body for metabolic processes, physiological functions, muscular activity, heat production, growth and the synthesis of new tissues. The macronutrients protein, carbohydrate, fat and alcohol from food and drinks are the only sources of energy for humans.

The median daily energy intake from foods and beverages was 10,380 kJ for males and 7448 kJ for females. The *Bread* group was the main contributor to energy intake (11%), followed by *Grains and pasta* (7%) and *Potatoes, kumara and taro* (6%).

The reported energy intake of New Zealanders aged 15 years and over has dropped since 1997, although the decrease for females was not significant. The increase in body weight, body mass index and the prevalence of obesity in the intervening period suggests that the energy ‘equation’ continues to be unbalanced, with energy ‘in’ exceeding energy ‘out’. The survey did not assess energy expenditure, so further research is needed to explore the underlying reasons for the reported decrease in energy intake from 1997 to 2008/09.

Protein

Protein is necessary to build, maintain and repair tissue and to synthesise hormones, enzymes and antibodies. Proteins are made up of 20 amino acids, some of which the body can synthesise, but others must be obtained from food.

The median usual daily intake was 102 g of protein for males and 71 g for females, with most people (98%) meeting the recommended average protein requirement. Protein provided 16.4% and 16.5% of energy for males and females, respectively; this falls within the recommended range of 15–25% energy from protein. The single biggest contributor of protein in the diet was the *Bread* group (11%), followed by the groups *Poultry* and *Milk* (each 9%). The contribution of protein to energy has increased from 1997 to 2008/09 for both males and females.

Fat

Fats are the most concentrated sources of energy. Dietary fats also help in the absorption of fat-soluble vitamins, are the precursors of many hormones, and are an important structural component of cell membranes. There are three main types of fatty acids in the diet: saturated, monounsaturated and polyunsaturated.

The median usual daily intake of total fat was 95 g for males and 67 g for females. Total fat provided 33.7% and 33.8% of energy for males and females, respectively; this falls within the recommended range of 20–35% energy from total fat. The biggest single contributor to total fat in the diet was the group *Butter and margarine* (9%), followed by *Potatoes, kumara and taro*, *Bread-based dishes* and *Poultry* (each 6%). The contribution of total fat to energy has decreased from 1997 to 2008/09 for males and females, although the decrease was not significant for females.

The median usual daily intake of saturated fat was 36.5 g for males and 25.8 g for females. Saturated fat was provided by the following groups: *Butter and margarine* and *Milk* (each 8%), *Bread-based dishes, Cheese* and *Potatoes, kumara and taro* (each 6%). From 1997 to 2008/09 there was a decline in the contribution of saturated fat to daily energy intake for both males (15.1% to 13.1%) and females (14.7% to 13.1%). However, this contribution is still above the recommended 10% contribution of saturated fat to total energy.

The median usual daily intake of monounsaturated fat was 35.1 g for males and 24.3 g for females. The *Butter and margarine* group provided 10% of monounsaturated fat, *Poultry* and *Potatoes, kumara and taro* each provided 7%, and *Bread-based dishes* and *Beef and veal* each provided 6%. From 1997 to 2008/09 the proportion of energy from monounsaturated fat increased for both males (11.8% to 12.4%) and females (11.4% to 12.3%).

The median usual daily intake of polyunsaturated fat was 13.1 g for males and 9.6 g for females. Polyunsaturated fat provided 4.8% and 4.9% of energy for males and females, respectively. The *Butter and margarine* group provided 12% of polyunsaturated fat, *Bread* 9%, *Bread-based dishes* and *Potatoes, kumara and taro* each 7%, and *Vegetables* and *Poultry* each 6%. There was no change in polyunsaturated fat intake from 1997 to 2008/09.

Carbohydrate

Carbohydrates are a diverse group of substances with varied chemical and physiological properties with varying importance to health. They include the sugars, starches and fibres.

The median usual daily intake was 278 g of carbohydrate for males and 207 g for females. The mean contribution of carbohydrate to daily energy intake was 46.0% for males and 47.1% for females; this falls within the recommended range of 45–65% energy from carbohydrate. *Bread* was the biggest single contributor to carbohydrate intake (17%). There was no change in the contribution of carbohydrate to daily energy from 1997 to 2008/09.

The median usual daily intake of total sugars was 120 g for males and 96 g for females. Sucrose was the major contributor to total sugars, followed by fructose, glucose, lactose and maltose. Almost one-quarter of the sucrose came from the group *Sugars and sweets* (23%), followed by *Non-alcoholic beverages* and *Fruit* (each 16%).

Dietary fibre intake was 22.1 g and 17.5 g per day for males and females, respectively. *Bread* (17%) and *Vegetables* (16%) were the main contributors to dietary fibre intake, followed by *Potatoes, kumara and taro*, and *Fruit* (each 12%).

Micronutrient intake

Micronutrients are nutrients needed in small amounts, such as vitamins and minerals. The survey measured intakes of vitamins A, B, C and E and the minerals calcium, iron, zinc, potassium and selenium. Where appropriate, micronutrient intakes were compared to nutrient reference values to estimate the prevalence of inadequate intake. Estimates of vitamin and mineral intake are from food and beverages only, and do not include micronutrients from supplements (other than supplements providing energy, eg meal replacements).

Vitamins

Forty-two percent of vitamin A in the diet came from retinol (animal-based foods) and the remainder from carotenoids (plant-based foods). The estimated prevalence of inadequate vitamin A intake was higher for males (22.7%) than for females (12.1%). There was a decrease in vitamin A intake from 1997 to 2008/09 for both males and females.

The B vitamins – thiamin, riboflavin, niacin, vitamin B6 and vitamin B12 – appear to be adequate for many males and females, but intakes in some age groups were less than optimal.

Vitamin C intakes were adequate for almost all New Zealanders aged 15 years and over. The predominant sources of vitamin C were *Vegetables* (28%), *Fruit* (22%), *Non-alcoholic beverages* (15%) and *Potatoes, kumara and taro* (13%).

Minerals

Most New Zealanders aged 15 years and over do not meet the recommendations for calcium intake. However, the adequacy of calcium intake is difficult to interpret given the high recommended levels to which they are compared and because calcium intake is only one of many factors that affect bone health. Experts worldwide are not agreed on optimal intakes because although calcium is of major importance to attaining and maintaining bone health, many other factors such as vitamin D status, physical activity levels and habitual levels of intake also influence bone health.

One in four (24.7%) New Zealanders aged 15 years and over had an inadequate intake of zinc (males 39.1%; females 11.2%). *Beef and veal* (10%), *Bread* (10%) and *Grains and pasta* (9%) were the largest contributors of zinc to the diet. There was a decrease in zinc intake from 1997 to 2008/09 for both males and females.

Selenium intakes increased from 1997 to 2008/09, but intakes were still inadequate for about one-third of males (31.5%) and over half (58.2%) of females. The *Bread* group was the largest single contributor of selenium to the diet (15%), followed by *Fish and seafood* (12%), and *Poultry* (10%).

Dietary supplements

Although the energy nutrient intakes of the population have been calculated without adding nutrients from supplements (other than supplements providing energy), information about the use of dietary supplements was collected.

Oils (fish oils and plant oils) was the supplement group used most often by New Zealanders aged 15 years and over. The *Regular* use of supplements was more frequent among older New Zealanders and O*ccasional* use more frequent among younger age groups.

Dietary habits

Dietary habits and patterns are associated with diet quality and nutrition-related health status. Participants were asked about key behaviours such as breakfast consumption, the frequency of eating certain foods and food groups, food preparation and cooking practices (eg, removal of excess fat, addition of salt), and choosing low fat or reduced-salt foods.

Breakfast was eaten daily by two-thirds of New Zealanders aged 15 years and over (males 64.5%; females 69.1%). Those aged 51+ years were more likely to have eaten breakfast daily than younger age groups.

Three-fifths (59.3%) of males and 72.2% of females reported eating the recommended three or more servings of vegetables each day, and 54.6% of males and 65.8% of females reported eating the recommended two or more servings of fruit each day. From 1997 to 2008/09 there was an increase in the proportion of males and females who reported eating the recommended number of servings of fruit, with no change in the proportion who reported eating the recommended number of servings of vegetables.

Whole-grain bread (heavy or light grain) was chosen most often by 60.4% of males and 65.9% of females. The proportion of males and females choosing whole-grain bread increased with increasing age.

Reduced-fat or trim milk was chosen most of the time by 44.5% of males and 51.9% of females. The use of reduced-fat or trim milk increased with increasing age for both males and females.

The excess fat was regularly or always removed from meat by 56.5% of males and 67.4% of females. Chicken skin was regularly or always removed by 42.3% of males and 53.5% of females.

Two-thirds of males (68.4%) and females (68.8%) reported choosing margarine as a spread most of the time, and one-fifth (20.1%) chose butter. Oil was used most often when cooking by 89.7% of males and 90.1% of females.

Almost all (98%) males and females used salt in the home. Of those who used salt in the home, 85.7% used iodised salt.

Food security

‘Food security’ is an internationally recognised term that encompasses the ready availability of nutritionally adequate and safe foods, and the assured ability to acquire personally acceptable foods in a socially acceptable way.

Based on responses to a series of eight statements, 59.1% of households were classified as being *Fully/almost food secure*, 33.7% were classified as being *Moderately food secure*, and 7.3% were classified as having *Low food security*. From 1997 to 2008/09 the proportion of households classified as having *Low food security* increased for males (1.6% to 5.6%) and females (3.8% to 8.8%).

Nutrition-related health outcomes

A range of anthropometric, biochemical and clinical measures were used to assess nutrition-related health status.

Body size and obesity

A healthy body size is important for good health and wellbeing. Obesity is associated with a long list of health conditions, including: cardiovascular disease (ischaemic heart disease, high blood pressure and stroke), various types of cancer, type 2 diabetes, osteoarthritis, sleep apnoea, and psychological and social problems.

Mean BMI was 27.6 kg/m^2 for both males and females. From 1997 to 2008/09 there was an increase in mean BMI in both males and females.

The prevalence of obesity was 27.7% in males and 27.8% in females, an increase since 1997 (males 17.0%, females 20.6%). Data from the 2002/03 and 2006/07 New Zealand Health Surveys have previously shown that the prevalence of obesity had increased since 1997.

Blood pressure

Mean systolic blood pressure was 130 mmHg in males and 122 mmHg in females. Systolic blood pressure was highest in those aged 71+ years.

Iron status

The prevalence of iron deficiency among females aged 15 years and over increased from 2.9% in 1997 to 7.2% in 2008/09.

Folate status

It was not possible to reliably determine dietary folate intake, but biochemical measures indicate folate status is satisfactory for most New Zealanders aged 15 years and over. Four percent of women of childbearing age had red blood cell folate levels associated with a high risk of having a baby affected by neural tube defects (NTDs), such as spina bifida. Twenty-seven percent had levels associated with a low risk of NTDs (≥ 906 nmol/L).

Iodine status

The New Zealand population aged 15 years and over is classified as mildly iodine deficient because the median urinary iodine concentration of 53 µg/L falls within the range defined by the International Council for the Control of Iodine Deficiency Disorders as mild iodine deficiency (50–99 µg/L). This survey took place before the implementation of mandatory fortification of bread with iodised salt (to reduce the prevalence of iodine deficiency) in September 2009.

Blood cholesterol

From 1997 to 2008/09 total cholesterol levels decreased in males (5.70 to 5.09 mmol/L) and females (5.73 to 5.17 mmol/L), while HDL cholesterol levels have increased slightly. Although it is likely that dietary factors, such as the decrease in saturated fat intake, contributed to the decline in total cholesterol, the increased prescribing of lipid-lowering drugs is also likely to have played a role.

Diabetes

Glycated haemoglobin (HbA1c) was measured in blood samples to allow the prevalence of undiagnosed diabetes to be estimated. Overall, 7.1% of New Zealanders aged 15 years and over have diabetes. Of these, just over one-quarter (2.0% of the total population) had not reported being told by a doctor that they had diabetes but had HbA1c levels ≥ 6.5%, which is indicative of undiagnosed diabetes.

HbA1c levels also give an indication of blood glucose management among those who have been diagnosed with diabetes. Just under one-half (48.5%) of those with known diabetes had good diabetes control (HbA1c levels < 7.0%).

1 Introduction

1.1 Overview

The 2008/09 New Zealand Adult Nutrition Survey (NZANS) was carried out from October 2008 to October 2009, collecting information from 4721 New Zealanders aged 15 years and over.

The 2008/09 NZANS assessed self-reported food and nutrient intake, dietary habits and eating patterns, dietary supplement use, food security, and nutrition-related health conditions and risk factors. The survey also included an examination component, comprising anthropometric measures (height, weight and waist circumference), blood pressure measurement, and the collection of blood and urine samples.

A final response rate of 61% was achieved. All results have been weighted in order to be representative of New Zealand's estimated resident population aged 15 years and over living in permanent private dwellings at 31 June 2007.

The *Statement of Intent* sets out the Ministry of Health's strategic direction for 2011 to 2014 (Ministry of Health 2011). The Government's overarching goal for health is to enable New Zealanders to live longer, healthier and more independent lives. Lifelong good nutrition and appropriate physical activity are the key elements needed to achieve this. The 2008/09 NZANS will provide valuable information for the monitoring, development and implementation of the Ministry's nutrition policies and programmes, and the monitoring of inequalities.

In particular, the results from this survey will provide guidance for health professionals working towards meeting the Government's health target related to 'better diabetes and cardiovascular services'. Knowledge of New Zealanders' dietary habits, body size and nutrition-related health will assist health professionals to provide nutrition advice that is relevant and will help with planning the type and amount of services required for diabetes and cardiovascular disease.

The Government introduced mandatory fortification of bread with iodised salt in September 2009. The 2008/09 NZANS will provide baseline data for monitoring the impact of fortification by providing an overview of the iodine status of the New Zealand population. The survey data can also be used to inform the development of food standards and monitoring of changes in the food supply.

1.2 Background

The 2008/09 NZANS is a component of the New Zealand Health Monitor, an integrated programme of household surveys and cohort studies managed by the Ministry of Health, and is a key element of the cross-sector programme of Official Social Statistics. The 2008/09 NZANS is the fourth national population-based nutrition survey in adults and the second funded by the Ministry of Health. Earlier surveys were the 1977 National Diet Survey (Birkbeck 1983), the 1989 Life in New Zealand Survey (Russell and Wilson 1991) and the 2002 National Nutrition Survey (Russell et al 1999).

As a signatory to the Protocols of Official Statistics (Statistics New Zealand 1998), the Ministry of Health employed best-practice survey techniques in the 2008/09 NZANS to produce high-quality data. Standard frameworks and classifications with validated questions were utilised, where possible, to allow for the integration of 2008/09 NZANS data with data from other sources. Ethical approval for the 2008/09 NZANS was gained through the Multi-Region Ethics Committee.

Objectives of the 2008/09 NZ Adult Nutrition Survey

The objectives of the 2008/09 NZANS were to:

1. assess the consumption of food and food groups, and their contribution to nutrient intake, and where possible to compare the results with the New Zealand *Food and Nutrition Guidelines for Healthy Adults* and the *Food and Nutrition Guidelines for Healthy Older People*
2. assess the nutrient intakes of the population and assess dietary adequacy against the nutrient reference values for Australia and New Zealand
3. assess the consumption of dietary supplements
4. assess the nutritional status of the adult population using a range of anthropometric, biochemical and clinical measures
5. examine factors associated with dietary intake, including food security and dietary patterns
6. estimate the prevalence of nutrition-related chronic diseases, such as cardiovascular disease and diabetes
7. estimate the prevalence of risk factors that influence dietary intake and nutritional status.

1.3 Further information

The Ministry of Health hopes this report stimulates interest in the dietary patterns and health of New Zealanders and generates more research, both through additional use of the 2008/09 NZANS data and by informing future research directions and priorities.

There are several ways to access further information and data from the 2008/09 NZANS:

- through the online data tables
- through the confidentialised unit record files (CURFs)
- by contacting Health and Disability Intelligence at the Ministry of Health.

The analyses presented in this report are only a small proportion of those that could be undertaken, and in many ways pose more questions than they answer. The Ministry of Health encourages researchers to use 2008/09 NZANS data sets to explore topics of interest.

Online data tables, which contain data for additional descriptive results, are available online in Excel format: www.moh.govt.nz.

Confidentialised unit record files (CURFs) are potentially available for statistical purposes to bona fide public good researchers, subject to certain conditions. The NZANS CURFs, with accompanying documentation and user guides, will be available in early 2012. For more information on accessing CURFs, and to download an application form, please go to www.moh.govt.nz.

The survey questionnaire, methodology report and additional publications will be made available on www.moh.govt.nz.

Health and Disability Intelligence can be contacted:

by mail: Health and Disability Intelligence
Ministry of Health
PO Box 5013
Wellington

by phone: +64 4 816 2000

by email: hdi@moh.govt.nz, or to contact staff directly,
firstname_lastname@moh.govt.nz

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.

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.

3 Nutrient Intakes and Dietary Sources: Energy and Macronutrients

New Zealanders obtain the energy and nutrients they require from a wide variety of foods and beverages, and in some cases from dietary supplements as well. This chapter on energy and macronutrients presents the intake of energy and nutrients from food and beverages, without adding the nutrients from supplements (other than supplements providing energy, eg meal replacements).

3.1 Explanatory notes

Usual intake distributions

Using repeat 24-hour diet recalls on a subsample (25%) of participants, nutrient intakes for each subgroup were adjusted for intra-individual variability using the PC-SIDE programme to obtain usual intake distributions. Nutrient ratios (eg, percent energy from protein) presented in this section were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats.

Note that comparisons between NZDep2006 quintiles are based on nutrient intake, adjusted for intra-individual variation using PC-SIDE, whereas the overall test for trend (gradient) by neighbourhood deprivation is not adjusted for intra-individual variation.

Accuracy of energy and nutrient intake estimates

The accuracy of nutrient estimates depend on two factors: the accuracy of information provided by participants in the 24-hour diet recall and the accuracy of the food composition data. These two potential sources of error are briefly outlined briefly below (see Chapter 2 and the Methodology Report for more information).

Misreporting of a food intake, especially under-reporting, is a well-known problem in all types of dietary surveys. If food intake is under-reported, energy and nutrient intakes may also be underestimated, and the prevalence of inadequate intake may be overestimated.

The New Zealand Food Composition Database (NZFCDB) was the main source of nutrient data for the survey. The NZFCDB includes approximately 2740 foods, and an additional 5000 nutrient lines were created for the survey based on data from the NZFCDB and other sources (eg, overseas databases).

Nutrient adequacy

For protein, the probability of inadequate intake was estimated by comparing the *usual* intake distribution to the estimated average requirement (EAR) from the Nutrient Reference Values (NRV) for Australia and New Zealand (NHMRC 2006). Nutrient adequacy could not be determined if there was no EAR for a nutrient. When interpreting the prevalence of inadequate intakes it is important to note the following.

- Nutrient intake estimates are from food and drinks only and exclude intake from dietary supplements (other than supplements providing energy, eg meal replacements).
- Nutrient intake estimates depend on the accuracy of the information provided by participants in the 24-hour diet recall and the accuracy of the food composition data.
- The prevalence of inadequate intakes partly reflects the criterion on which the requirement is based. For example, if the requirement for nutrient X is based on maintaining body stores (assuming normal losses), and it is estimated that 15% of the population have inadequate intakes, this indicates that 15% are not consuming enough nutrient X to maintain body stores but does not indicate functional impairment or a deficiency disorder. It also does not indicate which specific individuals in the population have inadequate intakes to maintain their body stores. A cautionary comment on the interpretation of adequacy of intake for a nutrient has been made when the derivation of the reference value is either unclear or scientifically debatable.
- Accurate assessment of nutrient status requires a combination of dietary, anthropometric, biochemical and clinical measurements (Gibson 2005). Adequacy or inadequacy of nutrient status cannot be determined from dietary data alone.

Dietary sources

For each nutrient, the percentage contribution from different food groups is presented. In this way, the adequacy of nutrient intake can be understood in the context of the foods from which each was sourced.

It is important to understand how foods were classified when interpreting information on dietary sources. If a participant was able to provide a detailed description for a mixed dish, then the individual ingredients were assigned to their separate food groups. However, if a detailed description could be provided, then the dish was assigned to the food group of its main ingredient. For example, macaroni cheese would be assigned to the *Grains and pasta* group because pasta is its main ingredient, even though it contains milk and cheese. Food group descriptors are written in italics to indicate these are food groups rather than foods per se.

Details of the food groups used and the types of foods included within each group are summarised in Chapter 2 (Table 2.2). It is important to review the foods included in each group rather than simply focusing on the food group descriptor, which was created for the 1997 National Nutrition Survey. The order of foods listed as examples does not necessarily reflect current consumption patterns. For example, the *Butter and margarine* group includes more margarine than butter.

In this report, comments in the text are restricted to the top 10 dietary sources for each nutrient. Note that the largest single contributor to nutrient intake (sometimes referred to as the principal source) partly depends on how foods are grouped and how many participants consumed items within each group. Foods frequently consumed (eg, *Bread*) are more likely to feature in the top 10 dietary sources than food groups consumed by only a small proportion of participants (eg, *Fats and oils* and *Other meat)*. Note that most fats and oils added during food preparation and cooking are included in the foods to which they were added (eg, *Potatoes, kumara and taro*) rather than in the *Fats and oils* group.

Sex differences

Males have a higher body weight and a greater proportion of lean body mass than females. They therefore require more food (energy) to maintain their body mass and to meet their requirements for exercise. Therefore, daily energy intake, on average, for males will exceed that for females, as will their intake of macronutrients.

Percent energy from macronutrients

Percent energy from macronutrients per day was calculated from day 1 of recall as follows (NHMRC 2006):

- percent energy from fat = (fat (g/day) x 37.7 kJ/g) / energy (kJ/day)
- percent energy from carbohydrate = (carbohydrate (g/day) x 16.7 kJ/g) / energy (kJ/day)
- percent energy from protein = (protein (g/day) x 16.7 kJ/g) / energy (kJ/day)
- percent energy from alcohol = (alcohol (g/day) x 29.3 kJ/g) / energy (kJ/day).

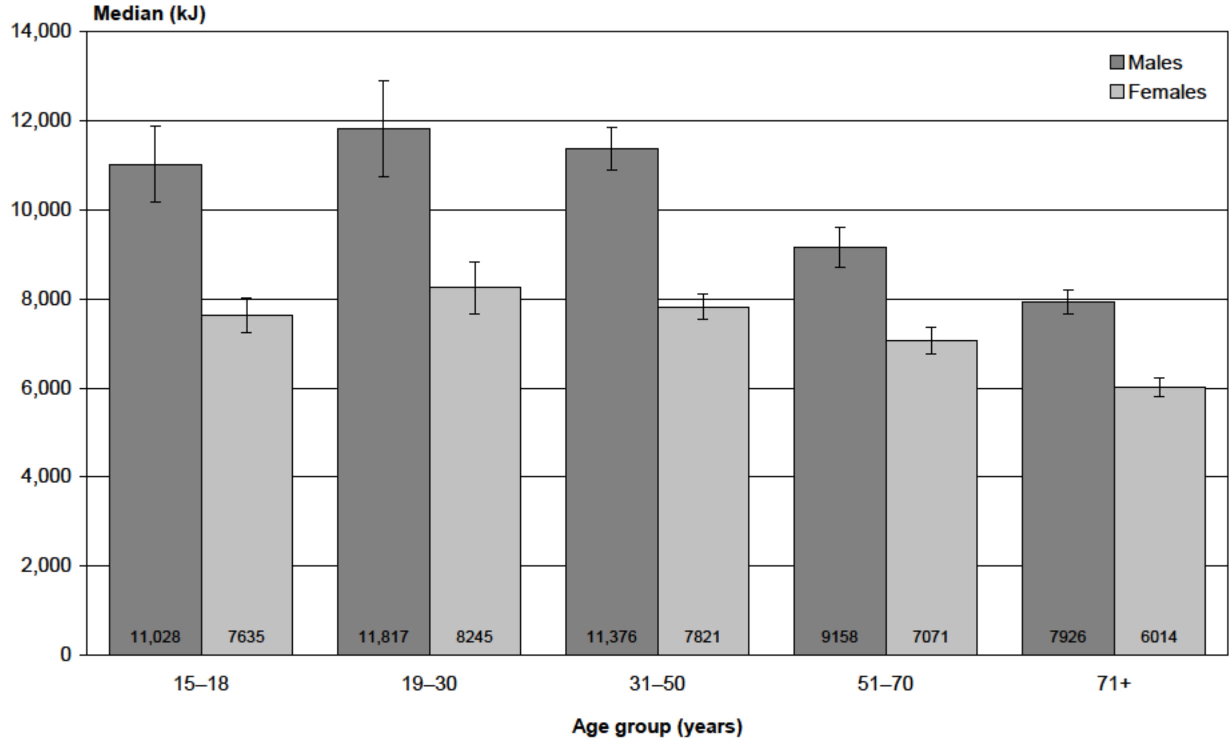
3.2 Energy

Energy is required in the body for metabolic processes, physiological functions, muscular activity, heat production, growth and the synthesis of new tissues. Food components release energy through oxidation during the digestive process. Protein, carbohydrate, fat and alcohol (the macronutrients) from food and drinks are the only sources of energy for humans. Energy requirements can vary widely according to sex, body size and physical activity (NHMRC 2006).

Energy intake

The median usual daily energy intake was 10,380 kJ for males and 7448 kJ for females (Table 3.1). Males aged 51+ years and females aged 71+ years had lower usual daily energy intakes than younger males and females (Figure 3.1).

Figure 3.1: Median energy intake (kJ), by age group and sex



Among Māori males, those aged 51+ years had a lower median usual daily energy intake than younger males; Māori females 51+ years had intakes lower than those aged 19–30 years. Pacific females aged 51+ years had a lower median usual daily energy intake than those aged 31–50 years.

For both males and females there were no differences in energy intake between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for energy intake, after adjusting for age, sex and ethnic group.

Dietary sources of energy

The *Bread* group was the principal source of energy, contributing 11%, followed by *Grains and pasta* (7%) and *Potatoes, kumara and taro* (6%); *Fruit, Non-alcoholic beverages*, *Milk*, *Bread-based dishes* and *Alcoholic beverages* each contributed 5%, and *Sugar and sweets* and *Poultry* each contributed 4% (Table 3.2).

Although *Bread* was the largest source of energy for males and females of all age groups, for females aged 19–30 years *Grains and pasta* and *Bread* each contributed 9% of energy. Males aged 71+ years had a higher proportion of energy from *Bread* (14%) than males aged 15–30 years (10%). Females aged 71+ years obtained more energy from *Bread* than all younger age groups (Figure 3.2).

The contribution of other food sources to energy in the diet varied according to age and sex groups. Females consumed more energy than males from *Fruit* (6% and 4%, respectively). Males consumed more energy than females from *Bread-based dishes* (6% and 4%, respectively) and *Alcoholic beverages* (6% and 4%). Older females (71+ years) obtained less energy from *Grains and pasta* and *Non-alcoholic beverages* than females aged 15–50 years. Younger males (15–18 years) obtained more energy from *Potatoes, kumara and taro* (9%) compared to males aged 31+ years (6%).

Figure 3.2: Percent energy from bread, by age group and sex

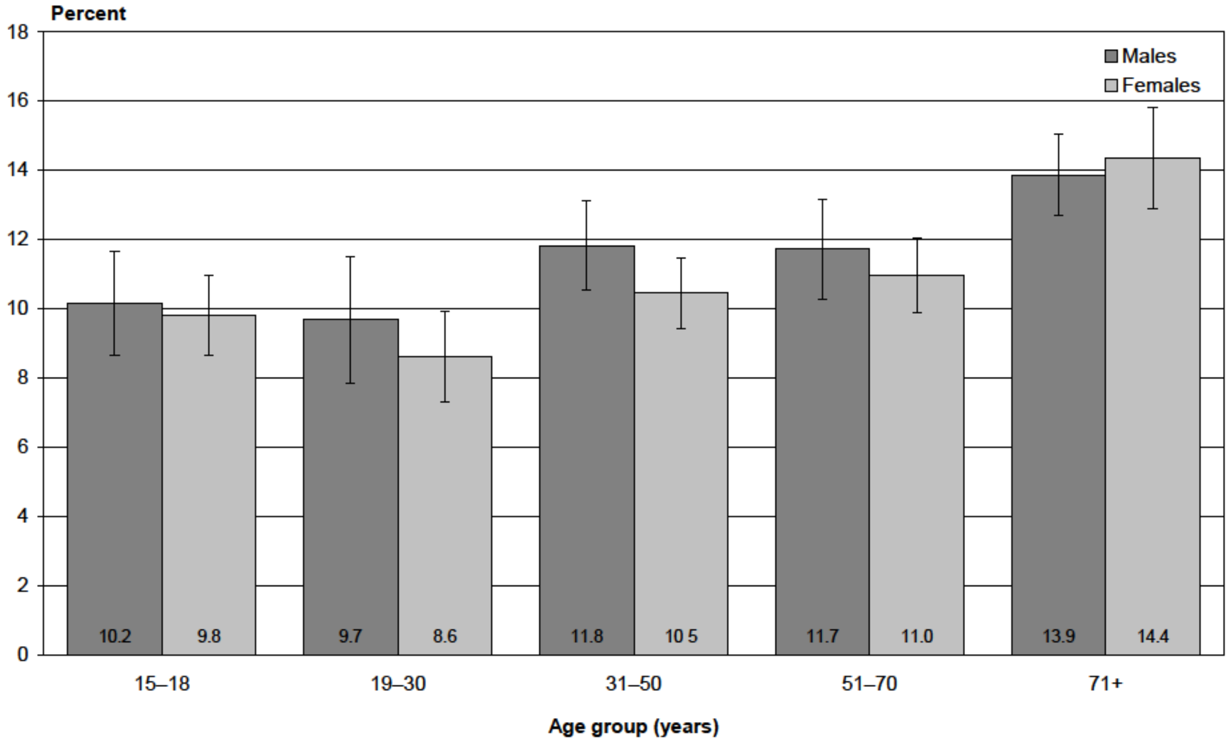


Table 3.1: Energy intake, by age group, ethnic group, NZDep2006 and sex

		Energy (kJ)[1]			
		Mean	**10th[2]**	**Median (50th),[2] 95% CI**	**90th[2]**
Total population (15 years+)		9103	5890	8742 (8544–8940)	12,750
By age group (years)					
Males	15–18	11,201	8460	11,028 (10,171–11,885)	14,165
	19–30	11,940	9921	11,817 (10,733–12,901)	14,114
	31–50	11,493	8971	11,376 (10,908–11,844)	14,160
	51–70	9371	6387	9158 (8701–9615)	12,635
	71+	8067	5968	7926 (7646–8206)	10,334
	Total	10,683	7500	10,380 (10,053–10,707)	14,268
Females	15–18	7856	5488	7635 (7253–8017)	10,506
	19–30	8426	5664	8245 (7653–8837)	11,361
	31–50	7921	6165	7821 (7537–8105)	9799
	51–70	7205	4994	7071 (6777–7365)	9579
	71+	6116	4458	6014 (5812–6216)	7906
	Total	7644	5305	7448 (7275–7621)	10,220
Māori					
Males	15–18	11,820	8059	11,513 (9874–13,152)	16,011
	19–30	12,918	9040	12,290 (11,051–13,529)	17,517
	31–50	11,871	9088	11,769 (10,807–12,731)	14,783
	51+	8953	6009	8897 (7966–9828)	11,956
	Total	11,630	8824	11,449 (10,839–12,059)	14,669
Females	15–18	7678	5611	7409 (6045–8773)	10,085
	19–30	8880	6195	8668 (7923–9413)	11,802
	31–50	7474	4764	7195 (5850–8540)	10,541
	51+	6590	4569	6483 (5930–7036)	8752
	Total	7928	5215	7632 (7285–7979)	10,976
Pacific					
Males	15–18	11,080	8864	11,008[#]	13,390
	19–30	11,995	7667	11,563 (8976–14,150)	16,828
	31–50	11,027	7995	10,858 (9900–11,816)	14,278
	51+	8871	5129	8580 (7143–10,017)	12,991
	Total	11,027	6968	10,711 (9843–11,579)	15,496
Females	15–18	7615	5256	7376 (6214–8538)	10,275
	19–30	8832	5259	8217 (6500–9934)	13,086
	31–50	8619	5458	8311 (7580–9042)	12,176
	51+	6940	4358	6554 (5860–7248)	9974
	Total	8321	5525	7970 (7564–8376)	11,540

		Energy (kJ)[1]			
		Mean	10th[2]	Median (50th),[2] 95% CI	90th[2]
NZEO					
Males	15–18	11,121	8080	10,933 (9963–11,903)	14,404
	19–30	11,635	7814	11,242 (10,274–12,210)	15,957
	31–50	11,499	9170	11,416 (10,883–11,949)	13,938
	51+	9073	6566	8864 (8511–9217)	11,855
	Total	10,602	7591	10,375 (9885–10,865)	13,901
Females	15–18	7839	5514	7623 (7202–8044)	10,435
	19–30	8311	5567	8151 (7447–8855)	11,264
	31–50	7875	6150	7797 (7479–8115)	9697
	51+	6918	4868	6794 (6571–7017)	9121
	Total	7589	5301	7431 (7243–7619)	10,073
By NZDep2006 quintile					
Males	1	10,507	6847	10,301 (9609–10,993)	14,429
	2	11,133	8496	10,955 (10,157–11,753)	14,006
	3	10,312	8541	10,205 (9386–11,024)	12,228
	4	10,248	7354	10,049 (9287–10,811)	13,399
	5	10,872	7188	10,530 (9822–11,238)	14,941
Females	1	7555	5273	7447 (7043–7851)	9938
	2	7665	5692	7556 (7133–7979)	9774
	3	7834	5957	7710 (7330–8090)	9847
	4	7463	5028	7225 (6847–7603)	10,188
	5	7602	5126	7333 (6986–7680)	10,395

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.2: Energy sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	11.0 (10.6–11.4)	10.2 (8.7–11.7)	9.7 (7.9–11.5)	11.8 (10.5–13.1)	11.7 (10.3–13.2)	13.9 (12.7–15.0)	11.4 (10.8–12.1)	9.8 (8.7–11)	8.6 (7.3–9.9)	10.5 (9.4–11.5)	11.0 (9.9–12.0)	14.4 (12.9–15.8)	10.6 (10.0–11.2)
Grains and pasta	6.8 (6.3–7.4)	7.0 (5.2–8.7)	9.4 (7.1–11.7)	6.8 (5.7–7.9)	6.5 (4.9–8.1)	4.7 (3.6–5.7)	7.1 (6.3–7.9)	7.9 (6.5–9.2)	8.7 (6.9–10.5)	7.1 (5.9–8.2)	5.2 (4.1–6.2)	4.1 (3.3–4.8)	6.6 (6.0–7.2)
Potatoes, kumara and taro	6.4 (6.0–6.7)	8.8 (7.3–10.4)	6.3 (4.8–7.7)	6.2 (5.3–7.1)	6.3 (5.3–7.3)	6.3 (5.6–7.0)	6.5 (5.9–7.0)	8.2 (6.9–9.4)	7.4 (5.7–9.0)	6.1 (5.2–7.1)	5.4 (4.6–6.2)	5.6 (4.9–6.2)	6.3 (5.7–6.8)
Fruit	5.4 (5.1–5.6)	3.4 (2.7–4.2)	3.6 (2.7–4.4)	4.0 (3.3–4.6)	4.8 (4.1–5.4)	7.0 (6.2–7.7)	4.3 (4.0–4.7)	4.3 (3.7–4.9)	4.8 (4.0–5.6)	5.8 (5.1–6.4)	7.8 (7.0–8.6)	8.8 (8.1–9.5)	6.3 (5.9–6.7)
Non-alcoholic beverages	5.0 (4.7–5.3)	7.6 (6.4–8.8)	7.6 (6.5–8.7)	4.5 (3.8–5.2)	3.6 (2.8–4.4)	2.2 (1.8–2.6)	4.9 (4.5–5.4)	8.1 (7.1–9.1)	7.0 (5.9–8.1)	4.7 (4.0–5.5)	4.1 (3.4–4.7)	2.7 (2.3–3.1)	5.0 (4.6–5.4)
Milk	5.0 (4.7–5.2)	4.5 (3.8–5.2)	3.7 (2.9–4.5)	4.6 (4.0–5.1)	5.2 (4.6–5.9)	5.8 (5.2–6.4)	4.7 (4.4–5.0)	4.0 (3.3–4.7)	4.2 (3.5–4.9)	5.8 (5.0–6.5)	5.2 (4.6–5.9)	6.2 (5.7–6.8)	5.2 (4.9–5.6)
Bread-based dishes	5.0 (4.4–5.5)	10.6 (8.5–12.7)	9.3 (6.5–12.2)	5.3 (4.1–6.5)	4.6 (3.1–6.1)	1.7 (1.1–2.3)	6.0 (5.1–6.9)	8.9 (7.0–10.9)	4.9 (3.5–6.4)	4.4 (3.4–5.4)	2.2 (1.6–2.8)	1.7 (1.1–2.2)	4.0 (3.4–4.5)
Alcoholic beverages	4.9 (4.5–5.4)	2.5 (1.2–3.8)	6.0 (4.1–7.9)	6.0 (4.7–7.4)	6.1 (4.8–7.4)	5.3 (4.1–6.5)	5.7 (5–6.4)	2.3 (1.1–3.4)	4.9 (2.6–7.3)	4.6 (3.5–5.7)	4.1 (3.1–5.1)	3.1 (2.2–3.9)	4.2 (3.6–4.8)
Sugar and sweets	4.2 (3.9–4.5)	3.1 (2.2–4.0)	4.5 (3.2–5.8)	4.4 (3.7–5.1)	3.9 (3.4–4.5)	4.3 (3.8–4.8)	4.2 (3.8–4.6)	4.9 (3.8–5.9)	4.7 (3.7–5.8)	4.8 (4.1–5.5)	3.6 (2.9–4.2)	3.1 (2.7–3.5)	4.3 (3.9–4.7)
Poultry	3.8 (3.5–4.1)	4.5 (3.4–5.5)	4.1 (2.9–5.3)	4.5 (3.4–5.6)	3.3 (2.3–4.2)	2.0 (1.5–2.6)	3.9 (3.3–4.4)	4.1 (3.0–5.1)	4.7 (3.7–5.6)	4.1 (3.4–4.9)	2.9 (2.2–3.7)	2.5 (1.8–3.2)	3.7 (3.3–4.2)
Vegetables	3.8	2.0	2.4	3.1	3.6	4.3	3.1	2.4	3.5	4.1	5.7	4.7	4.4
Cakes and muffins	3.7	1.7	2.4	3.7	3.8	3.6	3.3	4.5	4.1	3.4	4.6	5.1	4.1
Breakfast cereals	3.5	3.1	2.5	2.9	5.0	4.1	3.5	2.4	2.6	3.5	4.1	4.4	3.5
Beef and veal	3.3	3.2	3.1	3.7	3.5	4.0	3.5	2.5	2.1	3.3	3.5	3.7	3.1
Butter and margarine	3.0	1.9	2.0	2.9	3.7	4.9	3.1	1.8	2.2	2.8	3.4	4.8	3.0
Fish and seafood	2.8	1.5	1.9	3.2	2.8	3.3	2.7	1.1	2.4	2.9	3.4	2.8	2.8
Biscuits	2.7	2.7	1.0	2.4	2.5	3.7	2.3	3.8	2.5	3.2	2.9	3.7	3.1
Pies and pasties	2.5	3.9	4.4	3.1	1.9	1.6	3.0	2.6	2.9	1.9	1.7	1.4	2.0
Dairy products	2.5	2.5	1.7	2.1	2.6	2.5	2.2	3.0	3.0	2.1	2.9	3.1	2.7
Sausages and processed meats	2.3	2.4	2.7	2.6	2.0	2.1	2.4	2.6	1.9	2.2	2.0	1.9	2.1
Cheese	1.9	1.6	1.9	2.0	1.5	1.4	1.8	1.9	1.2	2.5	1.9	1.9	2.0
Pork	1.7	2.1	2.2	1.5	2.3	2.1	2.0	1.1	1.3	1.4	1.7	1.6	1.5
Eggs and egg dishes	1.5	1.6	1.1	1.4	1.6	1.9	1.4	0.9	2.0	1.2	1.6	2.0	1.5

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Savoury sauces and condiments	1.4	1.7	1.1	1.2	1.2	1.0	1.2	1.2	1.6	1.6	1.5	1.1	1.5
Nuts and seeds	1.2	1.0	0.7	1.1	1.4	1.0	1.1	0.6	0.8	1.7	1.8	0.7	1.3
Lamb and mutton	1.1	0.6	0.9	1.0	1.6	0.9	1.1	0.6	1.2	0.7	1.5	1.1	1.0
Puddings and desserts	1.0	0.9	0.4	0.9	1.1	2.2	0.9	0.8	1.0	0.8	1.2	1.3	1.0
Soups and stocks	0.8	0.2	0.6	0.4	0.7	1.4	0.6	0.5	0.9	0.9	1.3	1.6	1.0
Snack bars	0.7	1.5	0.6	1.1	0.4	0.2	0.8	1.4	0.4	0.6	0.8	0.3	0.7
Snack foods	0.6	1.0	0.9	0.5	0.2	0.1	0.5	1.4	1.4	0.7	0.3	0.0	0.7
Fats and oils	0.3	0.0	0.6	0.3	0.1	0.3	0.3	0.1	0.6	0.3	0.4	0.2	0.4
Supplements providing energy	0.2	0.5	0.6	0.3	0.1	0.0	0.3	0.2	0.3	0.2	0.1	0.3	0.2
Other meat	0.2	0.1	0.1	0.2	0.4	0.3	0.2	0.1	0.1	0.1	0.2	0.3	0.1

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

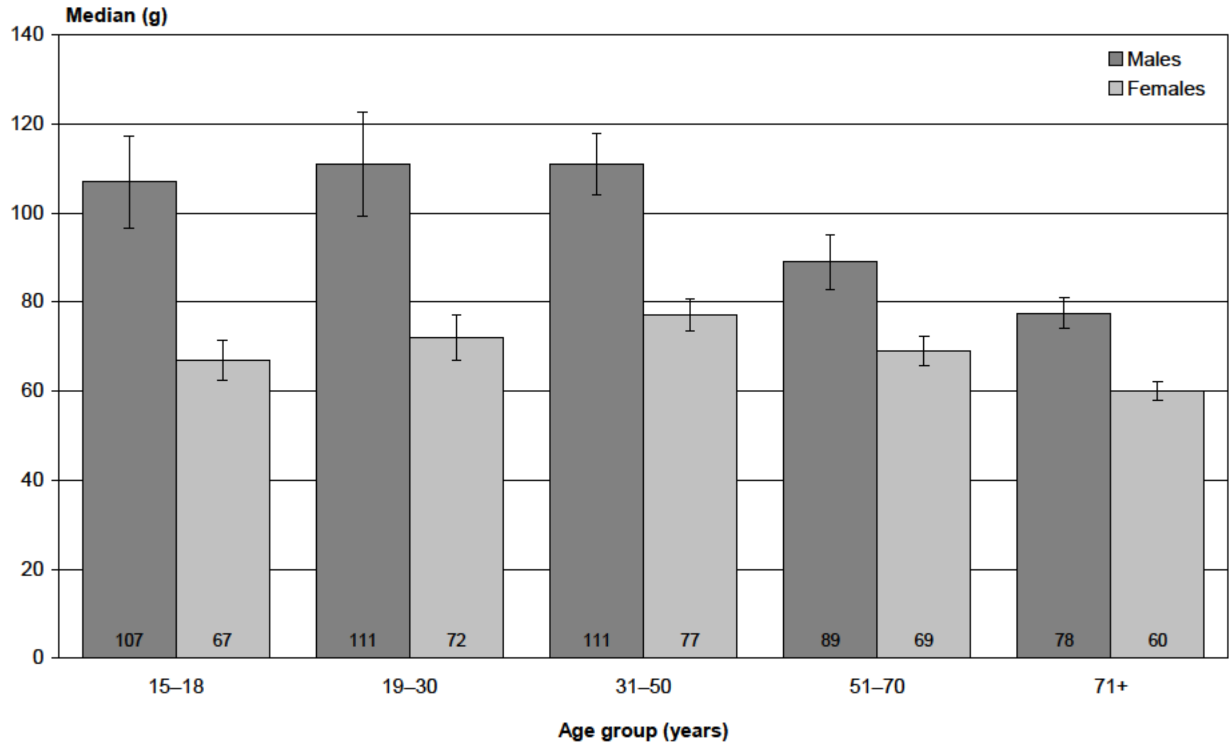
3.3 Protein

Protein is necessary to build, maintain and repair tissue and to synthesise hormones, enzymes and antibodies. Protein can also be used as a source of energy. Proteins are made up of 20 amino acids, some of which the body can synthesise, but others must be obtained from food (Mann and Truswell 2007). The acceptable macronutrient distribution range (AMDR) for protein is 15–25% of total energy (NHMRC 2006).

Protein intake

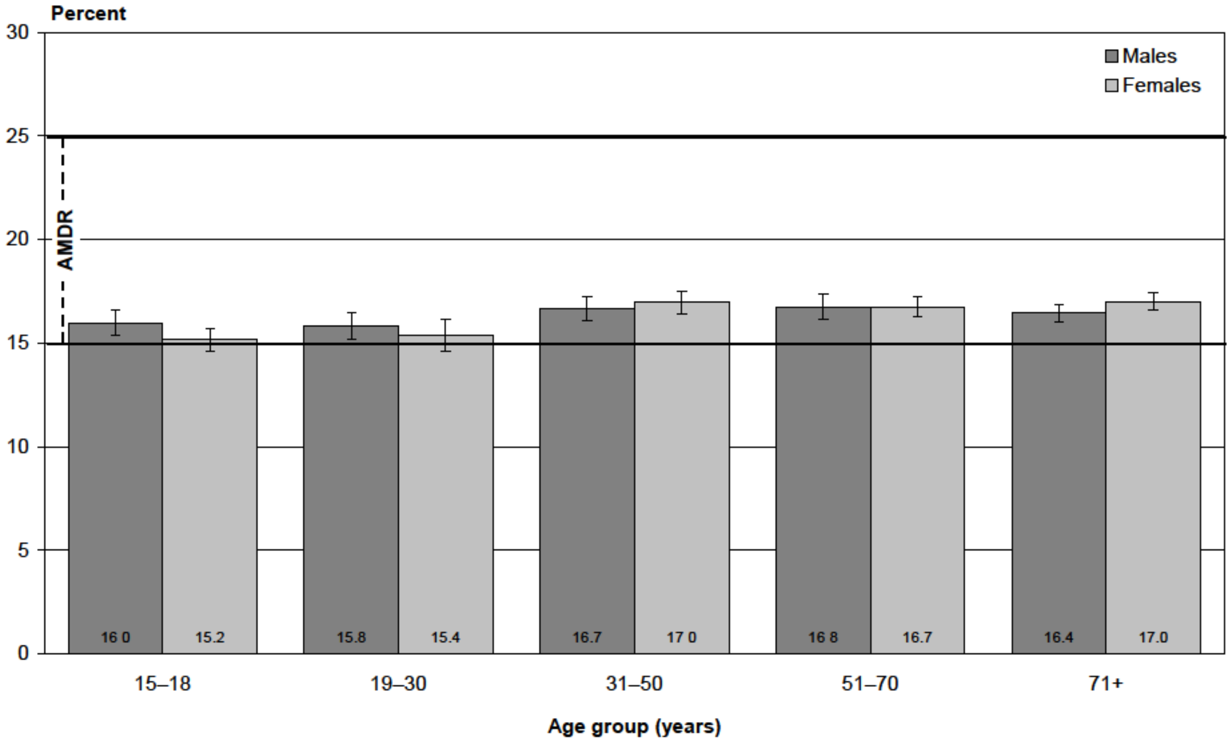
The median usual daily protein intake was 102 g for males and 71 g for females (Table 3.3). Males aged 51+ years and females aged 71+ years had lower intakes than younger males and females (Figure 3.3).

Figure 3.3: Median protein intake (g), by age group and sex



The mean contribution of protein to energy intake was 16.4% for males and 16.5% for females and varied little across age groups (Table 3.3, Figure 3.4).

Figure 3.4: Mean percent energy from protein,[1] by age group and sex



1 Acceptable macronutrient distribution range for protein is 15–25% of energy (NHMRC 2006).

Māori males aged 51+ years had a median usual daily protein intake lower than those aged 19–30 years, and the mean percent energy from protein was lower for the 15–18-year-old Māori males and females (14.7% and 15.3%, respectively) compared to those aged 51+ years (17.7% and 17.6%).

There were no differences in the median usual daily intake of protein, or in mean percent energy from protein, across age groups for Pacific males or females.

For both males and females there were no differences in intakes of protein consumed and the mean contribution of protein to energy intake between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for amounts of protein consumed and the contribution of protein to energy intake, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake for protein was 2.0% (males 1.7%; females 2.3%). The estimated average requirement (EAR) has been augmented by 25% for males and females aged 71+ years (NHMRC 2006) and the estimated prevalence of inadequate intake is higher for this age group than for all younger adults (13.4% for males aged 71+ years; 15.5 % for females aged 71+ years).

Dietary sources of protein

The *Bread* group was the single largest contributor of protein to the diet (11%), followed by *Poultry* and *Milk* (each 9%), *Beef and veal* (8%), *Grains and pasta* and *Bread-based dishes* (each 7%), *Fish and seafood* (6%) and *Pork* (5%) (Table 3.4).

Older males (71+ years) obtained more protein from *Bread* than those aged 15–30 years, and older females (71+ years) more than all younger females. In contrast, males aged 15–30 years and females aged 15–18 years obtained more protein from *Bread-based dishes* than older age groups.

The contribution of other food sources to protein intake varied according to age and sex. Older males (71+ years) and females aged 51+ years obtained less protein from *Poultry* compared to younger age groups (Figure 3.5). Males aged 15–30 years and females aged 15–50 years obtained less protein from *Milk* than older age groups; and older males (71+ years) and females aged 31+ years obtained more protein from *Fish* than younger age groups.

Figure 3.5: Percent protein from poultry, by age group and sex

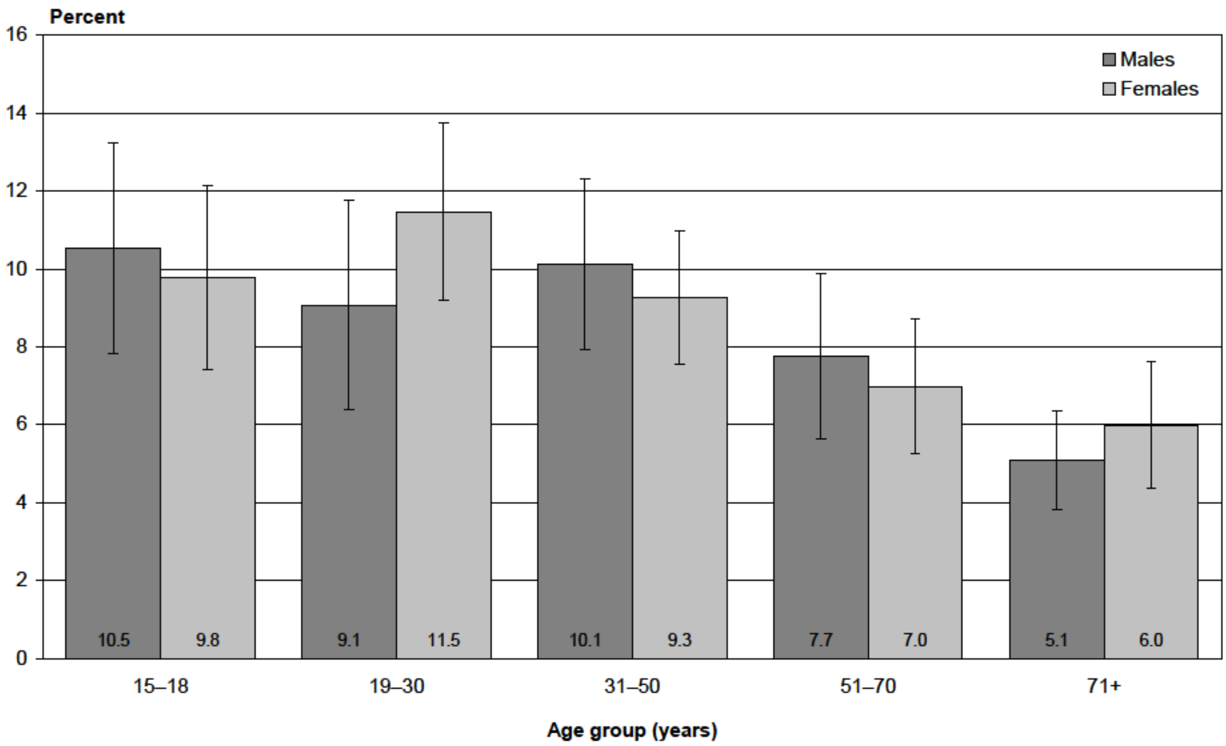


Table 3.3: Protein intake (g) and % energy from protein, by age group, ethnic group, NZDep2006 and sex

Protein intake (g) [1]

		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake: percent (95% CI)[3]
Total population		88	57	84 (82–86)	124	2.0
By age group (years)						
Males	15–18	108	91	107 (97–117)	125	0.0
	19–30	113	88	111 (99–123)	140	0.0
	31–50	113	87	111 (104–118)	142	0.0
	51–70	92	65	89 (83–95)	124	1.7*
	71+	79	63	78 (74–81)	95	13.4*
	Total	104	76	102 (98–106)	136	1.7
Females	15–18	69	49	67 (63–71)	93	0.7*
	19–30	73	52	72 (67–77)	97	0.5*
	31–50	79	57	77 (73–81)	103	0.3
	51–70	71	48	69 (66–72)	95	1.6*
	71+	62	43	60 (58–62)	83	15.5
	Total	73	50	71 (69–73)	99	2.3
Māori						
Males	15–18	102	66	98 (83–113)	144	1.5*
	19–30	127	84	119 (107–131)	176	0.3
	31–50	118	76	113 (104–122)	167	1.3
	51+	95	55	92 (79–105)	138	8.0*
	Total	114	87	113 (107–119)	144	2.5
Females	15–18	67	44	63 (51–75)	95	1.4*
	19–30	81	60	79 (71–87)	104	0.0
	31–50	76	49	73 (67–79)	107	1.1*
	51+	68	49	67 (62–72)	89	0.9*
	Total	76	52	73 (70–76)	102	0.8*
Pacific						
Males	15–18	117	79	117 (89–145)	153	1.2*
	19–30	114	61	106 (79–133)	178	5.1*
	31–50	167	60	100[#]	225	5.4*
	51+	86	50	83 (70–96)	126	11.3*
	Total	109	69	105 (95–115)	154	5.9*
Females	15–18	66	47	65 (49–81)	88	1.5*
	19–30	81	53	79 (67–91)	113	1.0*
	31–50	87	67	85 (75–95)	108	0.0
	51+	73	45	68 (59–77)	106	3.9*
	Total	81	49	77 (71–83)	117	1.4*
NZEO						
Males	15–18	107	84	105 (94–116)	131	0.0
	19–30	110	87	109 (97–121)	134	0.0
	31–50	113	89	112 (103–121)	139	0.0
	51+	89	66	87 (81–93)	114	0.8*
	Total	103	78	101 (97–105)	130	0.3

		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake: percent (95% CI)[3]
Females	15–18	69	49	67 (63–71)	91	0.5*
	19–30	71	51	70 (64–76)	93	0.9*
	31–50	79	59	77 (73–81)	100	0.2
	51+	68	48	66 (63–69)	90	1.7
	Total	73	51	71 (69–73)	96	0.9
By NZDep2006 quintile						
Males	1	101	76	99 (89–109)	129	[4]
	2	106	81	104 (97–111)	133	[4]
	3	102	64	96 (88–104)	145	[4]
	4	98	78	97 (89–105)	120	[4]
	5	109	70	105 (96–114)	154	[4]
Females	1	72	54	71 (67–75)	92	[4]
	2	73	57	73 (68–77)	91	[4]
	3	75	49	72 (68–76)	105	[4]
	4	73	49	71 (67–75)	98	[4]
	5	72	49	69 (65–73)	99	[4]

Percent energy from protein[5]

		Mean (95% CI)	10th[2]	Median (50th)[2]	90th[2]
Total population		16.5 (16.3–16.7)	11	16	23
By age group (years)					
Males	15–18	16.0 (15.4–16.6)	10	16	22
	19–30	15.8 (15.2–16.5)	11	16	22
	31–50	16.7 (16.1–17.3)	11	16	24
	51–70	16.8 (16.2–17.4)	11	16	24
	71+	16.4 (16.0–16.9)	11	16	22
	Total	16.4 (16.2–16.7)	11	16	23
Females	15–18	15.2 (14.6–15.7)	9	14	22
	19–30	15.4 (14.6–16.2)	10	15	22
	31–50	17.0 (16.4–17.5)	11	16	24
	51–70	16.7 (16.2–17.2)	11	16	24
	71+	17.0 (16.6–17.4)	11	16	23
	Total	16.5 (16.2–16.8)	11	16	23
Māori					
Males	15–18	14.7 (13.3–16.1)	9	15	20
	19–30	16.8 (15.3–18.4)	10	16	23
	31–50	17.0 (15.9–18.1)	11	16	24
	51+	17.7 (16.5–19.0)	11	17	24
	Total	16.8 (16.1–17.5)	10	16	23
Females	15–18	15.3 (13.9–16.6)	9	14	21
	19–30	15.8 (15.0–16.6)	10	15	22
	31–50	16.2 (15.3–17.1)	10	15	23
	51+	17.6 (16.8–18.4)	11	17	24
	Total	16.3 (15.8–16.7)	10	15	23

		Mean (95% CI)	10th[2]	Median (50th)[2]	90th[2]
Pacific					
Males	15–18	16.6 (14.7–18.5)	7	17	24
	19–30	16.3 (15.0–17.5)	11	16	23
	31–50	17.0 (15.7–18.4)	12	17	25
	51+	17.2 (15.6–18.8)	10	17	27
	Total	16.8 (16.1–17.5)	11	17	25
Females	15–18	15.8 (13.2–18.3)	9	13	23
	19–30	16.0 (14.8–17.2)	10	15	23
	31–50	17.2 (16.3–18.1)	11	17	24
	51+	18.0 (16.8–19.3)	12	17	26
	Total	16.9 (16.2–17.5)	11	16	24
NZEO					
Males	15–18	15.9 (15.2–16.6)	11	16	22
	19–30	15.7 (15.0–16.4)	11	16	21
	31–50	16.6 (16.0–17.3)	11	16	23
	51+	16.6 (16.1–17.1)	11	16	22
	Total	16.4 (16.1–16.7)	11	16	22
Females	15–18	15.1 (14.5–15.6)	10	14	21
	19–30	15.2 (14.3–16.2)	10	15	21
	31–50	17.0 (16.4–17.6)	11	16	24
	51+	16.7 (16.3–17.1)	11	16	23
	Total	16.4 (16.1–16.8)	11	16	23
By NZDep2006 quintile					
Males	1	16.3 (15.6–16.9)	12	16	22
	2	16.3 (15.6–17.0)	11	16	22
	3	16.5 (15.9–17.2)	11	16	23
	4	16.3 (15.6–16.9)	12	16	22
	5	16.9 (16.4–17.5)	10	16	24
Females	1	16.3 (15.6–17.0)	11	16	22
	2	16.6 (15.9–17.3)	11	16	22
	3	16.5 (15.7–17.3)	11	16	23
	4	16.6 (16.1–17.2)	10	16	23
	5	16.3 (15.8–16.9)	10	16	23

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

5 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from protein for each participant was calculated as the energy from protein (conversion factor = 16.7 kJ/g) divided by the total energy intake.

Table 3.4: Protein sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	11.1 (10.6–11.5)	9.9 (8.3–11.5)	10.0 (8.1–11.9)	11.7 (10.5–12.9)	11.5 (10.2–12.9)	14.3 (12.8–15.7)	11.4 (10.7–12.1)	10.8 (9.5–12.1)	9.0 (7.5–10.4)	10.4 (9.3–11.4)	11.2 (10.0–12.3)	14.2 (12.8–15.6)	10.7 (10.1–11.3)
Poultry	8.8 (8.1–9.6)	10.5 (7.8–13.2)	9.1 (6.4–11.8)	10.1 (7.9–12.3)	7.7 (5.6–9.9)	5.1 (3.8–6.4)	8.8 (7.7–10)	9.8 (7.4–12.1)	11.5 (9.2–13.7)	9.3 (7.5–11.0)	7.0 (5.2–8.7)	6.0 (4.4–7.6)	8.8 (7.9–9.7)
Milk	8.8 (8.4–9.2)	7.2 (6.1–8.3)	6.1 (4.8–7.4)	7.7 (6.8–8.6)	9.7 (8.4–10.9)	10.8 (9.7–12.0)	8.1 (7.6–8.7)	6.6 (5.5–7.7)	7.7 (6.2–9.1)	9.9 (8.7–11.1)	9.8 (8.7–10.8)	11.5 (10.6–12.5)	9.4 (8.8–10.0)
Beef and veal	7.8 (7.1–8.5)	7.2 (5.0–9.5)	6.5 (4.3–8.7)	8.6 (6.6–10.7)	8.6 (6.3–10.9)	10.1 (8.3–12.0)	8.2 (7.1–9.3)	6.0 (4.2–7.8)	4.6 (2.8–6.4)	7.7 (6.2–9.2)	8.5 (6.6–10.5)	9.3 (7.3–11.2)	7.3 (6.5–8.2)
Grains and pasta	6.8 (6.2–7.4)	7.3 (5.2–9.4)	9.4 (7.0–11.8)	6.8 (5.5–8.1)	6.5 (4.8–8.1)	4.7 (3.4–5.9)	7.1 (6.2–8.0)	9.2 (7.3–11.1)	9.7 (7.0–12.3)	6.7 (5.4–7.9)	4.4 (3.6–5.3)	4.2 (3.3–5.1)	6.6 (5.8–7.4)
Bread-based dishes	6.6 (5.9–7.2)	14.1 (11.6–16.7)	12.9 (9.0–16.8)	6.7 (5.1–8.3)	5.4 (3.6–7.2)	2.1 (1.4–2.8)	7.8 (6.6–9.0)	12.6 (10.0–15.2)	7.7 (5.3–10.1)	5.8 (4.5–7.2)	2.6 (1.8–3.3)	1.9 (1.2–2.5)	5.4 (4.6–6.2)
Fish and seafood	6.0 (5.4–6.6)	3.5 (2.0–4.9)	3.6 (1.9–5.4)	6.5 (4.9–8.1)	6.1 (4.3–7.9)	7.0 (5.5–8.6)	5.6 (4.8–6.5)	2.8 (1.8–3.8)	5.2 (3.3–7.2)	6.4 (4.9–7.8)	8.1 (6.3–9.9)	6.0 (4.8–7.3)	6.3 (5.5–7.1)
Pork	4.5 (4.0–5.0)	4.8 (3.1–6.4)	5.9 (3.8–8.0)	4.1 (3.0–5.2)	6.0 (4.0–8.0)	6.0 (4.6–7.5)	5.2 (4.4–6.0)	3.3 (2.2–4.4)	3.3 (1.8–4.8)	3.9 (2.9–4.9)	4.2 (3.1–5.4)	4.3 (3.2–5.4)	3.9 (3.3–4.4)
Vegetables	4.3 (4.0–4.6)	2.4 (1.5–3.3)	2.8 (1.9–3.7)	3.7 (3.1–4.4)	3.7 (3.0–4.3)	5.0 (4.4–5.6)	3.5 (3.2–3.9)	2.8 (2.2–3.4)	4.7 (3.4–6.0)	4.5 (3.8–5.2)	6.3 (5.4–7.2)	5.5 (4.9–6.1)	5.0 (4.5–5.5)
Potatoes, kumara and taro	3.2 (3–3.4)	4.6 (3.7–5.5)	2.9 (2.2–3.6)	3.0 (2.5–3.5)	3.2 (2.7–3.7)	3.4 (3.0–3.8)	3.2 (2.9–3.5)	4.2 (3.5–4.9)	4.2 (3.0–5.3)	3.1 (2.5–3.6)	2.6 (2.2–3.0)	2.9 (2.6–3.3)	3.2 (2.9–3.6)
Sausages and processed meats	3.1	3.3	3.9	3.5	2.9	3.1	3.3	3.9	3.0	2.9	2.8	2.7	2.9
Cheese	3.1	2.5	3.3	3.1	2.4	2.3	2.8	3.2	2.0	4.1	3.2	3.1	3.3
Eggs and egg dishes	2.9	2.8	2.1	2.8	3.3	3.7	2.8	1.8	3.9	2.3	3.0	3.9	2.9
Breakfast cereals	2.8	2.5	2.2	2.4	4.0	3.5	2.9	2.0	1.9	2.6	3.2	3.5	2.7
Pies and pasties	2.6	3.7	4.6	3.2	2.1	1.8	3.1	2.9	3.0	1.9	1.7	1.5	2.1
Non-alcoholic beverages	2.5	0.9	2.3	2.1	2.2	1.3	2.0	2.0	2.6	3.3	3.1	1.9	2.9
Lamb and mutton	2.0	1.2	1.7	1.7	2.6	1.9	1.9	1.0	2.4	1.4	2.9	2.5	2.1
Dairy products	2.0	1.6	1.3	1.6	1.7	1.6	1.5	2.6	2.6	1.8	2.8	2.8	2.4
Cakes and muffins	1.8	0.9	1.4	1.6	1.7	1.6	1.5	2.5	2.2	1.6	2.0	2.6	2.0
Fruit	1.7	1.2	1.1	1.2	1.5	2.1	1.3	1.5	1.5	1.8	2.5	2.6	2.0
Nuts and seeds	1.2	1.1	0.7	1.1	1.4	1.0	1.1	0.6	0.6	1.5	1.5	0.7	1.2
Biscuits	1.1	1.2	0.5	0.9	1.0	1.4	0.9	1.8	1.0	1.4	1.3	1.5	1.3
Soups and stocks	1.1	0.3	0.9	0.6	0.8	1.7	0.8	0.8	1.0	1.2	1.7	1.7	1.3

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Sugar and sweets	0.9	0.9	1.2	0.8	0.4	0.3	0.7	1.8	1.3	1.1	0.7	0.4	1.0
Savoury sauces and condiments	0.8	0.7	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.9	0.8	0.8	0.8
Alcoholic beverages	0.7	0.5	1.2	1.0	1.0	0.9	1.0	0.1	0.2	0.6	0.3	0.3	0.4
Puddings and desserts	0.5	0.4	0.1	0.5	0.5	1.4	0.5	0.4	0.5	0.4	0.6	0.8	0.5
Other meat	0.5	0.2	0.2	0.5	0.9	0.8	0.6	0.2	0.2	0.3	0.4	0.5	0.4
Snack bars	0.4	1.3	0.3	0.6	0.3	0.1	0.5	0.8	0.3	0.4	0.4	0.2	0.4
Supplements providing energy	0.4	0.7	0.8	0.5	0.1	0.0	0.4	0.2	0.7	0.4	0.1	0.3	0.4
Snack foods	0.3	0.5	0.5	0.3	0.1	0.0	0.3	0.7	0.6	0.4	0.2	0.0	0.4
Butter and margarine	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

3.4 Total fat

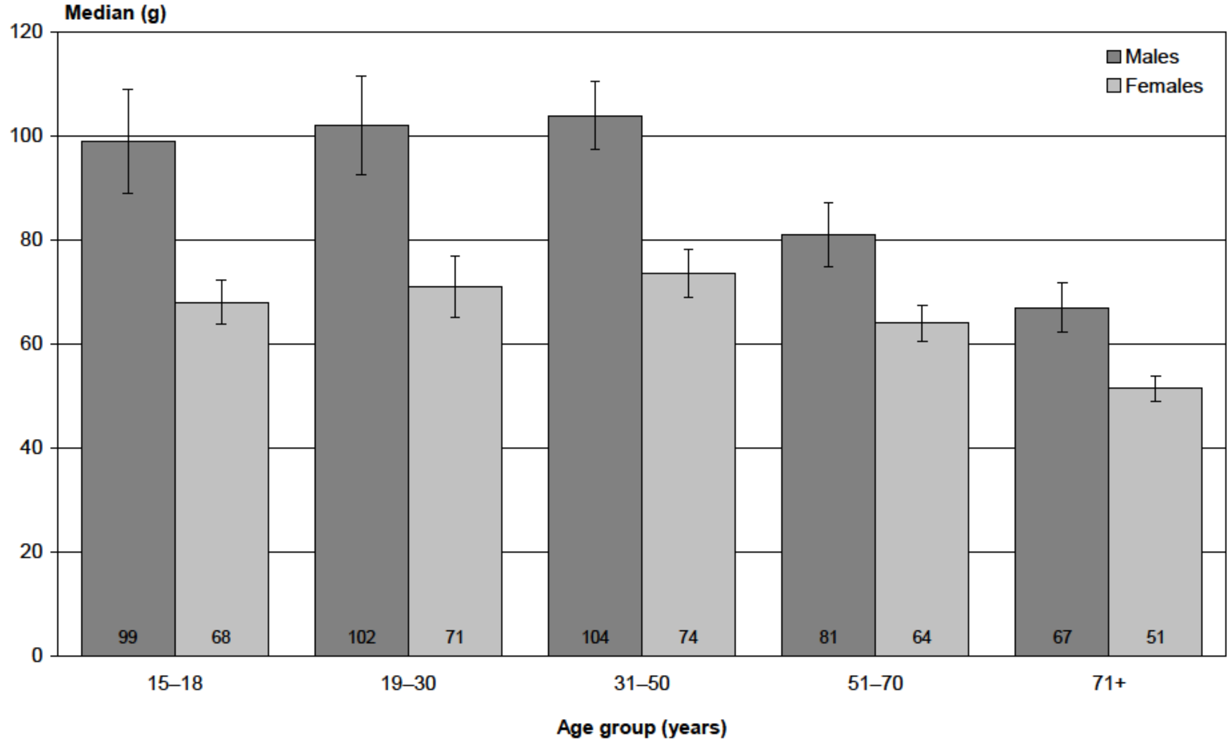
Fats are the most concentrated sources of energy. Dietary fats also help in the absorption of fat-soluble vitamins, are the precursors of many hormones, and are an important structural component of cell membranes (Mann and Truswell 2007). There are three main types of fatty acids in the diet: saturated, monounsaturated and polyunsaturated. Some monounsaturated and polyunsaturated fatty acids have a particular configuration and are called trans fatty acids.

Deficiencies resulting from inadequate fatty acids intake are rare, suggesting the minimum requirements are low. In countries such as New Zealand the major health issues concerning dietary fat are related to excess consumption of dietary fat (especially saturated fat) and/or an imbalance of fatty acids. The acceptable macronutrient distribution range for total fat is 20–35% of energy (NHMRC 2006).

Total fat intake

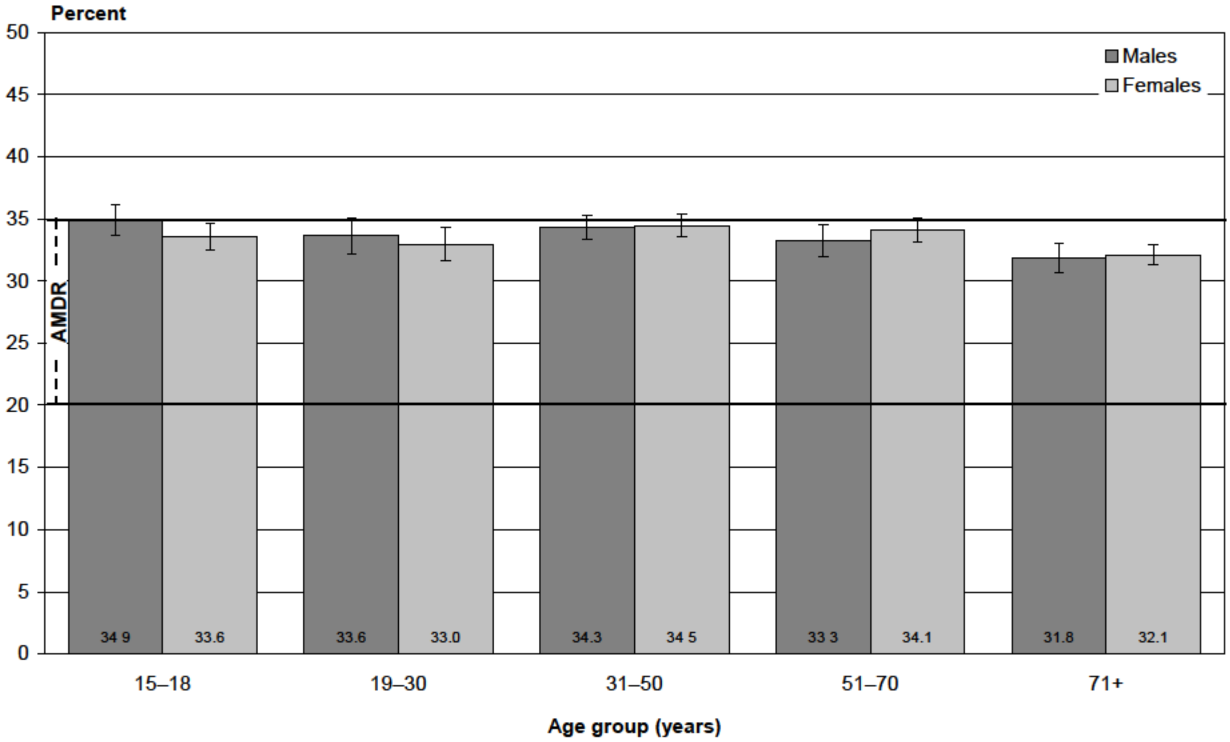
The median usual daily intake of total fat for males was 95 g and for females 67 g (Table 3.5). Males aged 51+ years and females aged 71+ years had lower total fat intakes than younger males and females (Figure 3.6).

Figure 3.6: Median total fat intake (g), by age group, and sex



The mean percent contribution to daily energy intake from total fat was 33.7% for males and 33.8% for females (Table 3.5). This falls within the AMDR of 20–35% of energy for total fat. There was little variation across age groups for percent energy from total fat for both males and females (Figure 3.7).

Figure 3.7: Percent energy from total fat,[1] by age group and sex



1 Acceptable macronutrient distribution range for fat is 20–35% of energy (NHMRC 2006).

Māori males aged 51+ years consumed less total fat (92 g) than those aged 31–50 years (117 g), and Māori females aged 51+ years (62 g) consumed less total fat than those aged 19–30 years (80 g). Pacific females aged 51+ years consumed less total fat (60 g) than those aged 19–30 years (75 g).

For males and females the proportion of energy from fat did not vary between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for total fat intake, after adjusting for age, sex and ethnic group.

Dietary sources of total fat

The largest single contributor of total fat to the diet was the *Butter and margarine* group (9%), followed by *Potatoes, kumara and taro*, *Bread-based dishes* and *Poultry* (each 6%), and *Milk* and *Beef and veal* (each 5%) (Table 3.6). *Bread*, *Cakes and muffins*, *Cheese* and *Grains and pasta* all contributed 4% of total fat.

There were differences in the contribution of *Butter and margarine* to the total fat intake across age groups. Males aged 31+ years and females aged 51+ years obtained proportionately more fat from *Butter and margarine* than those aged 15–18 years. In particular, males and females aged 71+ years obtained 16% and 15% of total fat, respectively, from *Butter and margarine.*

Other variations in the contributions to total fat intake were:

- *Potatoes, kumara and taro* contributed more for 15–18-year-old males and females compared to those 31+ years (Figure 3.8)
- *Bread-based dishes* contributed more total fat to the diet of 15–18-year-old males compared to those aged 31+ years, and to the diet of 15–18-year-old females compared to all older females
- *Poultry* provided less total fat to older males (71+ years) than to those aged 15–50 years
- females aged 51+ years obtained less fat from *Poultry* than females aged 19–30 years.

Figure 3.8: Percent total fat from *Potatoes, kumara and taro*, by age group and sex

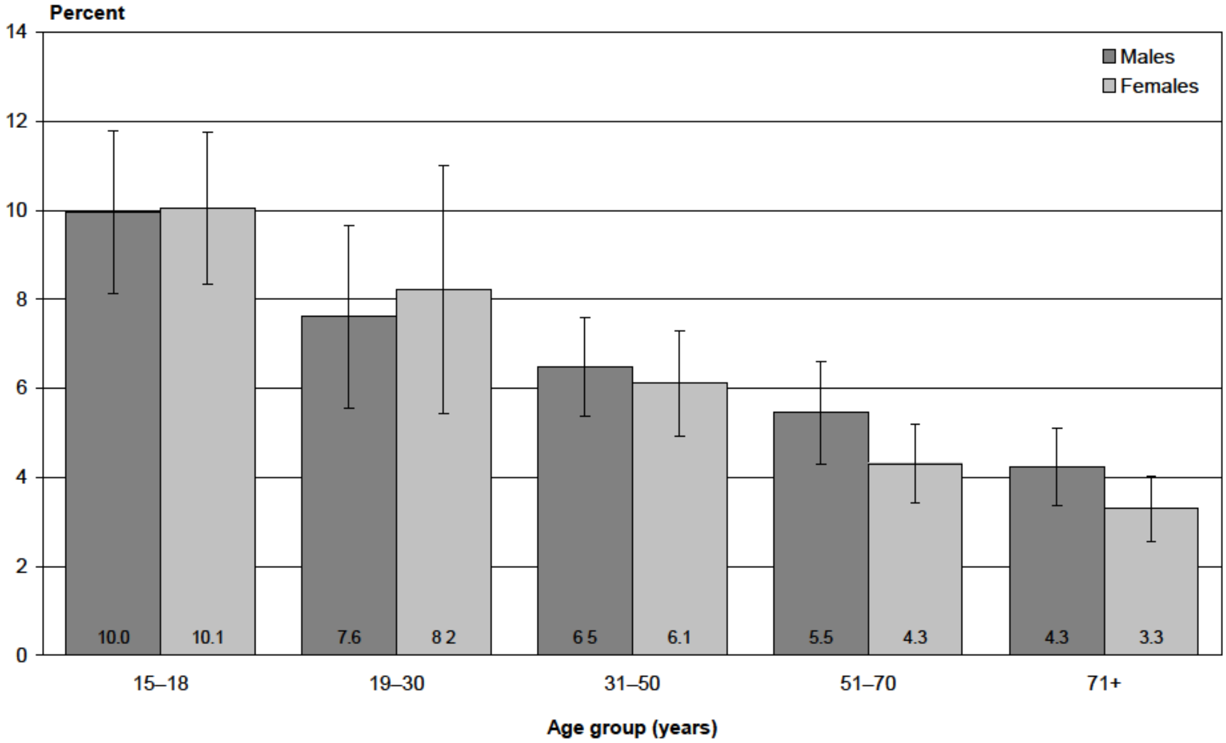


Table 3.5: Total fat intake, by age group, ethnic group, NZDep2006 and sex

		Total fat (g)[1]				Percent energy from total fat[2]			
		Mean	10th[3]	Median (50th) (95% CI)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
Total population		83	51	79 (77–81)	119	33.7 (33.3–34.1)	23	34	46
By age group (years)									
Males	15–18	104	63	99 (89–109)	151	34.9 (33.6–36.1)	24	34	45
	19–30	108	63	102 (93–111)	159	33.6 (32.2–35.0)	23	35	45
	31–50	105	81	104 (98–110)	131	34.3 (33.3–35.2)	23	35	47
	51–70	85	49	81 (75–87)	125	33.3 (32.0–34.6)	21	33	45
	71+	69	47	67 (62–72)	94	31.8 (30.6–33.1)	23	33	44
	Total	97	67	95 (92–98)	131	33.7 (33.1–34.3)	23	34	45
Females	15–18	70	44	68 (64–72)	101	33.6 (32.5–34.6)	23	34	44
	19–30	74	43	71 (65–77)	110	33.0 (31.6–34.3)	22	35	46
	31–50	74	62	74 (69–78)	87	34.5 (33.5–35.4)	24	35	46
	51–70	66	39	64 (61–67)	98	34.1 (33.1–35.1)	23	34	48
	71+	53	36	51 (49–54)	72	32.1 (31.3–32.9)	22	33	44
	Total	70	44	67 (65–69)	98	33.8 (33.2–34.3)	23	34	46
Māori									
Males	15–18	109	70	103 (82–124)	158	34.7 (32.2–37.2)	25	35	45
	19–30	120	77	113 (101–125)	170	34.9 (32.6–37.2)	24	36	48
	31–50	119	86	117 (106–128)	152	38.0 (36.5–39.6)	26	38	48
	51+	93	62	92 (81–103)	127	37.5 (35.3–39.6)	24	38	48
	Total	113	90	112 (104–120)	139	36.6 (35.5–37.7)	25	37	48
Females	15–18	71	43	67 (53–81)	105	35.7 (33.0–38.5)	23	35	47
	19–30	82	54	80 (72–88)	113	34.8 (33.2–36.4)	23	36	46
	31–50	75	49	73 (63–83)	106	35.6 (34.0–37.3)	26	36	48
	51+	64	44	62 (56–68)	86	36.4 (34.7–38.2)	25	37	48
	Total	75	48	72 (67–77)	107	35.6 (34.6–36.5)	24	36	47
Pacific									
Males	15–18	106	72	104 (70–138)	141	35.0 (30.9–39.1)	19	36	50
	19–30	118	66	112 (78–146)	177	36.8 (33.4–40.3)	26	36	49
	31–50	99	51	92 (75–109)	158	33.7 (30.0–37.5)	21	36	49
	51+	71	35	65 (49–81)	115	30.3 (27.5–33.2)	17	32	43
	Total	103	65	99 (87–111)	146	34.2 (32.2–36.1)	20	35	48
Females	15–18	66	40	63 (50–76)	98	32.6 (29.6–35.7)	21	34	44
	19–30	81	39	75 (64–86)	131	34.2 (32.2–36.2)	22	35	47
	31–50	83	46	78 (70–86)	128	35.6 (34.2–37.1)	23	36	46
	51+	65	37	60 (53–67)	98	35.1 (33.1–37.0)	23	35	48
	Total	78	46	74 (68–80)	115	34.7 (33.7–35.7)	22	35	46

		Total fat (g)[1]				Percent energy from total fat[2]			
		Mean	10th[3]	Median (50th) (95% CI)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
NZEO									
Males	15–18	102	80	101 (90–112)	125	34.7 (33.3–36.1)	24	34	45
	19–30	102	83	101 (91–110)	122	33.2 (31.5–34.8)	23	34	44
	31–50	104	77	103 (97–109)	134	34.0 (32.9–35.0)	23	34	45
	51+	81	54	78 (74–82)	111	32.7 (31.6–33.8)	22	33	44
	Total	95	68	93 (90–96)	126	33.4 (32.7–34.1)	23	33	45
Females	15–18	70	46	68 (63–73)	98	33.8 (32.6–34.9)	23	34	44
	19–30	73	43	70 (64–76)	107	32.8 (31.2–34.4)	22	35	46
	31–50	73	63	73 (68–78)	84	34.3 (33.3–35.4)	23	34	45
	51+	62	39	60 (57–63)	89	33.3 (32.5–34.1)	22	33	45
	Total	69	44	67 (65–69)	96	33.6 (33.0–34.2)	22	34	45
By NZDep2006 quintile									
Males	1	95	56	90 (82–98)	142	33.6 (32.1–35.0)	24	33	45
	2	102	83	101 (91–110)	122	33.6 (32.3–34.9)	25	34	44
	3	119	86	117 (106–128)	152	33.6 (32.1–35.1)	21	33	45
	4	92	68	90 (82–98)	118	33.6 (32.3–34.8)	23	35	45
	5	100	62	96 (88–104)	141	34.1 (33.0–35.3)	22	35	48
Females	1	68	45	66 (61–71)	94	33.6 (32.2–35.0)	21	34	45
	2	69	44	67 (62–72)	97	33.2 (32.2–34.2)	23	33	44
	3	69	49	67 (62–72)	92	33.0 (31.7–34.3)	23	33	45
	4	70	42	66 (61–71)	103	34.7 (33.6–35.8)	23	34	46
	5	71	46	68 (64–72)	99	34.5 (33.4–35.6)	23	36	47

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from fat for each participant was calculated as the energy from fat (conversion factor = 37.7 kJ/g) divided by the total energy intake.

3 Percentiles.

Table 3.6: Total fat sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Butter and margarine	9.3 (8.8–9.8)	5.6 (4.4–6.9)	6.3 (5.0–7.7)	9.0 (7.8–10.2)	11.9 (10.1–13.7)	15.8 (14.5–17.2)	9.6 (8.9–10.3)	5.5 (4.5–6.4)	6.7 (5.3–8.0)	8.1 (6.9–9.4)	10.3 (9.0–11.7)	15.0 (13.6–16.5)	9.0 (8.3–9.6)
Potatoes, kumara and taro	6.3 (5.7–6.8)	10.0 (8.1–11.8)	7.6 (5.6–9.7)	6.5 (5.4–7.6)	5.5 (4.3–6.6)	4.3 (3.4–5.1)	6.5 (5.8–7.2)	10.1 (8.3–11.8)	8.2 (5.4–11.0)	6.1 (4.9–7.3)	4.3 (3.4–5.2)	3.3 (2.6–4.0)	6.0 (5.3–6.8)
Bread-based dishes	6.3 (5.6–6.9)	12.3 (9.9–14.6)	11.4 (7.9–15.0)	6.8 (5.1–8.4)	6.0 (4.1–7.9)	2.1 (1.4–2.8)	7.5 (6.4–8.6)	11.4 (8.9–13.9)	6.3 (4.4–8.1)	5.7 (4.3–7.0)	2.9 (2.0–3.8)	2.1 (1.4–2.9)	5.1 (4.4–5.8)
Poultry	5.7 (5.2–6.2)	6.9 (5.2–8.6)	6.7 (4.6–8.9)	6.6 (5.0–8.3)	5.1 (3.4–6.7)	2.9 (2.1–3.7)	5.9 (5.0–6.8)	6.2 (4.5–7.9)	7.5 (5.8–9.2)	5.7 (4.6–6.8)	4.2 (3.1–5.3)	3.8 (2.8–4.9)	5.5 (4.9–6.1)
Milk	5.0 (4.7–5.3)	5.2 (4.3–6.0)	4.5 (3.3–5.7)	4.9 (4.2–5.6)	5.0 (4.1–5.8)	5.5 (4.7–6.3)	4.9 (4.5–5.3)	4.6 (3.7–5.5)	4.5 (3.6–5.4)	5.6 (4.6–6.6)	4.7 (3.8–5.6)	5.8 (5.2–6.5)	5.1 (4.6–5.6)
Beef and veal	4.8 (4.4–5.3)	4.8 (3.2–6.5)	4.6 (2.9–6.3)	5.3 (3.8–6.7)	5.2 (3.7–6.7)	6.1 (4.8–7.4)	5.1 (4.4–5.9)	3.7 (2.4–4.9)	3.1 (1.9–4.3)	4.8 (3.7–5.9)	4.9 (3.7–6.2)	5.7 (4.5–6.9)	4.5 (3.9–5.1)
Bread	4.4 (4.1–4.6)	4.0 (3.3–4.8)	4.5 (3.1–5.8)	4.9 (4.1–5.8)	4.4 (3.8–5.0)	5.5 (4.8–6.1)	4.7 (4.2–5.1)	4.4 (3.6–5.1)	3.4 (2.7–4.1)	3.9 (3.4–4.4)	4.1 (3.6–4.7)	5.7 (5.0–6.4)	4.1 (3.8–4.4)
Cakes and muffins	4.2 (3.8–4.7)	2.1 (1.4–2.9)	2.9 (1.3–4.5)	4.3 (3.1–5.5)	4.4 (3.1–5.7)	4.0 (3.2–4.9)	3.8 (3.2–4.5)	4.9 (3.8–6.1)	4.9 (2.9–6.9)	3.7 (2.9–4.5)	5.3 (3.9–6.6)	5.5 (4.1–6.9)	4.6 (4.0–5.2)
Cheese	4.1 (3.7–4.5)	3.2 (2.2–4.3)	4.1 (2.9–5.3)	4.4 (3.4–5.5)	3.4 (2.4–4.5)	3.2 (2.5–3.9)	3.9 (3.3–4.4)	3.9 (2.8–4.9)	3.0 (1.9–4.1)	5.2 (4.2–6.3)	4.0 (3.0–5.1)	4.3 (3.4–5.2)	4.3 (3.8–4.8)
Grains and pasta	4.1 (3.6–4.6)	5.1 (3.3–6.8)	6.1 (4.1–8.0)	3.7 (2.7–4.7)	3.8 (2.4–5.2)	3.0 (2.0–3.9)	4.3 (3.5–5.0)	5.6 (4.2–7.0)	5.8 (3.6–7.9)	4.3 (3.1–5.5)	2.2 (1.5–2.8)	2.5 (1.9–3.2)	3.9 (3.3–4.6)
Sausages and processed meats	4.0	4.1	4.7	4.6	3.8	3.9	4.3	4.6	4.0	3.9	3.6	3.5	3.8
Vegetables	3.9	2.1	2.5	2.9	3.9	4.5	3.2	2.8	3.3	4.0	6.6	4.7	4.5
Fish and seafood	3.8	2.1	2.3	4.3	4.0	4.5	3.7	1.5	3.2	4.2	4.6	4.0	3.9
Pies and pasties	3.5	5.5	6.1	4.3	2.8	2.4	4.2	3.7	4.0	2.7	2.4	2.0	2.9
Dairy products	3.3	3.3	2.0	2.7	4.1	4.0	3.1	3.9	3.4	2.8	3.9	4.1	3.4
Biscuits	3.0	3.2	1.2	2.5	2.7	4.5	2.5	4.2	2.9	3.4	3.1	4.3	3.4
Eggs and egg dishes	2.8	2.9	1.9	2.7	3.0	3.5	2.7	1.7	3.7	2.2	3.1	4.0	2.9
Nuts and seeds	2.5	2.2	1.6	2.3	2.4	2.2	2.2	1.4	1.6	3.5	3.9	1.8	2.9
Pork	2.5	2.6	3.3	2.3	3.5	3.2	2.9	1.4	1.8	2.0	2.4	2.4	2.0
Fruit	2.3	0.9	1.7	1.9	1.5	2.5	1.7	1.5	1.8	2.9	3.8	3.2	2.8
Sugar and sweets	2.2	1.5	3.2	2.0	1.1	1.0	1.9	3.4	2.4	3.1	2.0	1.0	2.5
Lamb and mutton	2.0	1.0	1.9	1.8	3.0	1.9	2.1	0.9	2.4	1.1	2.9	2.1	1.9
Savoury sauces and condiments	1.9	2.4	1.3	1.8	1.7	1.1	1.6	1.3	2.4	2.5	2.3	1.4	2.2

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Breakfast cereals	1.8	0.9	0.9	1.6	3.0	2.1	1.8	0.8	1.1	2.1	2.1	2.4	1.8
Non-alcoholic beverages	1.2	0.5	1.5	1.3	1.1	0.5	1.2	1.0	1.5	1.5	1.2	0.8	1.3
Puddings and desserts	1.0	1.0	0.5	1.0	1.2	2.5	1.1	0.9	1.1	0.7	1.2	1.5	1.0
Fats and oils	0.9	0.1	1.6	0.8	0.3	0.9	0.8	0.3	1.7	0.9	1.2	0.7	1.1
Snack bars	0.9	2.2	0.7	1.2	0.5	0.2	0.9	1.6	0.5	0.9	0.8	0.3	0.8
Snack foods	0.8	1.2	1.2	0.6	0.2	0.1	0.6	2.0	2.1	0.9	0.4	0.0	1.0
Soups and stocks	0.8	0.2	0.6	0.3	0.8	1.5	0.6	0.5	0.9	0.9	1.2	1.2	1.0
Other meat	0.3	0.1	0.2	0.2	0.6	0.6	0.3	0.1	0.1	0.1	0.4	0.5	0.2
Supplements providing energy	0.2	0.6	0.6	0.2	0.1	0.0	0.3	0.2	0.3	0.2	0.1	0.3	0.2
Alcoholic beverages	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.5	0.3	0.1	0.1	0.3

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

3.5 Types of fat and cholesterol

All fats are composed of fatty acids attached to a backbone structure. Most dietary fats are triglycerides, which are made up of three fatty acids attached to a unit of glycerol. Other types of dietary fats include phospholipids, phytosterols and cholesterol.

There are three main types of fatty acids in the diet: saturated, monounsaturated and polyunsaturated, and these account for about 90% of total fat intake. Trans fatty acids occur naturally in some ruminant foods, but are also produced by partial hydrogenation of polyunsaturated fats in food processing.

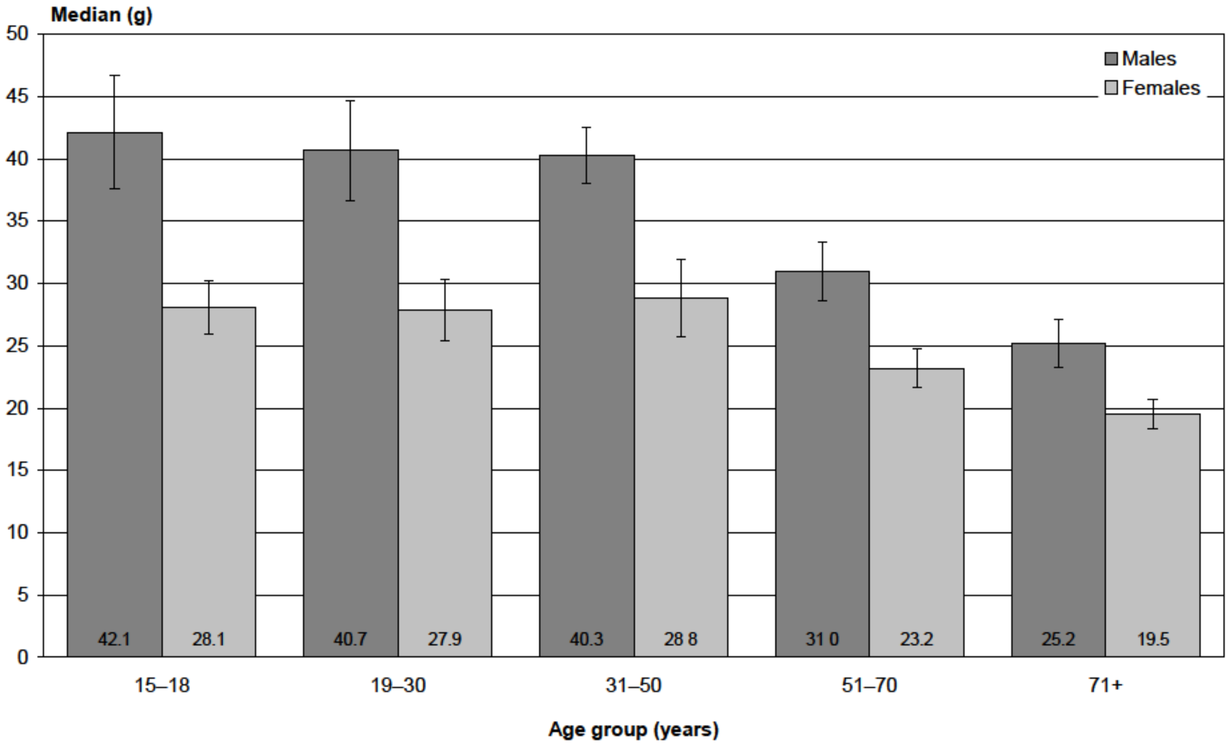
High intakes of saturated fatty acids and trans fatty acids are associated with raised total and low-density lipoprotein (LDL) cholesterol, while high intakes of polyunsaturated fatty acids, and to a lesser extent monounsaturated fatty acids, tend to reduce LDL cholesterol levels (Mann and Truswell 2007).

It is recommended that saturated and trans fats together be limited to no more than 10% of energy (NHMRC 2006).

Saturated fat intake

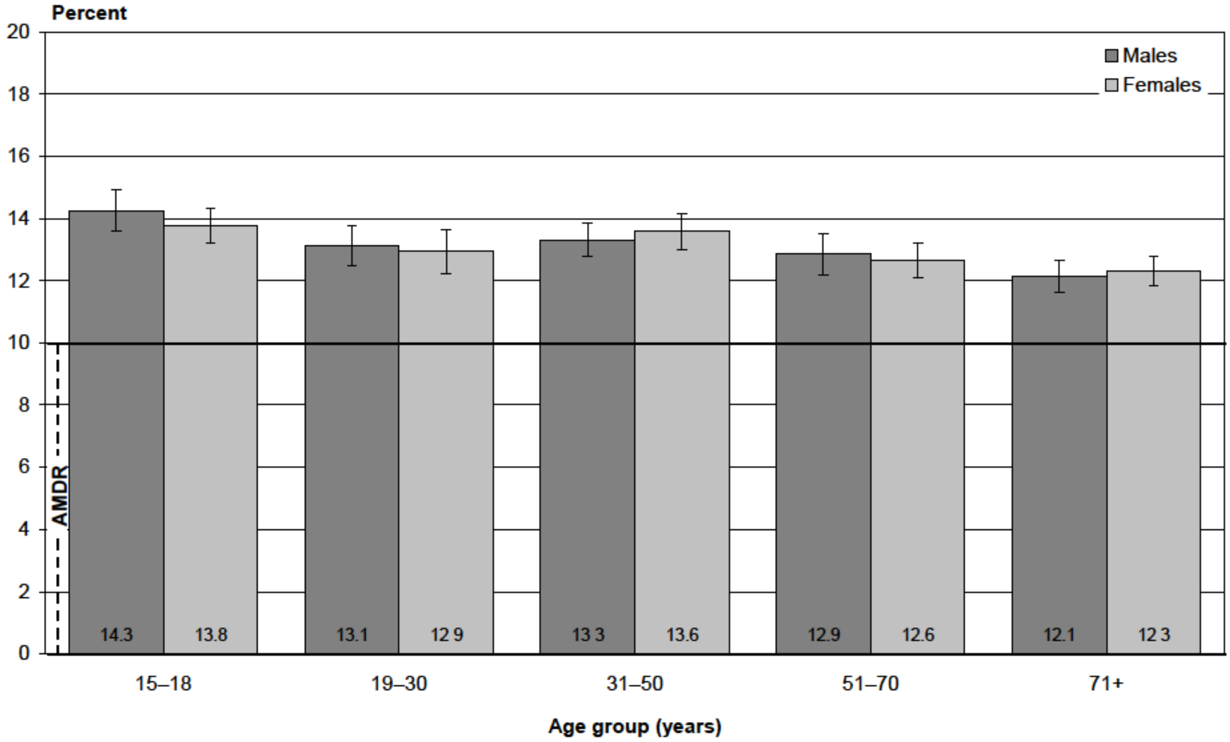
The median usual daily intake of saturated fatty acids (SAFA) was 36.5 g for males and 25.8 g for females (Table 3.7). For both males and females the median usual daily intake of SAFA was lower for those aged 51+ years than for all younger age groups (Figure 3.9).

Figure 3.9: Median SAFA intake (g), by age group and sex



The mean contribution of SAFA to daily energy intake was 13.1% for both males and females (Table 3.7). Older males and females (71+ years; 12.1% and 12.3%, respectively) had a lower mean percent energy from SAFA than those aged 15–18 years (14.3% and 13.8%) (Figure 3.10).

Figure 3.10: Percent energy from SAFA,[1] by age group and sex



1 Recommended intake for saturated and trans fats together is no more than 10% of energy (NHMRC 2006).

The mean contribution of SAFA to daily energy intake was 14.5% for Māori males and 14.2% for Māori females. The mean contribution of SAFA to daily energy intake was 13.3% for Pacific males and 13.5% for Pacific females.

There were no differences in amounts or percent contribution of SAFA to energy between NZDep2006 quintiles for males or females. Overall, there was no gradient across NZDep2006 quintiles for amounts or percent contribution of SAFA to energy, after adjusting for age, sex and ethnic group.

Dietary sources of saturated fat

The main sources of SAFA in the diets of New Zealanders were *Butter and margarine* and *Milk* (each 8%); *Bread-based dishes*, *Cheese* and *Potatoes, kumara and taro* (each 6%); *Cakes and muffins*, *Poultry*, *Beef and veal* and *Dairy products* (each 5%); and *Sausages and processed meats* (4%) (Table 3.8).

Differences in sources of SAFA across age groups were:

- older people (71+ years) obtained more SAFA from *Butter and margarine* than all younger age groups
- younger males (15–30 years) obtained more SAFA from *Bread-based dishes* than those aged 51+ years and younger females aged 15–18 years, and more SAFA from *Bread-based dishes* than all older females
- *Potatoes, kumara and taro* provided more SAFA to the diets of younger males and females (15–18 years) compared to those aged 31+ years (Figure 3.11).

Figure 3.11: Percent SAFA from *Potatoes, kumara and taro*, by age group and sex

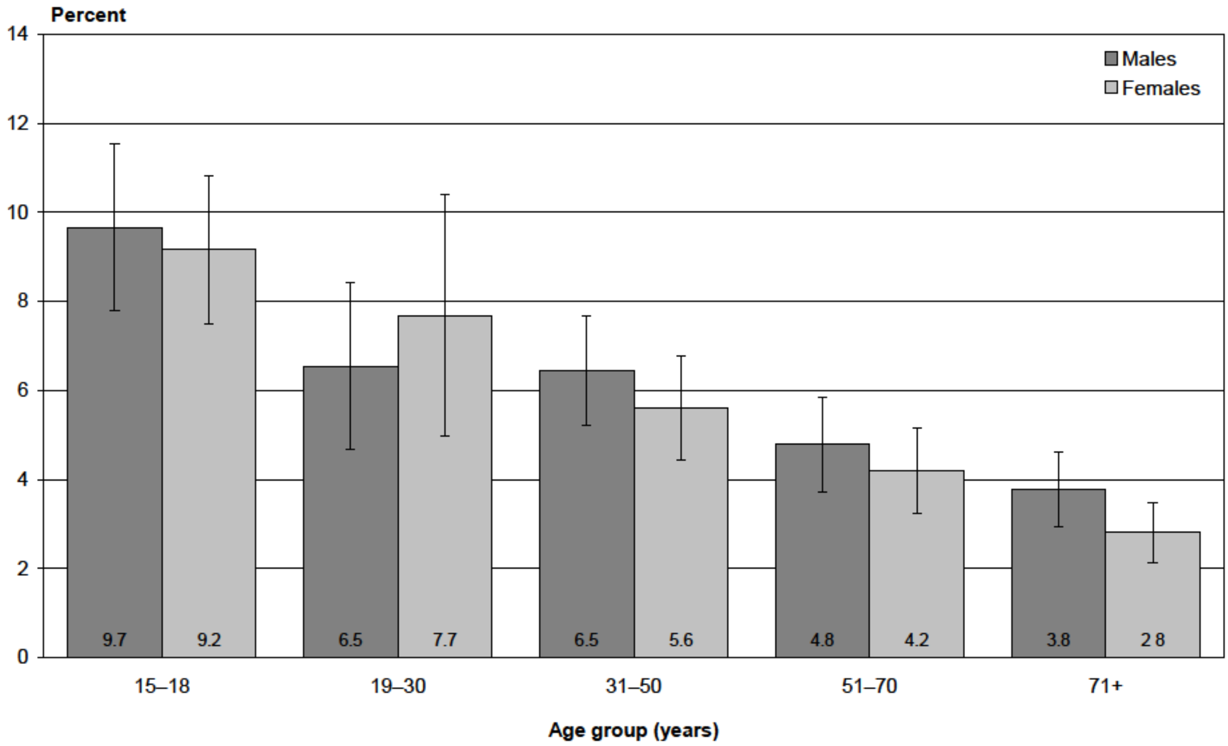


Table 3.7: Saturated fat intake, by age group, ethnic group, NZDep2006 and sex

		Saturated fat (g)[1]				Percent energy from saturated fat[2]			
		Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
Total population		32.4	18.6	30.7 (29.8–31.6)	48.5	13.1 (12.9–13.3)	7	13	20
By age group (years)									
Males	15–18	42.5	34.6	42.1 (37.6–46.6)	50.8	14.3 (13.6–14.9)	8	14	20
	19–30	41.7	31.0	40.7 (36.7–44.7)	53.6	13.1 (12.5–13.8)	8	14	20
	31–50	41.2	29.8	40.3 (38.1–42.5)	53.7	13.3 (12.8–13.8)	7	13	20
	51–70	32.9	17.1	31.0 (28.6–33.4)	51.3	12.9 (12.2–13.5)	7	12	19
	71+	26.5	16.1	25.2 (23.3–27.1)	38.4	12.1 (11.6–12.6)	7	12	18
	Total	38.0	23.6	36.5 (35.0–38.0)	54.4	13.1 (12.8–13.4)	7	13	19
Females	15–18	29.1	18.8	28.1 (26.0–30.2	40.6	13.8 (13.2–14.3)	8	14	20
	19–30	29.6	15.6	27.9 (25.4–30.4)	45.8	12.9 (12.2–13.6)	8	13	20
	31–50	29.2	22.0	28.8 (25.7–31.9)	36.9	13.6 (13.0–14.1)	7	13	20
	51–70	24.6	13.4	23.2 (21.6–24.8)	37.6	12.6 (12.1–13.2)	7	13	20
	71+	20.4	12.3	19.5 (18.3–20.7)	29.7	12.3 (11.9–12.8)	7	12	19
	Total	27.2	16.0	25.8 (24.8–26.8)	40.1	13.1 (12.8–13.4)	7	13	20
Māori									
Males	15–18	44.1	27.3	41.5 (32.6–50.4)	65.1	13.9 (12.7–15.0)	8	15	20
	19–30	47.4	30.6	44.5 (38.5–50.5)	67.4	13.9 (12.8–15.0)	10	14	20
	31–50	46.8	30.4	45.9 (40.7–51.1)	64.5	15.1 (14.2–16.0)	9	15	20
	51+	35.5	21.0	34.4 (30.0–38.8)	51.7	14.3 (13.2–15.5)	8	14	20
	Total	45.1	33.9	44.2 (40.5–47.9)	57.3	14.5 (13.9–15.0)	8	14	20
Females	15–18	29.8	18.9	28.4 (20.8–36.0)	42.6	14.8 (13.4–16.2)	8	14	21
	19–30	33.0	20.4	32.0 (28.2–35.8)	46.8	14.0 (13.2–14.7)	8	14	21
	31–50	29.7	18.5	28.5 (25.3–31.7)	42.4	14.1 (13.3–14.8)	9	14	20
	51+	25.9	15.3	24.7 (21.9–27.5)	38.1	14.5 (13.7–15.4)	9	14	21
	Total	30.3	17.9	28.7 (26.7–30.7)	44.7	14.2 (13.7–14.7)	8	14	21
Pacific									
Males	15–18	42.1	28.8	41.4 (31.2–51.6)	56.3	13.9 (12.3–15.5)	8	14	20
	19–30	46.5	21.0	43.0 (31.4–54.6)	77.0	14.5 (13.0–16.0)	7	15	21
	31–50	39.4	18.0	34.0 (26.7–41.3)	67.0	13.1 (11.4–14.7)	6	13	24
	51+	26.8	11.0	23.3 (15.8–30.8)	47.0	11.3 (10.0–12.6)	5	11	18
	Total	40.2	22.4	37.9 (33.1–42.7)	60.9	13.3 (12.4–14.1)	6	13	21
Females	15–18	27.2	15.0	25.9 (20.5–31.3)	41.3	13.3 (11.8–14.8)	7	13	20
	19–30	31.7	13.9	29.1 (23.8–34.4)	52.8	13.1 (12.1–14.0)	8	13	18
	31–50	33.0	16.5	30.4 (26.7–34.1)	52.7	14.0 (13.0–15.0)	7	13	21
	51+	24.8	13.4	22.5 (18.7–26.3)	38.6	13.3 (12.2–14.4)	7	12	20
	Total	30.8	16.9	28.7 (25.9–31.5)	47.1	13.5 (12.9–14.0)	7	13	20

		Saturated fat (g)[1]				Percent energy from saturated fat[2]			
		Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
NZEO									
Males	15–18	42.3	29.7	41.5 (36.6–46.4)	56.1	14.3 (13.5–15.1)	8	14	20
	19–30	39.7	23.2	38.3 (33.7–42.9)	58.0	12.9 (12.1–13.6)	8	13	19
	31–50	40.9	29.2	40.1 (37.0–43.2)	53.5	13.2 (12.6–13.8)	8	13	19
	51+	31.3	17.0	29.5 (27.6–31.4)	47.8	12.6 (12.1–13.1)	7	12	18
	Total	37.2	24.1	36.0 (34.6–37.4)	52.0	13.0 (12.6–13.3)	7	13	19
Females	15–18	29.2	20.0	28.4 (26.0–30.8)	39.4	13.9 (13.2–14.5)	8	14	20
	19–30	29.1	14.9	27.4 (24.4–30.4)	45.4	12.8 (12.0–13.7)	8	13	20
	31–50	28.9	23.1	28.6 (26.3–30.9)	35.2	13.5 (12.9–14.2)	7	13	20
	51+	23.2	13.2	22.1 (21.1–23.1)	34.6	12.4 (12.0–12.9)	7	12	19
	Total	26.8	16.0	25.6 (24.5–26.7)	39.1	13.0 (12.7–13.3)	7	13	19
By NZDep2006 quintile									
Males	1	36.7	20.5	34.9 (30.9–38.9)	55.3	12.9 (12.3–13.6)	8	13	18
	2	40.0	27.8	39.0 (35.4–42.6)	53.6	13.2 (12.6–13.9)	9	13	19
	3	36.7	26.3	35.9 (31.4–40.4)	48.0	12.9 (12.1–13.6)	7	13	20
	4	36.5	24.6	35.1 (31.8–38.4	50.2	13.3 (12.6–13.9)	7	13	19
	5	39.0	22.1	36.8 (33.2–40.4)	58.2	13.4 (12.7–14.0)	7	13	21
Females	1	26.1	15.9	25.0 (22.8–27.2)	37.7	12.9 (12.2–13.5)	7	12	19
	2	27.1	16.3	25.8 (23.2–28.4)	39.6	13.0 (12.3–13.8)	7	13	19
	3	26.6	17.1	25.6 (23.3–27.9)	37.2	12.6 (11.9–13.3)	8	13	19
	4	27.2	15.7	25.6 (23.4–27.8)	40.7	13.4 (12.8–14.0)	8	13	19
	5	28.1	16.5	26.8 (25.0–28.6)	41.4	13.6 (12.9–14.2)	7	14	21

1 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats.

2 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from fat for each participant was calculated as the energy from fat (conversion factor = 37.7 kJ/g) divided by the total energy intake.

3 Percentiles.

Table 3.8: SAFA sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Butter and margarine	8.5 (8.0–9.0)	5.1 (3.5–6.7)	5.0 (3.9–6.0)	8.4 (7.1–9.7)	10.7 (8.9–12.6)	14.6 (13.0–16.1)	8.6 (7.9–9.4)	4.9 (3.8–5.9)	6.3 (4.7–8.0)	7.8 (6.4–9.1)	9.6 (8.2–11.0)	13.3 (11.8–14.7)	8.3 (7.6–9.1)
Milk	7.6 (7.1–8.1)	7.6 (6.3–8.9)	7.2 (5.3–9.2)	7.8 (6.6–9.0)	7.7 (6.4–8.9)	8.6 (7.4–9.9)	7.7 (7.0–8.4)	6.3 (5.1–7.6)	6.9 (5.4–8.3)	8.0 (6.8–9.3)	7.0 (5.7–8.3)	9.0 (8.0–10.1)	7.5 (6.9–8.2)
Bread-based dishes	6.4 (5.7–7.1)	12.5 (9.9–15.1)	11.9 (8.1–15.7)	7.0 (5.2–8.7)	6.1 (4.1–8.1)	2.1 (1.4–2.8)	7.7 (6.5–8.9)	11.3 (8.8–13.8)	6.1 (4.2–8.0)	5.7 (4.4–7.1)	3.1 (2.2–4.0)	2.1 (1.3–2.9)	5.1 (4.4–5.8)
Cheese	6.3 (5.8–6.9)	4.6 (3.2–6.0)	6.4 (4.5–8.2)	6.9 (5.3–8.4)	5.4 (3.9–7.0)	5.1 (4.0–6.1)	6.0 (5.2–6.8)	5.5 (4.1–6.8)	4.5 (2.9–6.1)	8.1 (6.6–9.7)	6.4 (4.8–7.9)	6.8 (5.3–8.3)	6.6 (5.9–7.4)
Potatoes, kumara and taro	5.8 (5.3–6.3)	9.7 (7.8–11.5)	6.5 (4.7–8.4)	6.5 (5.2–7.7)	4.8 (3.7–5.8)	3.8 (3.0–4.6)	6.0 (5.4–6.7)	9.2 (7.5–10.8)	7.7 (5.0–10.4)	5.6 (4.4–6.8)	4.2 (3.2–5.2)	2.8 (2.1–3.5)	5.6 (4.8–6.3)
Cakes and muffins	5.1 (4.6–5.7)	2.5 (1.6–3.4)	3.4 (1.6–5.2)	4.8 (3.5–6.2)	5.4 (3.8–7.0)	4.9 (3.8–6.1)	4.5 (3.8–5.3)	5.7 (4.4–7.1)	5.4 (3.3–7.5)	4.7 (3.6–5.7)	6.8 (5.1–8.5)	6.6 (4.9–8.3)	5.6 (4.9–6.4)
Poultry	5.0 (4.5–5.5)	5.7 (4.3–7.1)	6.0 (3.9–8.1)	5.7 (4.3–7.1)	4.6 (3.1–6.2)	2.4 (1.8–3.1)	5.2 (4.4–6.0)	5.3 (3.7–6.9)	6.7 (5.1–8.3)	5.0 (4.0–6.0)	3.9 (2.8–4.9)	3.5 (2.5–4.5)	4.9 (4.3–5.5)
Beef and veal	5.0 (4.5–5.5)	4.7 (3.1–6.3)	4.5 (2.8–6.2)	5.3 (3.8–6.7)	5.2 (3.7–6.7)	6.6 (5.1–8.0)	5.2 (4.4–5.9)	3.6 (2.3–4.9)	3.1 (1.9–4.4)	5.1 (3.9–6.3)	5.6 (4.2–7.0)	6.1 (4.8–7.4)	4.9 (4.2–5.5)
Dairy products	4.7 (4.2–5.3)	4.6 (3.3–5.8)	2.9 (1.6–4.2)	3.9 (2.6–5.1)	5.8 (4.0–7.6)	6.1 (4.5–7.8)	4.5 (3.7–5.2)	5.7 (4.3–7.0)	5.0 (3.1–6.8)	4.0 (2.8–5.3)	5.7 (4.2–7.2)	6.1 (5.1–7.1)	5.0 (4.3–5.7)
Sausages and processed meats	4.4 (3.9–4.9)	4.4 (2.6–6.3)	5.1 (3.2–7.0)	4.9 (3.6–6.2)	4.1 (2.6–5.6)	4.4 (3.2–5.6)	4.6 (3.9–5.4)	4.9 (3.0–6.7)	4.5 (2.8–6.3)	4.2 (3.0–5.5)	4.0 (2.7–5.2)	3.8 (2.7–4.9)	4.2 (3.5–4.9)
Pies and pasties	4.0	6.4	7.0	4.9	3.2	2.7	4.8	4.1	4.4	3.1	2.8	2.4	3.2
Biscuits	4.0	4.1	1.6	3.3	3.7	6.3	3.4	5.5	3.7	4.4	4.4	5.9	4.5
Grains and pasta	3.6	4.9	5.7	3.2	3.2	2.0	3.7	5.4	5.4	3.9	1.6	2.1	3.5
Sugar and sweets	2.8	1.7	3.8	2.6	1.5	1.3	2.4	4.0	3.1	4.2	2.5	1.3	3.2
Fish and seafood	2.7	1.4	1.6	2.8	3.0	3.2	2.5	0.9	2.3	2.9	3.4	3.0	2.8
Pork	2.5	2.6	3.3	2.3	3.7	3.3	3.0	1.4	1.7	2.1	2.4	2.5	2.1
Vegetables	2.5	1.3	1.5	1.9	2.4	2.9	2.0	1.9	2.2	2.5	4.4	3.1	3.0
Bread	2.3	2.5	2.8	2.8	2.1	2.5	2.6	2.3	1.8	1.9	2.1	2.5	2.0
Lamb and mutton	2.3	1.1	2.1	2.0	3.4	2.1	2.3	1.0	2.6	1.4	3.3	2.4	2.2
Eggs and egg dishes	2.2	2.3	1.3	1.9	2.3	3.0	2.0	1.3	3.0	1.8	2.6	3.4	2.4
Non-alcoholic beverages	1.7	0.4	2.1	1.9	1.5	0.8	1.6	1.2	1.9	2.0	1.7	1.1	1.7

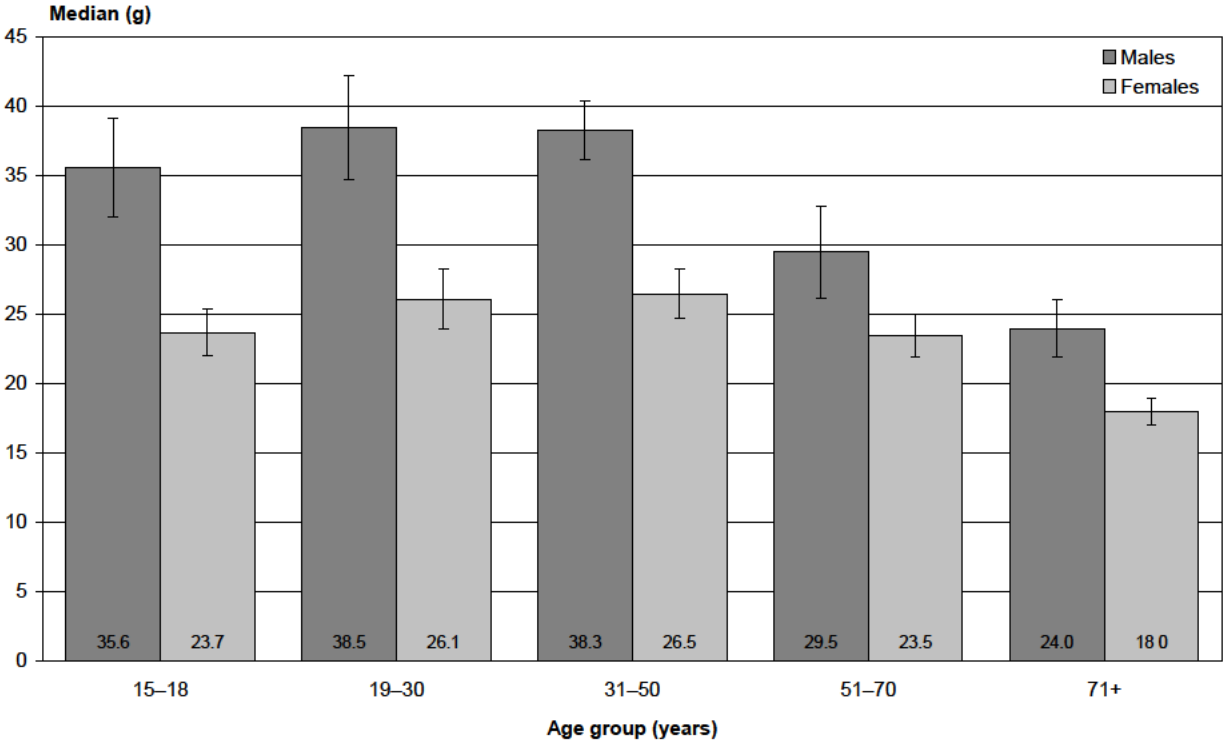
Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Nuts and seeds	1.6	1.4	1.1	1.4	1.8	1.2	1.4	0.8	1.0	2.4	2.3	1.0	1.9
Savoury sauces and condiments	1.4	2.3	0.8	1.3	1.3	0.9	1.2	0.9	1.6	1.7	1.5	1.1	1.5
Fruit	1.3	0.5	0.9	1.1	0.8	1.4	1.0	0.8	1.1	1.5	2.3	1.8	1.6
Puddings and desserts	1.3	1.1	0.6	1.1	1.3	3.4	1.3	1.1	1.5	1.0	1.5	1.9	1.3
Breakfast cereals	1.3	0.6	0.5	1.3	2.4	1.5	1.4	0.6	0.7	1.4	1.3	1.6	1.2
Snack bars	0.9	1.9	0.9	1.3	0.5	0.2	0.9	1.7	0.5	0.7	1.0	0.4	0.8
Soups and stocks	0.8	0.3	0.7	0.3	0.8	1.6	0.6	0.4	0.9	1.0	1.2	1.4	1.0
Snack foods	0.8	1.1	1.3	0.6	0.2	0.1	0.6	2.0	2.3	0.9	0.4	0.0	1.0
Fats and oils	0.4	0.1	0.8	0.3	0.1	0.4	0.3	0.1	0.8	0.4	0.5	0.3	0.5
Other meat	0.3	0.1	0.2	0.1	0.7	0.6	0.3	0.1	0.1	0.1	0.4	0.4	0.2
Supplements providing energy	0.2	0.3	0.4	0.2	0.0	0.0	0.2	0.1	0.4	0.3	0.1	0.2	0.2
Alcoholic beverages	0.1	0.4	0.0	0.0	0.0	0.1	0.0	0.1	0.7	0.2	0.0	0.0	0.2

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Monounsaturated fat intake

The median usual daily intake of monounsaturated fatty acids (MUFA) was 35.1 g for males and 24.3 g for females (Table 3.9). The median usual intake of MUFA was lower for males aged 51+ years than for those aged 19–50 years, and for females aged 71+ years than for those aged 15–70 years (Figure 3.12).

Figure 3.12: Median MUFA intake (g), by age group and sex



The mean contribution of MUFA to daily energy intake was 12.4% for males and 12.3% for females (Table 3.9). The mean contribution of MUFA to daily energy was lower for males aged 71+ years than for those aged 15–50 years, and for females aged 71+ years than for those aged 19–70 years.

The mean contribution of MUFA to daily energy intake was 13.6% for Māori males and 13.0% for Māori females. The mean contribution of MUFA to daily energy intake was 12.9% for Pacific males and 12.9% for Pacific females.

There were no differences in amounts or percent contribution of MUFA to energy between NZDep2006 quintiles for males or females. Overall, there was no gradient across NZDep2006 quintiles for amounts or percent contribution of MUFA to energy, after adjusting for age, sex and ethnic group.

Dietary sources of monounsaturated fat

The *Butter and margarine* group provided 10% of MUFA, *Poultry* and *Potatoes, kumara and taro* each provided 7%, *Bread-based dishes* and *Beef and veal* each provided 6%, and *Sausages and processed meats*, *Fish and seafood*, *Vegetables, Grains and pasta* and *Cakes and muffins* each provided 4% (Table 3.10).

Butter and margarine provided more MUFA for males aged 51+ years compared to all younger males, and for females aged 51+ years compared to females aged 15–30 years (Figure 3.13). In contrast, *Potatoes, kumara and taro* and *Bread-based dishes* provided more MUFA for people aged 15–18 years compared to most older age groups.

Figure 3.13: Percent MUFA from *Butter and margarine*, by age group and sex

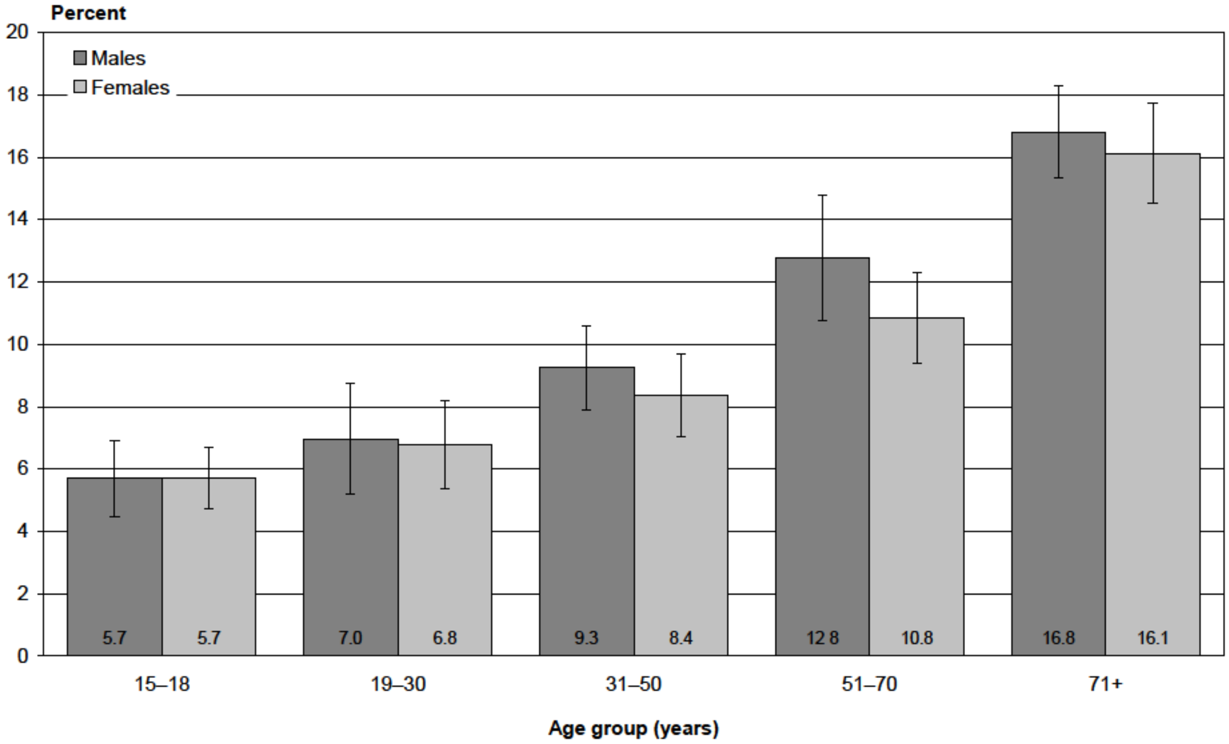


Table 3.9: Monounsaturated fat intake, by age group, ethnic group, NZDep2006 and sex

		Monounsaturated fat (g)[1]				Percent energy from monounsaturated fat[2]			
		Mean	10th[3]	Median (50th), (95% CI)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
Total population		30.5	18.6	29.2 (28.4–30.0)	44.1	12.4 (12.2–12.6)	7	12	18
By age group (years)									
Males	15–18	37.4	22.1	35.6 (32.0–39.2)	54.9	12.7 (12.2–13.2)	8	12	18
	19–30	41.1	23.1	38.5 (34.7–42.3)	62.1	12.8 (12.1–13.6)	8	13	18
	31–50	38.6	30.9	38.3 (36.2–40.4)	46.8	12.6 (12.2–13.0)	8	13	19
	51–70	31.1	18.9	29.5 (26.2–32.8)	45.4	12.1 (11.6–12.7)	7	12	18
	71+	24.7	16.7	24.0 (21.9–26.1)	33.6	11.4 (10.9–12.0)	7	12	18
	Total	36.0	25.1	35.1 (33.7–36.5)	47.8	12.4 (12.2–12.7)	8	12	18
Females	15–18	25.1	15.2	23.7 (22.0–25.4)	36.7	11.9 (11.4–12.4)	7	12	17
	19–30	27.5	15.4	26.1 (23.9–28.3)	41.6	12.3 (11.7–12.8)	7	13	19
	31–50	26.8	21.7	26.5 (24.7–28.3)	32.3	12.4 (12.0–12.9)	8	13	18
	51–70	24.8	14.2	23.5 (22.0–25.0)	36.9	12.7 (12.2–13.1)	7	13	19
	71+	18.6	11.9	18.0 (17.1–18.9)	26.0	11.2 (10.9–11.6)	7	11	17
	Total	25.5	15.6	24.3 (23.5–25.1)	36.7	12.3 (12.1–12.5)	7	12	18
Māori									
Males	15–18	40.2	25.3	37.6 (30.7–44.5)	58.2	12.7 (11.5–13.9)	9	13	18
	19–30	45.4	27.7	42.8 (37.6–48.0)	66.0	13.1 (12.0–14.3)	8	13	19
	31–50	44.3	36.6	44.0 (39.9–48.1)	52.4	14.2 (13.5–14.9)	9	14	20
	51+	35.2	22.1	34.4 (29.1–39.7)	49.2	13.9 (12.8–15.0)	8	14	19
	Total	42.6	33.7	42.1 (38.5–45.7)	52.0	13.6 (13.1–14.2)	8	14	19
Females	15–18	25.9	15.6	24.2 (18.9–29.5)	38.3	12.9 (11.7–14.0)	6	12	17
	19–30	29.8	19.1	28.8 (25.3–32.3)	41.9	12.7 (11.8–13.6)	7	13	19
	31–50	28.1	17.4	27.0 (23.4–30.6)	40.3	13.1 (12.3–14.0)	9	13	19
	51+	22.8	17.4	22.4 (19.4–25.4)	28.7	13.0 (12.2–13.9)	8	13	19
	Total	27.7	17.8	26.6 (24.7–28.5)	39.1	13.0 (12.5–13.4)	8	13	19
Pacific									
Males	15–18	40.4	26.6	39.5 (24.9–54.1)	55.5	13.4 (11.5–15.3)	5	13	21
	19–30	45.2	22.0	42.0 (28.5–55.5)	73.0	14.0 (12.4–15.6)	8	14	19
	31–50	37.2	18.8	34.0 (26.7–41.3)	60.0	12.6 (11.1–14.1)	7	13	20
	51+	27.3	19.4	26.6 (17.3–35.9)	36.2	11.4 (9.9–12.8)	5	12	18
	Total	39.0	27.3	38.1 (33.2–43.0)	51.7	12.9 (12.1–13.7)	6	13	19
Females	15–18	24.2	13.6	22.8 (17.6–28.0)	36.5	11.9 (10.5–13.3)	7	12	17
	19–30	30.8	14.0	28.4 (24.3–32.5)	50.5	12.9 (12.0–13.8)	7	13	19
	31–50	31.2	16.1	28.2 (24.6–31.8)	50.0	13.2 (12.4–14.0)	8	13	18
	51+	24.3	13.8	22.7 (10.4–35.0)	36.5	13.0 (11.9–14.0)	7	13	19
	Total	29.1	17.1	27.4 (25.0–29.8)	43.2	12.9 (12.4–13.4)	7	13	18

		Monounsaturated fat (g)[1]				Percent energy from monounsaturated fat[2]			
		Mean	10th[3]	Median (50th), (95% CI)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
NZEO									
Males	15–18	36.5	22.0	35.0 (31.2–38.8)	52.9	12.6 (12.0–13.1)	8	12	18
	19–30	39.3	23.0	37.6 (33.2–42.0)	57.8	12.7 (11.8–13.5)	8	12	18
	31–50	38.4	26.9	37.7 (35.4–40.0)	50.7	12.5 (12.0–12.9)	8	12	18
	51+	29.4	19.9	28.5 (26.4–30.6)	39.9	11.9 (11.4–12.4)	7	12	17
	Total	35.1	25.0	34.4 (32.4–36.4)	46.3	12.3 (12.0–12.6)	7	12	18
Females	15–18	24.9	15.7	23.7 (22.0–25.4)	35.6	11.9 (11.4–12.4)	8	12	17
	19–30	27.2	16.0	25.9 (23.2–28.6)	39.9	12.2 (11.5–12.9)	7	13	19
	31–50	26.4	21.2	26.2 (24.3–28.1)	32.1	12.3 (11.9–12.8)	8	12	18
	51+	22.9	13.6	21.8 (20.7–22.9)	33.5	12.2 (11.8–12.5)	7	11	18
	Total	25.1	15.7	24.1 (23.2–25.0)	35.8	12.2 (11.9–12.5)	7	12	18
By NZDep quintile									
Males	1	35.0	20.0	32.9 (29.7–36.1)	53.2	12.3 (11.7–13.0)	8	12	18
	2	37.5	21.9	35.5 (32.2–38.8)	55.7	12.4 (11.9–13.0)	8	12	18
	3	35.1	19.4	33.5 (30.1–36.9)	52.8	12.5 (11.8–13.1)	7	12	18
	4	33.6	26.2	33.1 (28.9–37.3)	41.6	12.3 (11.6–13.0)	8	12	18
	5	37.2	23.7	36.0 (32.7–39.3)	52.0	12.7 (12.2–13.2)	7	13	19
Females	1	24.6	15.7	23.8 (21.8–25.8)	34.6	12.2 (11.5–13.0)	7	12	18
	2	24.7	15.4	23.7 (21.8–25.6)	35.1	11.9 (11.4–12.3)	7	11	17
	3	25.6	17.7	24.8 (22.5–27.1)	34.5	12.1 (11.6–12.7)	7	12	18
	4	26.1	14.2	24.2 (22.1–26.3)	40.3	12.8 (12.3–13.4)	7	12	18
	5	25.8	16.4	24.8 (23.3–26.3)	36.6	12.5 (12.0–12.9)	7	13	19

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from fat for each participant was calculated as the energy from fat (conversion factor = 37.7 kJ/g) divided by the total energy intake.

3 Percentiles.

Table 3.10: Monounsaturated fat sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Butter and margarine	9.7 (9.2–10.3)	5.7 (4.5–6.9)	7.0 (5.2–8.7)	9.3 (7.9–10.6)	12.8 (10.7–14.8)	16.8 (15.3–18.3)	10.1 (9.3–11.0)	5.7 (4.7–6.7)	6.8 (5.4–8.2)	8.4 (7.0–9.7)	10.8 (9.4–12.3)	16.1 (14.5–17.7)	9.3 (8.6–10.1)
Poultry	7.2 (6.5–7.8)	8.7 (6.5–10.9)	8.0 (5.5–10.5)	8.3 (6.3–10.4)	6.4 (4.4–8.4)	3.8 (2.7–4.8)	7.4 (6.3–8.4)	7.9 (5.9–9.9)	9.5 (7.3–11.7)	7.2 (5.9–8.6)	5.3 (3.9–6.8)	5.0 (3.7–6.3)	7.0 (6.2–7.8)
Potatoes, kumara and taro	7.0 (6.4–7.6)	11.0 (9.0–13.1)	8.9 (6.3–11.5)	7.1 (5.9–8.3)	6.0 (4.6–7.4)	4.5 (3.4–5.5)	7.2 (6.4–8.1)	11.9 (9.8–14.0)	9.2 (6.0–12.4)	6.9 (5.5–8.2)	4.7 (3.7–5.8)	3.6 (2.7–4.5)	6.8 (5.9–7.6)
Bread-based dishes	6.3 (5.7–7.0)	12.5 (10.0–15.0)	11.6 (8.1–15.1)	6.8 (5.1–8.4)	6.0 (4.1–7.9)	2.2 (1.4–3.0)	7.6 (6.4–8.7)	11.4 (8.9–13.9)	6.7 (4.6–8.8)	5.8 (4.4–7.2)	2.9 (2.0–3.8)	2.2 (1.4–3.0)	5.2 (4.4–6.0)
Beef and veal	5.8 (5.2–6.4)	6.0 (3.9–8.0)	5.5 (3.4–7.6)	6.3 (4.6–7.9)	6.3 (4.5–8.1)	7.7 (5.9–9.4)	6.2 (5.3–7.1)	4.3 (2.9–5.8)	3.8 (2.3–5.3)	5.7 (4.5–7.0)	5.8 (4.3–7.3)	6.9 (5.5–8.4)	5.4 (4.7–6.1)
Sausages and processed meats	4.4 (3.9–4.9)	4.5 (2.7–6.4)	5.0 (3.1–7.0)	5.0 (3.7–6.4)	4.2 (2.7–5.6)	4.3 (3.1–5.4)	4.7 (3.9–5.5)	5.1 (3.2–6.9)	4.3 (2.6–5.9)	4.2 (3.0–5.4)	3.9 (2.7–5.1)	3.9 (2.9–5.0)	4.2 (3.5–4.8)
Fish and seafood	4.3 (3.8–4.8)	2.3 (1.2–3.4)	2.5 (1.1–3.9)	5.1 (3.6–6.5)	4.7 (3.0–6.4)	5.3 (3.9–6.6)	4.2 (3.5–5.0)	1.7 (1.0–2.4)	3.3 (1.7–4.8)	4.8 (3.4–6.2)	5.2 (3.8–6.6)	4.6 (3.5–5.7)	4.4 (3.6–5.1)
Vegetables	4.2 (3.7–4.6)	2.3 (1.5–3.2)	2.7 (1.7–3.8)	3.0 (2.2–3.7)	4.5 (3.1–5.8)	5.0 (4.1–5.8)	3.5 (2.9–4.0)	3.0 (1.9–4.0)	3.4 (1.8–4.9)	4.2 (3.3–5.0)	7.2 (5.5–8.8)	5.0 (4.2–5.9)	4.8 (4.2–5.4)
Grains and pasta	4.0 (3.5–4.5)	5.0 (3.3–6.6)	6.0. (4.0–8.0)	3.8 (2.7–4.9)	3.6 (2.2–4.9)	2.1 (1.3–3.0)	4.1 (3.4–4.9)	5.6 (4.2–6.9)	5.7 (3.5–7.9)	4.3 (3.1–5.6)	2.0 (1.3–2.6)	2.2 (1.5–2.9)	3.8 (3.2–4.5)
Cakes and muffins	3.8 (3.4–4.2)	2.0 (1.2–2.7)	2.5 (1.1–4.0)	4.0 (2.8–5.1)	3.9 (2.7–5.0)	3.8 (2.8–4.8)	3.5 (2.9–4.1)	4.6 (3.5–5.7)	4.7 (2.7–6.7)	3.2 (2.5–3.8)	4.6 (3.5–5.7)	5.0 (3.8–6.3)	4.1 (3.5–4.7)
Milk	3.7	3.7	3.0	3.5	3.6	4.0	3.5	3.5	3.2	4.4	3.5	4.4	3.9
Pies and pasties	3.5	5.5	5.9	4.3	2.8	2.4	4.1	3.7	4.0	2.7	2.3	2.0	2.9
Bread	3.3	3.1	3.4	3.8	3.3	4.2	3.6	3.5	2.5	2.9	3.0	4.5	3.1
Eggs and egg dishes	3.2	3.3	2.2	3.2	3.4	4.0	3.1	1.8	4.0	2.5	3.5	4.2	3.2
Nuts and seeds	2.9	2.8	1.9	2.8	2.6	2.8	2.6	1.8	1.9	3.9	4.4	2.2	3.3
Pork	2.9	3.0	3.7	2.7	4.1	3.7	3.4	1.7	2.1	2.3	2.9	3.0	2.4
Cheese	2.8	2.2	2.5	2.9	2.4	2.1	2.6	2.7	2.1	3.4	2.8	3.1	2.9
Biscuits	2.5	2.6	1.0	2.2	2.3	3.9	2.2	3.6	2.4	3.0	2.5	3.7	2.9
Dairy products	2.5	2.4	1.4	2.0	3.2	3.1	2.4	3.1	2.6	2.2	3.0	3.2	2.7
Fruit	2.3	0.6	1.7	1.9	1.4	2.4	1.7	1.1	1.5	3.1	4.1	3.0	2.9
Lamb and mutton	2.1	1.0	1.9	1.9	3.1	2.0	2.2	0.9	2.6	1.2	3.1	2.3	2.1
Savoury sauces and condiments	2.0	2.2	1.4	1.9	1.6	1.1	1.7	1.5	2.5	2.7	2.4	1.4	2.4
Sugar and sweets	1.9	1.3	3.0	1.6	0.9	0.8	1.6	2.8	2.1	2.8	1.7	1.0	2.2

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Breakfast cereals	1.6	0.6	0.7	1.4	2.4	1.7	1.5	0.7	0.9	2.0	1.8	2.1	1.7
Fats and oils	1.3	0.2	2.3	1.1	0.4	1.2	1.1	0.5	2.5	1.3	1.9	1.1	1.6
Puddings and desserts	0.9	0.9	0.4	0.9	1.1	2.4	1.0	0.9	0.9	0.6	1.0	1.4	0.9
Non-alcoholic beverages	0.8	0.3	0.9	0.9	0.8	0.4	0.8	0.7	1.0	1.1	0.8	0.5	0.9
Snack foods	0.8	1.3	1.1	0.6	0.3	0.1	0.6	2.1	2.1	1.0	0.4	0.0	1.0
Soups and stocks	0.8	0.2	0.5	0.3	0.9	1.4	0.6	0.6	0.8	1.0	1.4	1.2	1.0
Snack bars	0.8	2.3	0.5	1.2	0.5	0.2	0.9	1.4	0.5	0.9	0.6	0.3	0.7
Other meat	0.3	0.1	0.3	0.2	0.6	0.6	0.3	0.2	0.1	0.1	0.4	0.5	0.2
Supplements providing energy	0.2	0.4	0.4	0.1	0.1	0.0	0.2	0.1	0.3	0.2	0.1	0.4	0.2
Alcoholic beverages	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.1

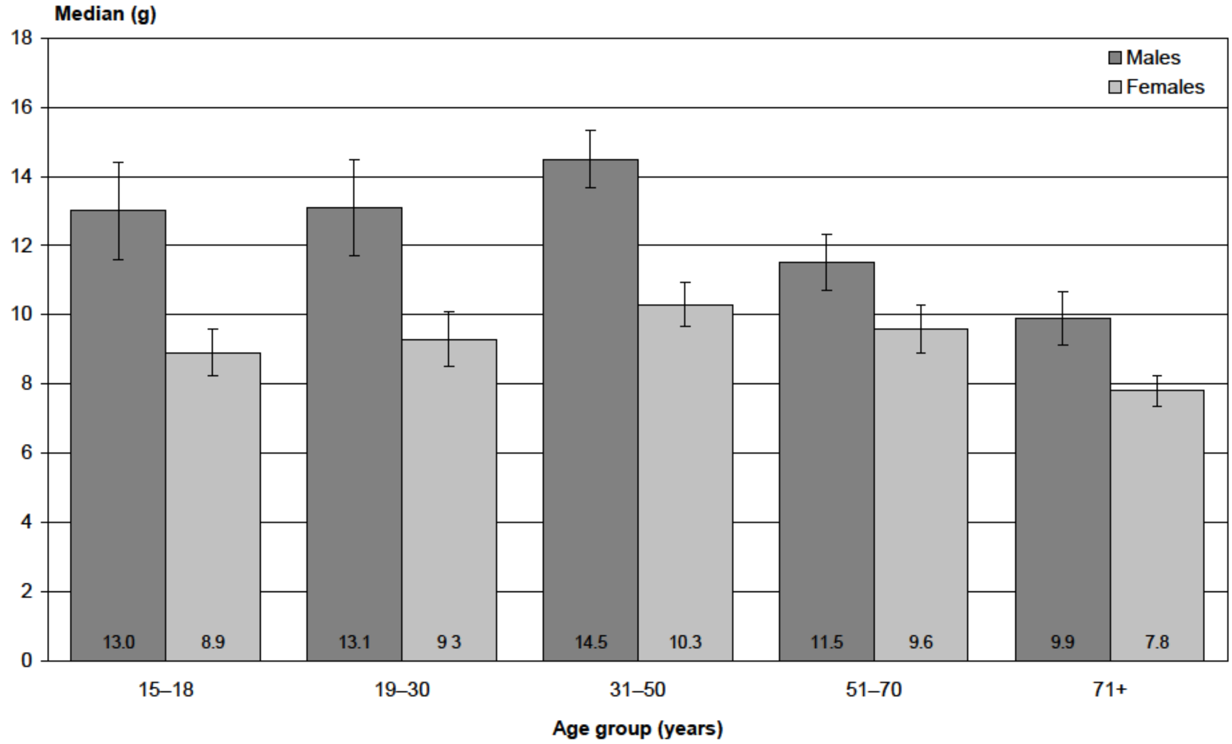
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Polyunsaturated fat intake

The median usual daily intake of polyunsaturated fatty acids (PUFA) was 13.1 g for males and 9.6 g for females Table 3.11. The median usual daily intake of PUFA for males and females aged 31–50 years was higher than for males and females aged 71+ years respectively (Figure 3.14).

PUFA provided 4.8% and 4.9% of energy for males and females, respectively.

Figure 3.14: Median PUFA intake (g), by age group and sex



The mean contribution of PUFA to daily energy intake was 4.9% for Māori males and 4.7% for Māori females. The mean contribution of PUFA to daily energy intake was 4.6% for Pacific males and 4.8% for Pacific females.

There were no differences in amounts or percent contribution of PUFA to energy between NZDep2006 quintiles for males or females. Overall, there was no gradient across NZDep2006 quintiles for amounts or percent contribution of PUFA to energy, after adjusting for age, sex and ethnic group.

Dietary sources of polyunsaturated fat

The *Butter and margarine* group provided 12% of PUFA, *Bread* 9%, *Bread-based dishes* and *Potatoes, kumara and taro* each 7%, *Vegetables* and *Poultry* each 6%, *Fish and seafood* and *Grains and pasta* each 5%, and *Breakfast* cereals and *Cakes and muffins* each 4% (Table 3.12).

Males obtained more PUFA from *Bread-based dishes* than females (8% versus 6%) but less PUFA from *Vegetables* (5% versus 7%). Older males and females (71+ years) obtained more PUFA from *Butter and margarine* than all younger age groups (Figure 3.15). *Bread-based dishes* provided more PUFA for 15–18-year-old males and females than for males aged 31+ years and females aged 19+ years. *Vegetables* provided more PUFA for older males (71+ years) than for males aged 15–50 years, and more PUFA for females aged 51–70 years than for all younger counterparts.

Figure 3.15: Percent PUFA from *Butter and margarine*, by age group and sex

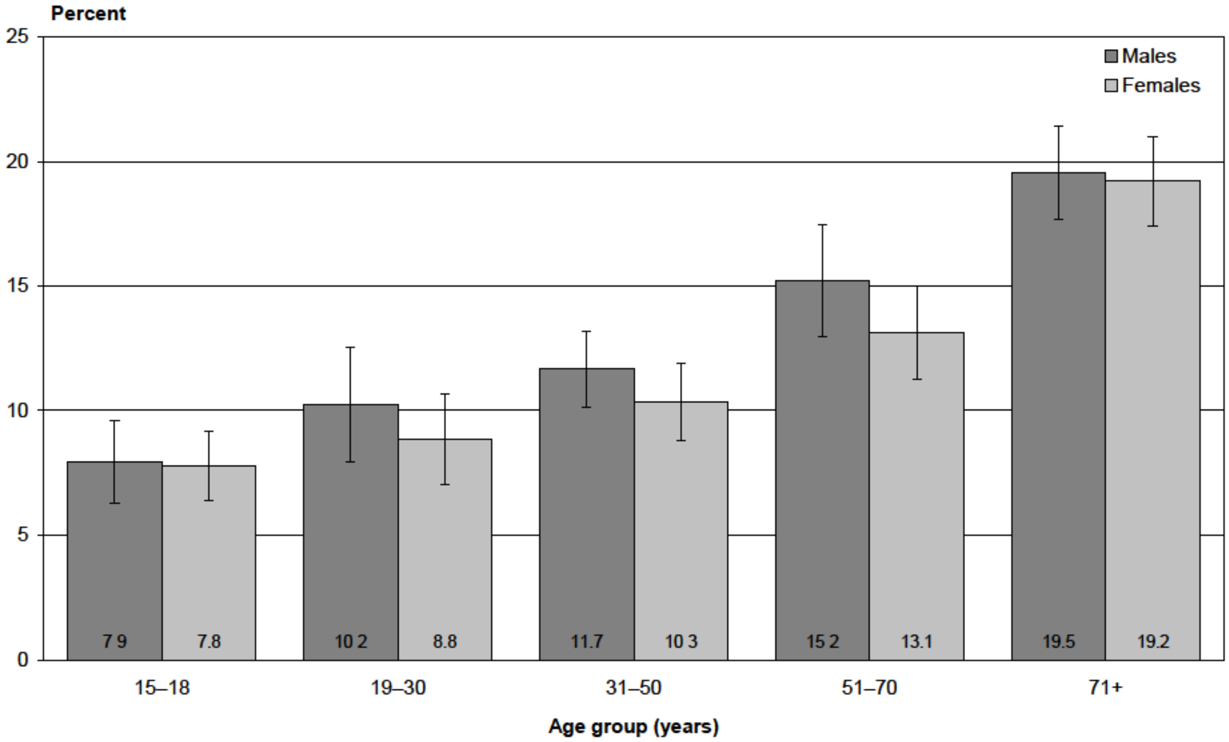


Table 3.11: Polyunsaturated fat intake, by age group, ethnic group, NZDep2006 and sex

		Polyunsaturated fat (g)[1]				Percent energy from polyunsaturated fat[2]			
		Mean	10th[3]	Median (50th),[3] (95% CI)	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
Total population		11.7	7.3	11.1 (10.7–11.5)	17.1	4.9 (4.8–4.9)	3	5	7
By age group (years)									
Males	15–18	13.3	9.8	13.0 (11.6–14.4)	17.2	4.5 (4.3–4.7)	2	4	7
	19–30	14.3	7.7	13.1 (11.7–14.5)	22.1	4.4 (4.1–4.7)	2	4	7
	31–50	14.8	11.0	14.5 (13.7–15.3)	19.0	4.9 (4.7–5.1)	2	5	7
	51–70	12.3	7.3	11.5 (10.7–12.3)	18.3	4.9 (4.6–5.2)	3	5	7
	71+	10.4	6.7	9.9 (9.1–10.7)	14.6	4.8 (4.5–5.0)	3	5	7
	Total	13.6	9.1	13.1 (12.6–13.6)	18.7	4.8 (4.6–4.9)	3	4	7
Females	15–18	9.2	6.0	8.9 (8.2–9.6)	12.9	4.5 (4.2–4.7)	2	4	7
	19–30	9.9	5.9	9.3 (8.5–10.1)	14.4	4.6 (4.3–4.8)	2	4	7
	31–50	10.5	7.7	10.3 (9.7–10.9)	13.6	5.0 (4.8–5.2)	3	5	8
	51–70	10.3	6.0	9.6 (8.9–10.3)	15.4	5.3 (5.0–5.6)	3	5	8
	71+	8.0	5.4	7.8 (7.4–8.2)	10.8	4.9 (4.7–5.1)	3	5	7
	Total	10.0	6.4	9.6 (9.2–10.0)	14.1	4.9 (4.8–5.1)	3	5	8
Māori									
Males	15–18	14.6	8.5	13.8 (11.6–16.0)	21.9	4.6 (4.2–5.0)	2	4	7
	19–30	16.0	8.5	15.1 (11.7–18.5)	24.3	4.6 (4.1–5.1)	2	4	7
	31–50	15.4	11.4	15.1 (13.4–16.8)	19.6	5.0 (4.5–5.4)	2	4	8
	51+	12.8	7.6	12.2 (10.6–13.8)	18.6	5.2 (4.7–5.7)	3	5	8
	Total	14.9	11.0	14.7 (13.6–15.8)	19.2	4.9 (4.6–5.1)	3	5	8
Females	15–18	8.7	4.8	8.2 (6.4–10.0)	13.3	4.4 (4.0–4.9)	2	4	7
	19–30	10.7	6.1	10.3 (9.2–11.4)	15.7	4.6 (4.3–4.9)	2	4	7
	31–50	10.2	5.9	9.5 (8.1–10.9)	15.3	4.8 (4.5–5.2)	3	4	8
	51+	8.4	5.9	8.2 (7.3–9.1)	11.2	4.9 (4.5–5.3)	3	5	7
	Total	9.9	6.6	9.6 (8.9–10.3)	13.6	4.7 (4.5–4.9)	2	4	7
Pacific									
Males	15–18	12.6	8.3	12.0[#]	17.7	4.4 (3.9–5.0)	3	4	7
	19–30	15.0	9.9	14.3 (8.7–19.9)	20.9	4.7 (3.9–5.6)	3	4	7
	31–50	13.0	6.7	12.0 (9.2–14.8)	20.6	4.6 (3.8–5.4)	2	4	7
	51+	10.0	5.0	9.5 (7.1–11.9)	15.8	4.4 (3.9–4.9)	2	4	7
	Total	13.6	6.3	12.2 (10.4–14.0)	22.6	4.6 (4.1–5.0)	2	4	7
Females	15–18	8.0	4.8	7.6 (5.8–9.4)	11.7	4.0 (3.6–4.5)	2	4	6
	19–30	10.7	5.9	10.0 (8.7–11.3)	16.3	4.8 (4.4–5.2)	3	4	8
	31–50	11.0	6.1	10.2 (9.0–11.4)	17.0	4.9 (4.5–5.2)	3	4	8
	51+	9.0	5.0	8.5 (7.4–9.6)	13.8	5.2 (4.7–5.7)	3	5	8
	Total	10.3	6.4	9.8 (8.7–10.9)	14.7	4.8 (4.6–5.0)	3	4	8

		Polyunsaturated fat (g)[1]				Percent energy from polyunsaturated fat[2]			
		Mean	10th[3]	Median (50th),[3] (95% CI)	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
NZEO									
Males	15–18	13.1	8.7	12.4 (10.9–13.9)	18.4	4.5 (4.3–4.7)	3	4	7
	19–30	13.9	7.7	13.0 (11.5–14.5)	21.2	4.4 (4.1–4.7)	2	4	6
	31–50	14.9	10.2	14.4 (13.5–15.3)	20.2	4.9 (4.7–5.2)	3	5	7
	51+	11.8	7.4	11.2 (10.5–11.9)	17.0	4.8 (4.6–5.1)	3	5	7
	Total	13.5	9.1	13.0 (12.3–13.7)	18.6	4.8 (4.6–4.9)	3	5	7
Females	15–18	9.3	6.4	9.0 (8.3–9.7)	12.7	4.6 (4.3–4.8)	2	4	7
	19–30	9.7	5.6	9.1 (8.1–10.1)	14.6	4.6 (4.3–4.9)	3	4	7
	31–50	10.5	8.5	10.4 (9.7–11.1)	12.7	5.0 (4.8–5.3)	3	5	7
	51+	9.7	5.8	9.1 (8.6–9.6)	14.3	5.2 (4.9–5.4)	3	5	8
	Total	10.0	6.5	9.6 (9.2–10.0)	14.0	5.0 (4.8–5.1)	3	5	8
By NZDep2006 quintile									
Males	1	14.1	8.2	13.1 (11.6–14.6)	21.3	4.9 (4.6–5.3)	3	4	7
	2	13.7	9.2	13.2 (12.0–14.4)	18.6	4.6 (4.4–4.8)	3	4	7
	3	13.3	7.5	12.7 (11.6–13.8)	19.8	4.9 (4.6–5.2)	3	4	7
	4	12.4	10.0	12.2 (11.0–13.4)	15.2	4.6 (4.3–4.9)	3	5	7
	5	13.6	8.3	12.9 (11.6–14.2)	19.7	4.7 (4.4–5.0)	2	4	7
Females	1	10.2	7.2	9.9 (9.0–10.8)	13.7	5.0 (4.7–5.4)	3	5	8
	2	10.0	6.2	9.6 (8.5–10.7)	14.4	4.8 (4.6–5.1)	3	4	8
	3	10.1	6.3	9.6 (8.8–10.4)	14.5	5.0 (4.6–5.3)	3	5	7
	4	9.7	5.8	9.2 (8.5–9.9)	14.2	4.9 (4.7–5.2)	2	5	8
	5	9.8	7.1	9.5 (8.9–10.1)	12.7	4.9 (4.7–5.2)	2	4	8

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from fat for each participant was calculated as the energy from fat (conversion factor = 37.7 kJ/g) divided by the total energy intake.

3 Percentiles.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.12: Polyunsaturated fat sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Butter and margarine	12.1 (11.4–12.8)	7.9 (6.3–9.6)	10.2 (7.9–12.5)	11.7 (10.1–13.2)	15.2 (13.0–17.4)	19.5 (17.7–21.4)	12.8 (11.8–13.7)	7.8 (6.4–9.2)	8.8 (7.0–10.7)	10.3 (8.8–11.9)	13.1 (11.2–15.0)	19.2 (17.4–21.0)	11.5 (10.6–12.4)
Bread	8.6 (8.1–9.0)	7.4 (6.2–8.6)	8.1 (6.2–9.9)	9.5 (8.1–10.9)	8.8 (7.5–10.0)	10.6 (9.0–12.1)	9.0 (8.2–9.7)	8.9 (7.5–10.3)	7.0 (5.6–8.4)	8.0 (6.9–9.1)	8.2 (7.2–9.2)	11.3 (10.1–12.5)	8.3 (7.7–8.8)
Bread-based dishes	6.6 (5.9–7.3)	12.5 (9.9–15.1)	11.5 (7.8–15.1)	6.8 (5.2–8.3)	6.6 (4.5–8.8)	2.4 (1.5–3.2)	7.7 (6.6–8.9)	12.3 (9.5–15.0)	7.0 (4.8–9.3)	6.1 (4.5–7.7)	3.0 (2.1–4.0)	2.4 (1.6–3.2)	5.5 (4.7–6.4)
Potatoes, kumara and taro	6.5 (6.0–7.1)	9.7 (7.9–11.5)	7.7 (5.5–9.8)	6.2 (5.0–7.4)	6.5 (5.0–7.9)	5.3 (4.3–6.2)	6.8 (6.0–7.5)	9.8 (8.1–11.5)	8.2 (5.5–10.8)	6.6 (5.3–8.0)	4.4 (3.6–5.3)	4.3 (3.4–5.1)	6.3 (5.5–7.1)
Vegetables	6.4 (5.8–6.9)	3.7 (2.5–4.9)	4.2 (2.9–5.6)	5.0 (4.1–6.0)	6.6 (5.1–8.1)	7.2 (6.3–8.2)	5.4 (4.8–6.0)	5.0 (3.5–6.5)	5.6 (4.2–7.0)	6.6 (5.6–7.7)	9.7 (8.0–11.5)	7.8 (6.8–8.7)	7.2 (6.5–8.0)
Poultry	5.5 (5.0–6.0)	7.8 (5.6–10.0)	7.3 (5.0–9.7)	6.6 (4.9–8.3)	4.1 (2.8–5.3)	2.8 (1.9–3.6)	5.8 (5.0–6.7)	6.5 (4.8–8.3)	6.9 (5.4–8.5)	5.7 (4.6–6.8)	3.6 (2.6–4.7)	3.3 (2.3–4.3)	5.2 (4.6–5.8)
Fish and seafood	5.2 (4.6–5.7)	3.3 (1.8–4.7)	3.3 (1.9–4.7)	6.2 (4.4–8.0)	5.2 (3.6–6.8)	5.7 (4.3–7.1)	5.1 (4.2–5.9)	2.3 (1.4–3.2)	4.5 (2.7–6.3)	6.0 (4.4–7.6)	5.6 (4.3–6.9)	5.2 (4.0–6.4)	5.3 (4.5–6.0)
Grains and pasta	5.0 (4.5–5.5)	5.2 (3.8–6.6)	6.9 (4.7–9.0)	4.7 (3.6–5.9)	4.9 (3.4–6.4)	4.9 (3.5–6.3)	5.3 (4.5–6.1)	6.1 (4.8–7.5)	6.5 (4.5–8.6)	4.9 (3.8–6.0)	3.4 (2.6–4.3)	3.6 (2.9–4.3)	4.8 (4.1–5.4)
Breakfast cereals	3.9 (3.5–4.4)	2.5 (1.8–3.1)	2.2 (1.4–3.0)	3.3 (2.2–4.4)	5.5 (3.7–7.3)	4.4 (3.5–5.2)	3.7 (3.1–4.3)	2.1 (1.5–2.7)	2.7 (1.4–3.9)	4.4 (3.2–5.6)	4.8 (3.6–5.9)	5.3 (4.3–6.4)	4.1 (3.5–4.7)
Cakes and muffins	3.8 (3.3–4.3)	1.9 (1.2–2.6)	2.4 (1.1–3.7)	4.4 (3.1–5.6)	4.1 (2.8–5.4)	3.9 (3.1–4.7)	3.7 (3.0–4.3)	4.5 (3.4–5.5)	4.5 (2.6–6.4)	3.0 (2.3–3.6)	4.3 (3.3–5.3)	5.1 (3.9–6.4)	3.9 (3.4–4.5)
Nuts and seeds	3.5	3.5	2.1	3.3	3.2	3.3	3.0	2.0	2.1	4.7	5.4	2.9	4.0
Savoury sauces and condiments	3.3	2.9	2.3	3.0	2.5	2.0	2.6	2.4	4.4	4.3	4.3	2.3	4.0
Fruit	3.3	2.0	2.8	2.6	2.3	3.2	2.6	3.1	3.2	3.8	4.9	4.5	4.0
Beef and veal	2.7	3.4	3.1	3.3	3.2	2.9	3.2	2.3	1.5	2.5	2.2	2.6	2.2
Eggs and egg dishes	2.4	2.8	1.8	2.7	2.5	2.7	2.5	1.4	2.9	1.9	2.5	2.9	2.3
Sausages and processed meats	2.3	2.5	3.2	2.7	2.0	2.0	2.5	2.8	2.1	2.2	2.0	1.8	2.1
Biscuits	2.2	2.3	0.8	1.9	2.0	2.8	1.8	2.9	2.4	2.6	2.1	2.8	2.5
Pies and pasties	2.1	3.0	3.6	2.6	1.6	1.3	2.5	2.1	2.6	1.7	1.5	1.1	1.8
Pork	1.9	2.3	2.8	1.9	2.7	2.5	2.4	1.1	1.5	1.4	1.8	1.7	1.5
Milk	1.8	1.6	1.3	1.5	1.6	1.6	1.5	2.0	1.8	2.4	1.9	1.8	2.0
Sugar and sweets	1.4	1.1	2.6	1.4	0.6	0.7	1.3	2.5	1.4	1.6	1.4	0.5	1.5
Fats and oils	1.3	0.3	2.0	1.1	0.5	1.4	1.1	0.5	2.3	1.5	1.7	0.8	1.6

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Snack bars	1.2	3.7	0.9	1.8	0.8	0.3	1.3	1.9	0.8	1.4	1.0	0.4	1.1
Cheese	1.1	0.9	1.2	1.1	0.9	0.8	1.0	1.2	0.8	1.3	1.1	1.0	1.1
Snack foods	1.0	1.6	1.6	0.7	0.2	0.1	0.8	2.3	2.3	1.2	0.4	0.0	1.2
Dairy products	1.0	0.9	0.5	0.9	1.3	1.0	0.9	1.0	1.1	1.0	1.0	1.0	1.0
Lamb and mutton	1.0	0.5	1.0	0.9	1.6	0.8	1.1	0.4	1.4	0.5	1.2	0.7	0.9
Soups and stocks	0.8	0.2	0.4	0.4	0.6	1.4	0.5	0.7	1.4	0.9	1.3	1.1	1.1
Non alcoholic beverages	0.8	0.4	0.8	0.6	0.9	0.4	0.7	0.8	0.9	1.1	0.8	0.4	0.9
Puddings and desserts	0.7	0.8	0.3	0.7	1.0	1.5	0.7	0.8	0.8	0.5	0.7	1.0	0.7
Supplements providing energy	0.3	1.5	1.1	0.3	0.1	0.0	0.5	0.6	0.1	0.0	0.0	0.5	0.1
Other meat	0.2	0.0	0.2	0.2	0.5	0.6	0.3	0.1	0.1	0.1	0.3	0.4	0.2

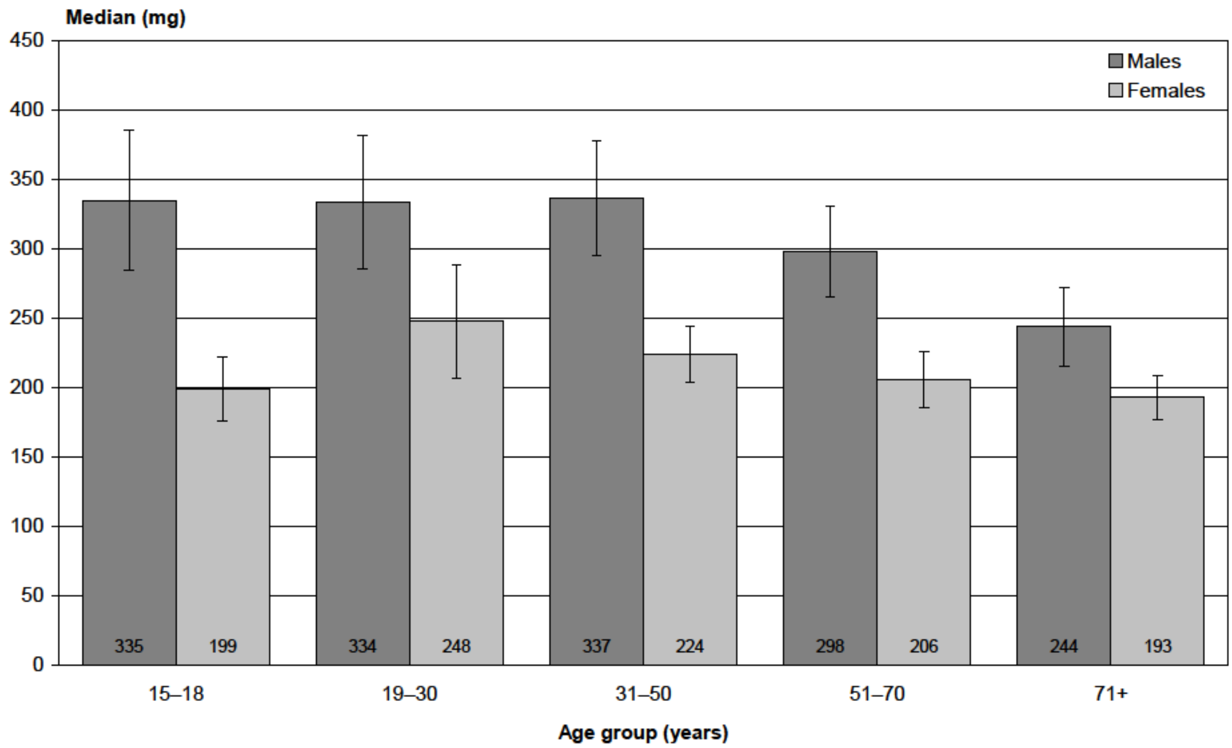
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Cholesterol intake

Dietary cholesterol is only an important determinant of total and LDL cholesterol if saturated fatty acids are a high proportion of dietary fats (> 15% energy) and cholesterol intake is greater than 300 mg/day. The effect of dietary cholesterol on blood lipids is less clear when intakes of cholesterol and saturated fat are lower (Mann and Truswell 2007).

The usual median daily intake of cholesterol was 316 mg for males and 219 mg for females (Table 3.13). Older males (71+ years) consumed less cholesterol than those aged 15–50 years (Figure 3.16).

Figure 3.16: Median cholesterol intake (mg), by age group and sex



The usual median daily intake of cholesterol was 410 mg for Māori males and 262 mg for Māori females. The usual median daily intake of cholesterol was 363 mg for Pacific males and 262 mg for Pacific females.

For males and for females there were no differences in cholesterol intake between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for cholesterol intake, after adjusting for age, sex and ethnic group.

Dietary sources of cholesterol

Eggs and egg dishes contributed 13% of cholesterol, *Poultry* 12%, and *Beef and veal* 9%. *Milk* and *Fish and seafood* each contributed 8%, *Bread-based dishes* 7% and *Pork* 5%. *Cakes and muffins*, *Sausages and processed meats* and *Grains and pasta* each contributed 4% (Table 3.14).

Among females, those aged 15–18 years obtained less cholesterol from *Eggs and egg dishes* (8%) than those aged 19–30 years and 71+ years (each 16%) (Figure 3.17). *Poultry* provided less cholesterol for older males (71+ years) than for younger males aged 15–50 years, and less for females aged 51+ years than for those aged 19–30 years. Younger females aged 19–30 years obtained less cholesterol from *Beef and veal* than all older females, and those aged 15–18 years obtained less cholesterol from *Fish and seafood* than those aged 31+ years. Older males and females (71+ years) obtained less cholesterol from *Bread-based dishes* than those aged 15–50 years.

Figure 3.17: Percent cholesterol from *Eggs and egg dishes*, by age group and sex

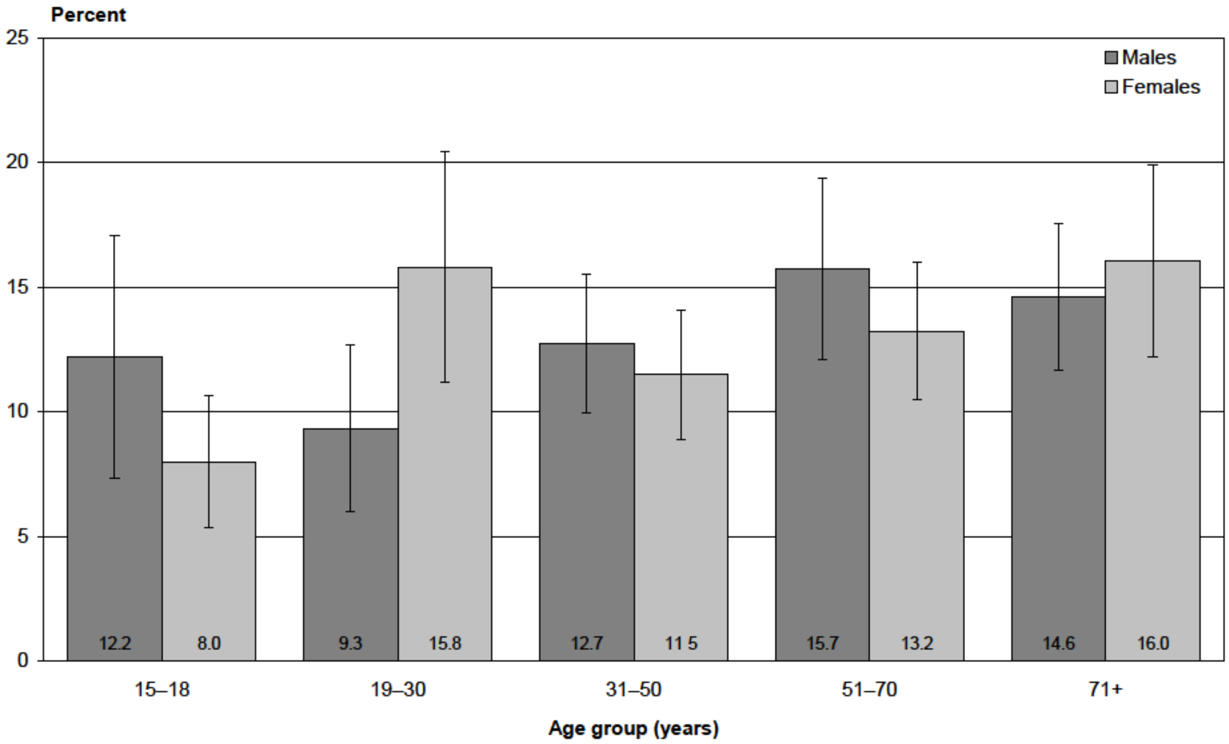


Table 3.13: Cholesterol intake, by age group, ethnic group, NZDep2006 and sex

		Cholesterol (mg)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
Total population		281	155	262 (252–272)	430
By age group (years)					
Males	15–18	337	285	335 (285–385)	391
	19–30	340	253	334 (286–382)	435
	31–50	359	202	337 (296–378)	547
	51–70	314	175	298 (265–331)	473
	71+	253	168	244 (216–272)	351
	Total	333	199	316 (299–333)	489
Females	15–18	215	119	199 (176–222)	331
	19–30	261	161	248 (207–289)	378
	31–50	235	145	224 (204–244)	339
	51–70	222	107	206 (186–226)	358
	71+	198	137	193 (177–209)	266
	Total	232	134	219 (206–232)	348
Māori					
Males	15–18	373	205	351 (270–432)	568
	19–30	425	215	388 (303–473)	678
	31–50	428	309	419 (346–492)	560
	51+	418	245	406 (307–505)	605
	Total	426	266	410 (365–455)	607
Females	15–18	242	87	185 (115–255)	438
	19–30	282	219	278 (227–329)	349
	31–50	274	157	258 (221–295)	410
	51+	268	151	256 (227–285)	401
	Total	277	163	262 (238–286)	412
Pacific					
Males	15–18	374	252	370 (249–491)	501
	19–30	451	209	409 (298–520)	747
	31–50	362	237	347 (243–451)	504
	51+	296	122	263 (190–336)	513
	Total	384	210	363 (315–411)	585
Females	15–18	243	104	217 (130–304)	416
	19–30	306	180	290 (200–380)	454
	31–50	291	218	286 (232–340)	371
	51+	202	85	175 (135–215)	351
	Total	277	165	262 (223–301)	407

Cholesterol (mg)[1]					
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**
NZEO					
Males	15–18	322	255	318 (261–375)	393
	19–30	313	144	287 (239–335)	516
	31–50	351	187	330 (296–364)	545
	51+	293	189	283 (255–311)	411
	Total	322	209	311 (293–329)	449
Females	15–18	204	114	189 (166–212)	312
	19–30	249	127	227 (197–257)	397
	31–50	227	146	218 (197–239)	318
	51+	212	128	204 (187–221)	308
	Total	225	134	214 (199–229)	330
By NZDep2006 quintile					
Males	1	289	167	274 (237–311)	429
	2	341	206	327 (293–361)	495
	3	329	140	294 (243–345)	561
	4	349	232	339 (300–378)	477
	5	350	188	328 (294–362)	540
Females	1	225	158	221 (193–249)	297
	2	211	157	207 (184–230)	271
	3	227	120	209 (179–239)	355
	4	234	117	215 (195–235)	378
	5	258	158	247 (223–271)	373

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Table 3.14: Cholesterol sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Eggs and egg dishes	13.0 (11.8–14.2)	12.2 (7.3–17.1)	9.3 (6.0–12.7)	12.7 (10.0–15.5)	15.7 (12.1–19.4)	14.6 (11.7–17.6)	13.0 (11.3–14.6)	8.0 (5.4–10.6)	15.8 (11.2–20.4)	11.5 (8.9–14.1)	13.2 (10.5–16.0)	16.0 (12.2–19.9)	13.0 (11.4–14.6)
Poultry	12.3 (11.2–13.3)	14.9 (11.4–18.5)	13.4 (9.3–17.6)	13.3 (10.6–16.0)	11.5 (8.2–14.7)	7.3 (5.4–9.3)	12.4 (10.9–14.0)	14.1 (10.9–17.3)	15.8 (12.4–19.2)	12.7 (10.3–15.2)	9.3 (6.9–11.7)	9.0 (6.9–11.2)	12.1 (10.8–13.5)
Beef and veal	9.0 (8.1–9.8)	7.8 (5.5–10.1)	7.2 (4.5–10.0)	9.6 (7.3–11.9)	8.5 (6.2–10.9)	12.3 (9.8–14.9)	8.9 (7.7–10.2)	6.6 (4.5–8.7)	4.6 (2.9–6.3)	9.5 (7.5–11.4)	10.9 (8.0–13.8)	12.5 (9.6–15.5)	9.0 (7.9–10.1)
Milk	8.0 (7.4–8.6)	6.9 (5.8–8.1)	7.2 (4.8–9.6)	7.5 (6.1–8.9)	9.0 (7.2–10.9)	8.9 (7.7–10.0)	7.9 (7.1–8.8)	6.9 (5.4–8.3)	7.0 (5.3–8.7)	8.5 (7.1–9.9)	8.2 (6.3–10.0)	9.5 (8.3–10.7)	8.1 (7.3–8.9)
Fish and seafood	7.9 (7.1–8.7)	4.4 (2.6–6.3)	4.2 (2.1–6.3)	8.3 (6.1–10.4)	7.9 (5.5–10.3)	8.1 (6.2–10.0)	7.0 (5.9–8.1)	3.5 (2.2–4.8)	6.7 (4.1–9.3)	9.2 (7.0–11.5)	11.2 (8.8–13.6)	7.7 (6.0–9.4)	8.7 (7.5–9.9)
Bread-based dishes	7.0 (6.2–7.8)	13.6 (10.8–16.3)	15.3 (10.9–19.8)	7.1 (5.2–9.1)	4.7 (3.2–6.3)	2.5 (1.6–3.3)	8.2 (6.9–9.6)	13.0 (9.9–16.2)	7.3 (4.7–10.0)	6.4 (4.8–8.1)	3.7 (2.5–4.8)	2.0 (1.2–2.7)	5.9 (5.0–6.8)
Pork	5.1 (4.5–5.6)	5.0 (3.2–6.7)	6.7 (4.0–9.4)	4.2 (3.1–5.3)	6.4 (4.1–8.7)	8.2 (5.6–10.8)	5.7 (4.7–6.7)	4.0 (2.6–5.5)	2.9 (1.4–4.3)	4.4 (3.3–5.5)	5.4 (3.9–7.0)	5.4 (3.8–7.0)	4.4 (3.8–5.1)
Cakes and muffins	4.3 (3.8–4.8)	2.2 (1.4–3.0)	2.4 (1.0–3.8)	4.6 (3.1–6.1)	4.0 (2.8–5.2)	5.1 (3.4–6.8)	3.8 (3.1–4.6)	6.2 (4.7–7.8)	4.3 (2.6–6.1)	4.1 (3.2–5.0)	5.1 (3.8–6.3)	6.0 (4.5–7.5)	4.7 (4.1–5.4)
Sausages and processed meats	3.9 (3.4–4.4)	4.1 (2.3–6.0)	4.4 (2.3–6.6)	4.3 (3.0–5.5)	4.1 (2.3–5.9)	4.4 (3.1–5.6)	4.3 (3.4–5.1)	4.5 (2.7–6.3)	4.3 (2.5–6.0)	3.4 (2.3–4.4)	3.2 (2.2–4.2)	3.8 (2.6–5.1)	3.6 (3.0–4.2)
Grains and pasta	3.8 (3.2–4.5)	5.0 (3.2–6.8)	6.0 (3.6–8.5)	3.5 (2.1–4.9)	3.7 (1.9–5.4)	1.8 (0.8–2.9)	4.0 (3.1–4.9)	6.1 (4.1–8.0)	5.8 (3.1–8.4)	4.0 (2.5–5.5)	1.5 (0.7–2.3)	2.1 (1.2–2.9)	3.6 (2.8–4.5)
Dairy products	3.5	3.2	2.0	2.8	3.8	4.0	3.0	4.6	3.8	3.6	4.0	4.5	3.9
Pies and pasties	3.3	4.4	5.4	4.1	2.9	2.5	3.9	3.7	2.8	2.3	2.8	2.4	2.6
Lamb and mutton	2.9	1.7	2.2	2.4	3.5	2.6	2.6	1.3	3.3	2.1	4.3	3.8	3.1
Cheese	2.8	2.0	2.1	2.9	2.7	1.9	2.5	2.1	2.3	3.3	3.8	2.8	3.1
Butter and margarine	2.5	1.5	1.3	2.6	2.1	3.9	2.2	1.8	2.4	3.1	2.9	3.3	2.8
Potatoes, kumara and taro	1.4	2.3	1.8	1.4	0.9	0.9	1.4	3.0	2.1	1.6	0.9	0.6	1.5
Puddings and desserts	1.2	0.9	0.5	1.2	1.5	3.3	1.3	1.1	0.8	0.9	1.6	1.7	1.2
Non-alcoholic beverages	1.2	0.4	1.7	1.1	1.1	0.5	1.1	1.2	1.1	1.5	1.4	0.8	1.3
Biscuits	1.2	1.3	0.5	1.2	1.0	1.6	1.0	1.7	1.0	1.3	1.3	1.7	1.3
Soups and stocks	1.1	0.3	1.2	0.7	0.9	1.7	0.9	0.8	0.7	1.3	1.6	1.1	1.2

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Vegetables	1.0	1.1	0.7	1.0	0.4	0.6	0.8	1.3	1.1	1.1	1.2	0.8	1.1
Bread	0.7	1.0	2.0	0.6	0.5	0.5	0.9	1.0	0.5	0.9	0.5	0.3	0.6
Other meat	0.7	0.4	0.2	0.7	1.6	1.6	0.9	0.2	0.4	0.5	0.7	1.2	0.6
Sugar and sweets	0.7	0.6	1.0	0.7	0.3	0.2	0.6	1.7	0.6	0.9	0.6	0.3	0.8
Savoury sauces and condiments	0.7	1.4	0.3	0.5	0.9	0.4	0.6	0.5	0.8	0.9	0.5	0.4	0.7
Supplements providing energy	0.3	0.3	0.6	0.4	0.0	0.0	0.3	0.1	0.9	0.5	0.1	0.0	0.4
Snack foods	0.1	0.2	0.1	0.2	0.0	0.0	0.1	0.3	0.4	0.2	0.0	0.0	0.2
Snack bars	0.1	0.7	0.1	0.2	0.0	0.0	0.2	0.3	0.1	0.0	0.1	0.0	0.1
Breakfast cereals	0.1	0.0	0.0	0.0	0.3	0.4	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Alcoholic beverages	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.1
Nuts and seeds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

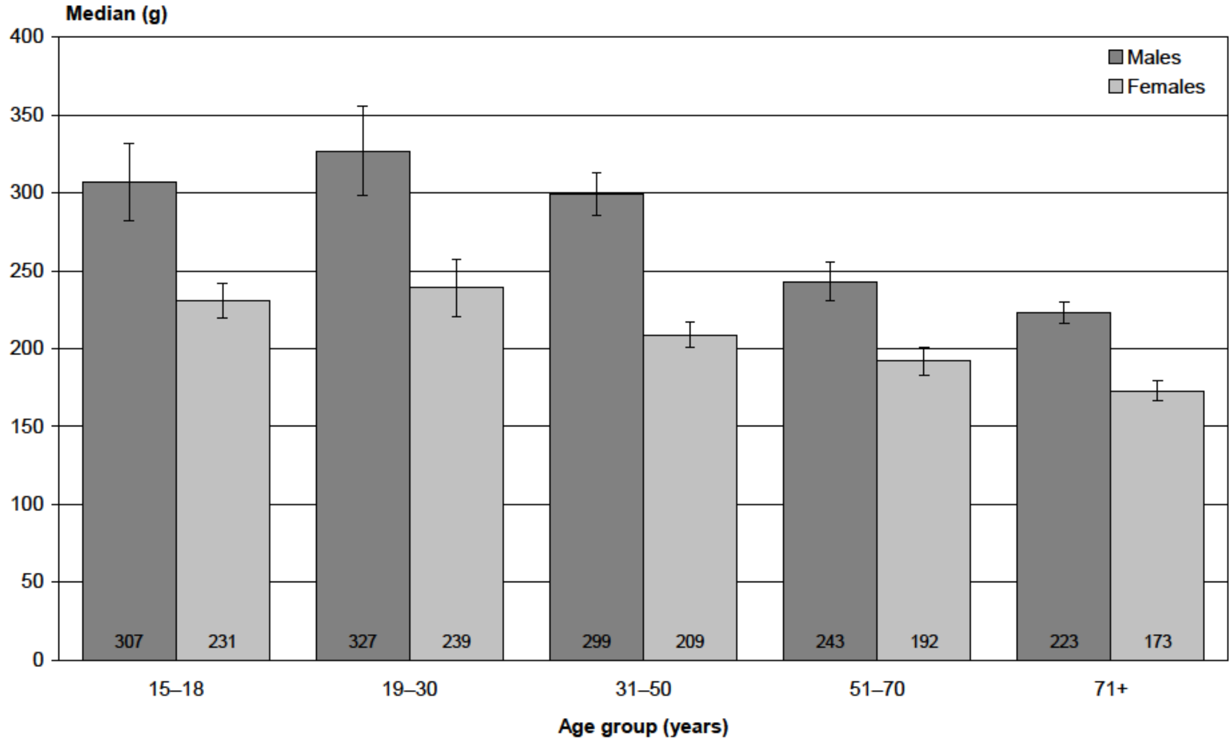
3.6 Total carbohydrate

Metabolism of carbohydrate is the most efficient source of energy for cells, particularly the brain, which requires glucose to function. Carbohydrates are a diverse group of substances with varied chemical and physiological properties with varying importance to health (Mann and Truswell 2007). They include the sugars, starches and fibres. The acceptable macronutrient distribution range for carbohydrate is 45–65% of energy (NHMRC 2006).

Total carbohydrate intake

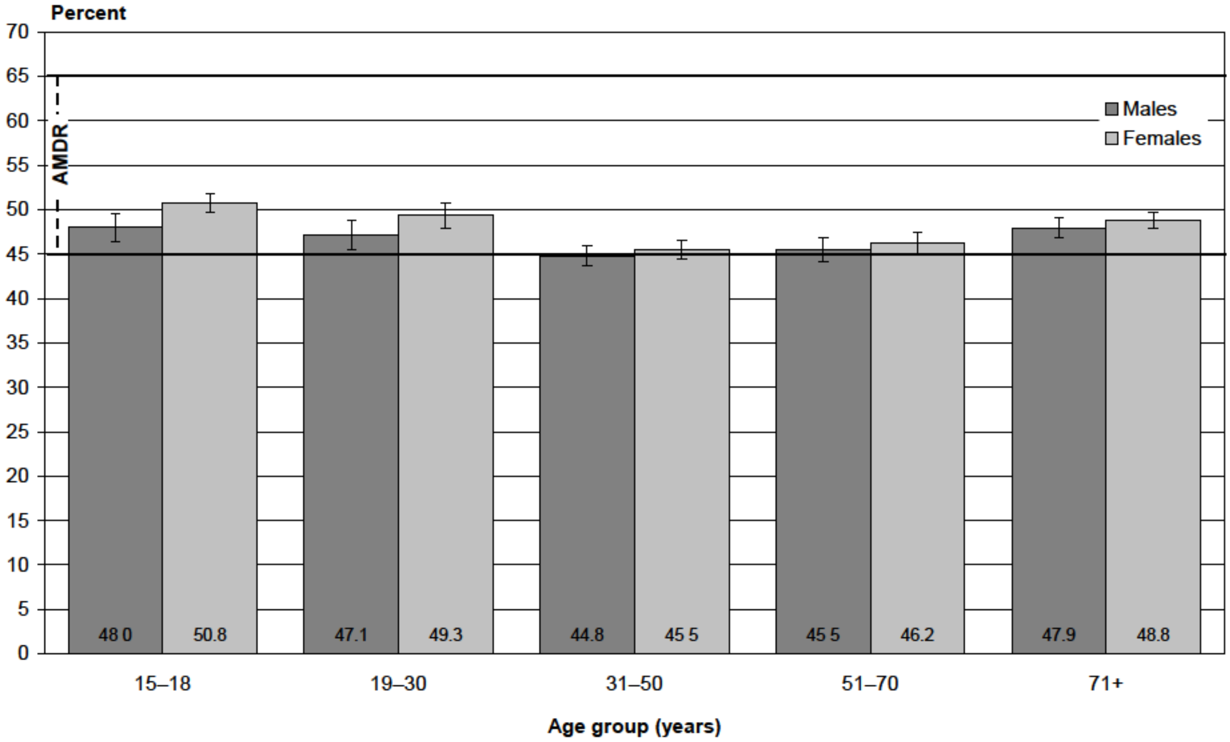
The median usual daily intake of carbohydrate was 278 g for males and 207 g for females (Table 3.15). Males aged 15–50 years had a higher median usual daily intake of carbohydrate compared to males aged 51+ years. Females aged 15–30 years had a higher median usual intake of carbohydrate than older females with intake decreasing for those 31+ years (Figure 3.18).

Figure 3.18: Median carbohydrate intake (g), by age group and sex



The mean contribution to daily energy intake was 46.0% for males and 47.1% for females, which fell just within the AMDR of 45–65% of total energy from carbohydrate (Table 3.15). Males aged 71+ years had a higher percent energy from carbohydrate (47.9%) than those aged 31–50 years (44.8%). Females aged 31–50 years had a lower percent energy intake than those aged 15–30 and 71+ years (Figure 3.19).

Figure 3.19: Percent energy from carbohydrate[1], by age group and sex



1 Acceptable macronutrient distribution range for carbohydrate is 45–65% of energy (NHMRC 2006).

Median usual daily intakes of carbohydrate in older Māori males and females (51+ years) were lower than in all male younger age groups and in females aged 19–50 years. Median usual daily intakes of carbohydrate in Pacific females aged 51+ years were lower than in those aged 19–50 years.

For both males and females there were no differences in the amount of carbohydrate or contribution to energy between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for amount or contribution of carbohydrate to energy, after adjusting for age, sex and ethnic group.

Dietary sources of carbohydrate

The *Bread* group was the single largest contributor of carbohydrate to the diet (17%), followed by *Grains and pasta*, *Fruit* and *Non-alcoholic beverages* (each 9%), *Potatoes, kumara and taro* (8%), *Sugar and sweets* (7%), *Breakfast cereals* (5%) and *Cakes and muffins*, *Milk* and *Bread-based dishes* (each 4%) (Table 3.16).

The differences in the contributions of carbohydrate to energy across food sources varied by age and sex. Older males and females (71+ years) obtained more from *Bread* than younger males aged 15–30 years and all younger females. In contrast, *Grains and pasta* provided less carbohydrate to males and females aged 71+ years than younger males aged 19–50 years and younger females aged 15–50 years. *Fruit* provided more carbohydrate for older males and females (71+ years) than for younger males and females aged 15–50 years. *Non-alcoholic beverages* provided a higher proportion of energy for males and females aged 15–30 years than for all older age groups (Figure 3.20).

Figure 3.20: Percent carbohydrate from non-alcoholic beverages, by age group and sex

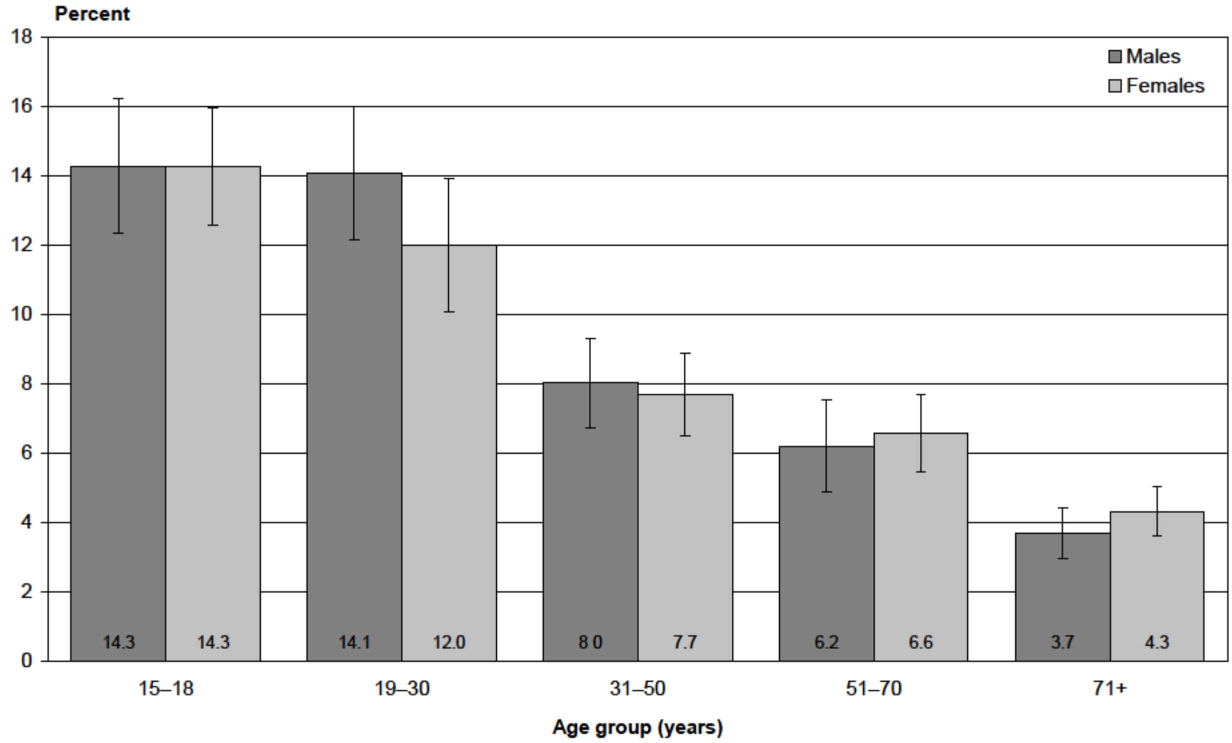


Table 3.15: Carbohydrate intake, by age group, ethnic group, NZDep2006 and sex

		Carbohydrate (g)[1]				Percent energy from carbohydrate[2]			
		Mean	10th[3]	Median (50th),[3] (95% CI)	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
Total population		250	158	239 (234–244)	354	46.6 (46.1–47.0)	34	47	60
By age group (years)									
Males	15–18	318	213	307 (283–332)	439	48.0 (46.4–49.6)	36	49	60
	19–30	329	277	327 (299–355)	384	47.1 (45.4–48.7)	32	45	58
	31–50	305	211	299 (285–313)	407	44.8 (43.7–45.9)	31	45	57
	51–70	249	168	243 (231–255)	337	45.5 (44.1–46.9)	32	46	61
	71+	227	159	223 (216–230)	301	47.9 (46.8–49.0)	34	47	60
	Total	289	192	278 (270–286)	399	46.0 (45.3–46.6)	33	46	59
Females	15–18	237	165	231 (220–242)	315	50.8 (49.7–51.8)	37	51	63
	19–30	246	165	239 (221–257)	335	49.3 (47.9–50.7)	36	48	61
	31–50	213	156	209 (201–217)	274	45.5 (44.4–46.6)	33	46	58
	51–70	197	137	192 (183–201)	262	46.2 (45.0–47.4)	32	46	58
	71+	177	130	173 (167–179)	228	48.8 (47.9–49.7)	37	49	60
	Total	213	144	207 (202–212)	290	47.1 (46.6–47.7)	35	48	60
Māori									
Males	15–18	337	233	323 (277–369)	464	48.2 (45.8–50.7)	37	49	59
	19–30	341	221	326 (282–370)	481	44.6 (41.8–47.4)	31	44	58
	31–50	300	204	293 (261–325)	406	42.5 (40.7–44.4)	30	42	54
	51+	217	136	212 (190–234)	304	42.8 (40.1–45.5)	29	43	58
	Total	301	199	290 (272–308)	419	43.9 (42.7–45.2)	31	44	57
Females	15–18	223	146	212 (168–256)	314	48.6 (45.8–51.3)	34	50	64
	19–30	254	166	247 (219–275)	351	47.8 (46.0–49.6)	36	46	59
	31–50	217	145	209 (190–228)	299	46.2 (44.2–48.2)	33	45	57
	51+	176	121	172 (155–189)	235	44.7 (42.7–46.7)	32	44	56
	Total	220	140	212 (201–223)	312	46.6 (45.5–47.7)	34	46	58
Pacific									
Males	15–18	309	249	306[#]	374	47.4 (42.4–52.4)	33	46	68
	19–30	317	198	308 (262–354)	446	45.8 (42.1–49.5)	30	45	58
	31–50	299	184	293 (263–323)	417	45.2 (43.2–47.1)	30	45	59
	51+	269	164	260 (217–303)	385	51.0 (47.7–54.4)	35	49	67
	Total	304	195	297 (269–325)	421	46.8 (45.2–48.5)	31	46	61
Females	15–18	228	184	224 (190–258)	277	51.3 (46.8–55.9)	38	52	67
	19–30	258	143	242 (214–270)	394	49.3 (46.9–51.8)	35	49	65
	31–50	236	203	235 (216–254)	271	46.5 (44.8–48.1)	33	47	61
	51+	193	109	180 (158–202)	295	47.1 (44.6–49.6)	30	48	60
	Total	236	150	225 (213–237)	334	48.1 (46.9–49.3)	34	48	62

		Carbohydrate (g)[1]				Percent energy from carbohydrate[2]			
		Mean	**10th[3]**	**Median (50th),[3] (95% CI)**	**90th[3]**	**Mean (95% CI)**	**10th[3]**	**Median (50th)[3]**	**90th[3]**
NZEO									
Males	15–18	316	201	302 (275–329)	448	48.0 (46.2–49.7)	36	49	60
	19–30	324	218	315 (289–341)	441	47.5 (45.7–49.3)	35	47	58
	31–50	307	218	302 (287–317)	404	45.0 (43.8–46.3)	33	45	58
	51+	244	169	238 (227–249)	327	46.2 (45.0–47.4)	34	47	60
	Total	288	192	278 (268–288)	397	46.2 (45.4–46.9)	34	47	59
Females	15–18	237	163	230 (218–242)	317	50.7 (49.6–51.8)	37	51	62
	19–30	244	172	240 (220–260)	320	49.5 (47.8–51.1)	36	49	61
	31–50	211	150	208 (200–216)	276	45.3 (44.1–46.5)	33	46	57
	51+	192	136	188 (181–195)	252	47.1 (46.2–48.0)	35	48	60
	Total	211	144	206 (200–212)	285	47.1 (46.5–47.8)	35	48	60
By NZDep2006 quintile									
Males	1	287	176	282 (263–301)	405	46.2 (44.8–47.5)	34	47	59
	2	297	206	293 (277–309)	392	45.1 (43.7–46.5)	35	46	57
	3	280	209	274 (253–295)	359	46.0 (44.6–47.5)	34	47	60
	4	280	203	275 (255–295)	362	46.4 (44.6–48.2)	33	47	59
	5	294	193	282 (261–303)	412	46.2 (44.9–47.5)	31	46	61
Females	1	206	137	201 (189–213)	281	46.2 (44.4–48.0)	35	48	60
	2	214	168	212 (201–223)	262	47.3 (46.2–48.4)	36	49	60
	3	223	170	219 (208–230)	278	48.0 (46.6–49.4)	35	49	60
	4	207	142	200 (189–211)	279	46.8 (45.6–47.9)	35	47	60
	5	212	137	204 (192–216)	297	47.2 (46.0–48.4)	34	47	61

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from carbohydrate for each participant was calculated as the energy from carbohydrate (conversion factor = 16.7 kJ/g) divided by the total energy intake.

3 Percentiles.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.16: Carbohydrate sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	17.2 (16.5–17.8)	15.2 (13.1–17.4)	14.4 (12.0–16.9)	18.9 (17.0–20.7)	18.7 (16.4–21.1)	21.1 (19.6–22.7)	17.8 (16.8–18.8)	14.0 (12.4–15.7)	13.0 (11.1–14.8)	17.0 (15.3–18.7)	17.1 (15.5–18.7)	21.7 (19.1–24.3)	16.5 (15.6–17.4)
Grains and pasta	9.3 (8.6–9.9)	8.3 (6.4–10.2)	12.1 (9.3–14.8)	9.8 (8.4–11.3)	9.1 (6.8–11.3)	6.2 (4.9–7.6)	9.6 (8.6–10.7)	9.4 (7.8–10.9)	11.3 (9.0–13.7)	9.6 (8.1–11.0)	7.5 (6.0–9.1)	5.3 (4.4–6.2)	8.9 (8.1–9.7)
Fruit	8.9 (8.5–9.4)	6.0 (4.7–7.3)	5.7 (4.4–7.0)	6.8 (5.8–7.8)	8.3 (7.2–9.5)	11.7 (10.5–12.8)	7.4 (6.8–8.0)	6.9 (5.9–8.0)	7.8 (6.5–9.1)	9.4 (8.3–10.5)	12.9 (11.7–14.2)	14.5 (13.5–15.5)	10.4 (9.7–11.0)
Non-alcoholic beverages	8.6 (8.1–9.1)	14.3 (12.3–16.2)	14.1 (12.2–16.0)	8.0 (6.7–9.3)	6.2 (4.9–7.5)	3.7 (3.0–4.4)	8.9 (8.1–9.6)	14.3 (12.6–15.9)	12.0 (10.1–13.9)	7.7 (6.5–8.9)	6.6 (5.4–7.7)	4.3 (3.6–5.0)	8.3 (7.7–9.0)
Potatoes, kumara and taro	8.4 (7.9–8.9)	10.8 (8.5–13.0)	7.8 (5.8–9.9)	8.0 (6.8–9.2)	9.2 (7.8–10.7)	9.4 (8.4–10.4)	8.6 (7.9–9.4)	8.5 (7.2–9.8)	8.7 (6.9–10.4)	8.0 (6.8–9.1)	7.9 (6.7–9.0)	8.5 (7.5–9.4)	8.2 (7.5–8.8)
Sugar and sweets	7.1 (6.6–7.5)	4.7 (3.6–5.9)	6.5 (5.0–8.1)	8.0 (6.8–9.1)	7.3 (6.3–8.3)	8.3 (7.4–9.1)	7.3 (6.7–7.9)	6.8 (5.5–8.2)	7.6 (6.0–9.2)	7.7 (6.7–8.7)	5.9 (5.0–6.8)	5.5 (4.9–6.2)	6.9 (6.3–7.5)
Breakfast cereals	5.2 (4.8–5.6)	5.0 (4.0–6.1)	3.9 (2.7–5.0)	4.2 (3.4–5.1)	7.3 (5.8–8.7)	6.2 (5.5–6.9)	5.2 (4.6–5.8)	3.5 (2.8–4.3)	3.8 (2.7–5.0)	5.1 (4.2–6.0)	6.1 (5.0–7.2)	6.4 (5.6–7.1)	5.1 (4.6–5.7)
Cakes and muffins	4.4 (4.0–4.9)	1.9 (1.3–2.6)	2.7 (1.4–4.1)	4.6 (3.4–5.8)	4.7 (3.5–6.0)	4.4 (3.6–5.3)	4.0 (3.4–4.7)	4.9 (3.9–5.9)	4.4 (2.9–5.9)	4.2 (3.3–5.0)	5.6 (4.3–6.9)	5.9 (4.6–7.2)	4.8 (4.2–5.4)
Milk	4.2 (4.0–4.5)	3.6 (3.0–4.2)	3.0 (2.3–3.7)	4.1 (3.6–4.6)	4.5 (3.9–5.1)	4.9 (4.4–5.3)	4.0 (3.7–4.3)	3.1 (2.6–3.7)	3.3 (2.7–3.8)	5.1 (4.5–5.7)	4.6 (4.1–5.2)	5.1 (4.7–5.6)	4.5 (4.2–4.8)
Bread-based dishes	4.2 (3.8–4.7)	9.5 (7.1–11.9)	7.4 (5.2–9.6)	4.5 (3.5–5.5)	4.3 (2.8–5.9)	1.5 (1.0–2.0)	5.2 (4.4–5.9)	7.0 (5.5–8.5)	4.1 (2.9–5.3)	3.9 (2.9–4.8)	2.0 (1.3–2.6)	1.5 (1.0–2.0)	3.4 (2.9–3.9)
Vegetables	4.0	1.8	2.5	3.5	3.8	4.3	3.3	2.1	3.8	4.6	5.8	4.9	4.6
Biscuits	3.3	3.0	1.1	3.1	3.2	4.6	2.8	4.5	2.9	3.9	3.9	4.4	3.8
Alcoholic beverages	2.4	1.4	3.8	3.0	2.5	2.0	2.8	2.0	3.7	2.2	1.2	0.7	2.0
Dairy products	2.2	2.5	1.8	2.0	1.7	2.0	1.9	2.8	2.9	1.8	2.5	2.6	2.3
Pies and pasties	2.0	3.0	3.9	2.5	1.4	1.2	2.4	1.8	2.4	1.5	1.3	1.0	1.6
Savoury sauces and condiments	1.3	1.3	1.4	1.3	1.2	1.2	1.3	1.3	1.3	1.5	1.2	1.1	1.3
Puddings and desserts	1.1	1.1	0.4	1.0	1.3	2.4	1.1	0.9	1.3	1.0	1.4	1.5	1.2
Fish and seafood	0.9	0.6	0.9	1.2	1.1	1.0	1.1	0.2	0.9	0.8	1.1	0.8	0.8
Soups and stocks	0.9	0.1	0.7	0.4	0.6	1.3	0.6	0.4	0.9	1.0	1.4	1.9	1.1
Snack bars	0.8	1.3	0.7	1.3	0.5	0.2	0.9	1.4	0.4	0.7	1.0	0.3	0.7
Sausages and processed meats	0.7	0.7	0.9	0.8	0.6	0.6	0.7	0.7	0.5	0.7	0.6	0.5	0.6

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Poultry	0.7	0.7	1.1	0.8	0.5	0.3	0.7	1.0	0.6	0.8	0.4	0.2	0.6
Snack foods	0.7	1.1	0.9	0.6	0.2	0.1	0.5	1.2	1.3	0.8	0.5	0.0	0.8
Beef and veal	0.5	0.5	0.8	0.8	0.5	0.6	0.7	0.5	0.3	0.4	0.5	0.4	0.4
Nuts and seeds	0.3	0.3	0.2	0.3	0.5	0.3	0.3	0.2	0.2	0.5	0.4	0.1	0.3
Supplements providing energy	0.2	0.5	0.6	0.1	0.1	0.0	0.2	0.2	0.3	0.2	0.1	0.3	0.2
Pork	0.2	0.3	0.5	0.1	0.3	0.2	0.3	0.1	0.2	0.1	0.1	0.1	0.1
Eggs and egg dishes	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Lamb and mutton	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.2	0.0	0.1
Other meat	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butter and margarine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

3.7 Sugars

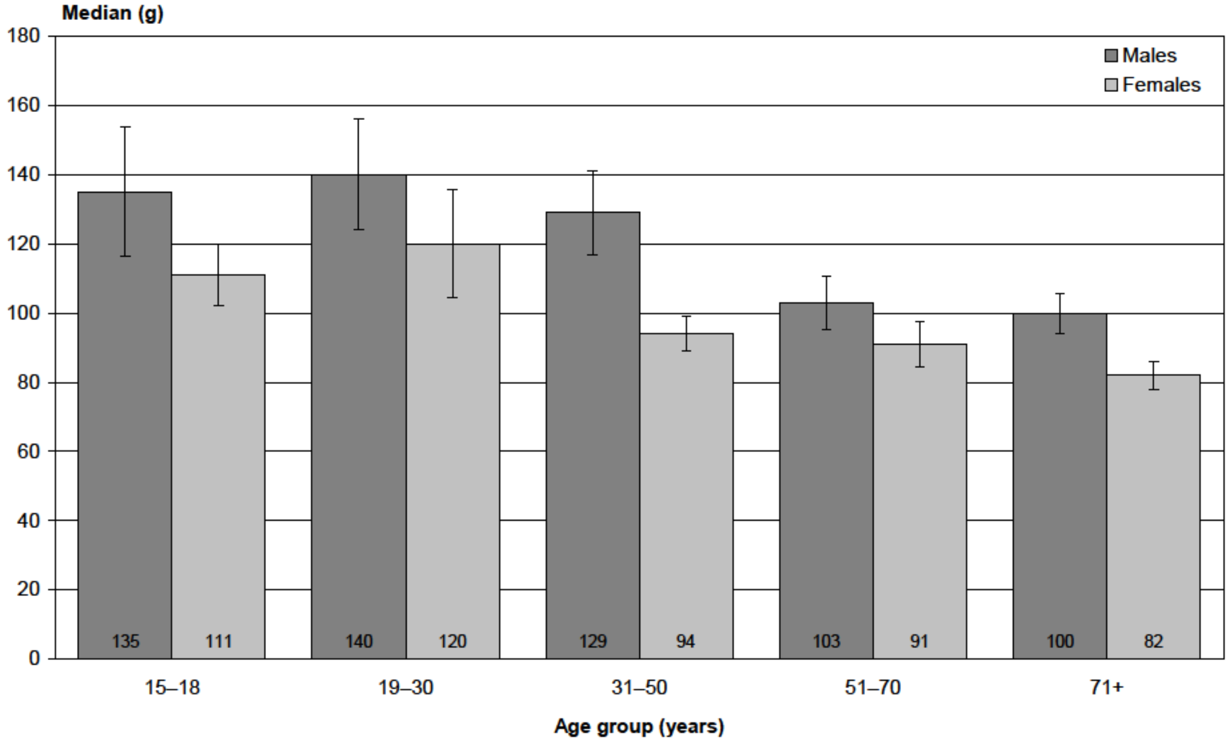
The term 'sugars' is a chemical classification used to describe the monosaccharides, disaccharides and oligosaccharides in food. Sugars are naturally present in a wide range of foods, including vegetables, fruit, cereals and milk. Sugars are added to foods in the form of sugar (white, brown, raw), syrups and extracts.

The principal monosaccharides are glucose, fructose and galactose. The principal disaccharides are sucrose and lactose (Mann and Truswell 2007). Results for sucrose, fructose and lactose are presented in this report, and results for glucose and maltose are available in the online data tables www.moh.govt.nz.

Total sugars intake

Median usual daily intake of total sugars from all sources was 120 g for males and 96 g for females (Table 3.17). Males aged 51+ years and females aged 31+ years had lower total sugars intakes than younger age groups (Figure 3.21).

Figure 3.21: Median intake of total sugars (g), by age group and sex



The most significant sugar contributing to the median usual daily intake of total sugars was sucrose (males 55 g; females 42 g), followed by fructose (22 g; 18 g), glucose (21 g; 18 g), lactose (14 g; 12 g) and maltose (5 g; 3 g).

Older Māori males and females (51+ years) consumed smaller amounts of total sugars than younger males aged 15–30 years and females aged 19–50 years. Older Pacific females (51+ years) consumed smaller amounts of total sugars than those aged 19–50 years.

For both males and females there were no differences in intake of total sugars between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for intake of total sugars, after adjusting for age, sex and ethnic group.

The major contributors of total sugars in the diet were *Fruit* (18%), *Non-alcoholic beverages* (17%), *Sugar and sweets* (15%) and *Milk* (10%). Males and females aged 15–30 years obtained more total sugars from *Non-alcoholic beverages* than those aged 31+ years (Figure 3.22).

Figure 3.22: Percent total sugars from *Non-alcoholic beverages*, by age group and sex

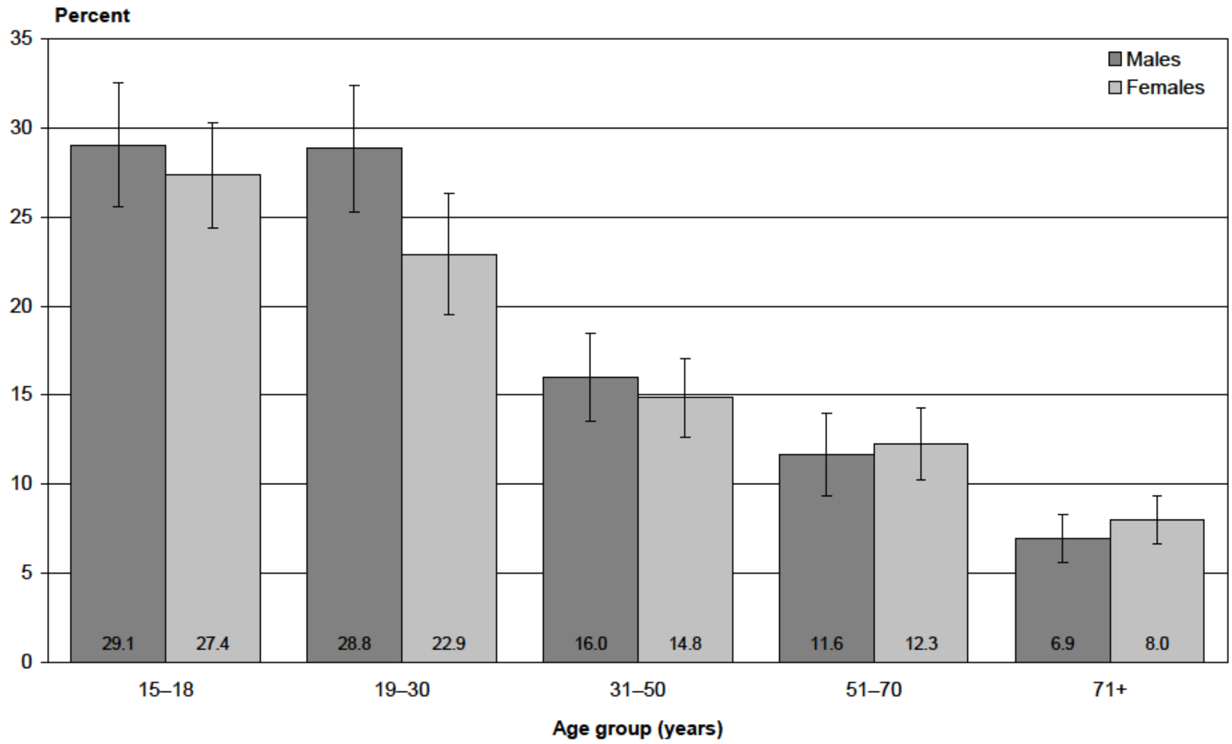


Table 3.17: Total sugars intake, by age group, ethnic group, NZDep2006 and sex

		Total sugars (g)[1]			
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**
Total population		115	63	107 (104–110)	175
By age group (years)					
Males	15–18	143	83	135 (116–154)	213
	19–30	147	90	140 (124–156)	212
	31–50	133	73	129 (117–141)	197
	51–70	108	63	103 (95–111)	158
	71+	105	63	100 (94–106)	153
	Total	128	71	120 (115–125)	194
Females	15–18	118	68	111 (102–120)	176
	19–30	123	84	120 (104–136)	166
	31–50	98	59	94 (89–99)	142
	51–70	95	57	91 (84–98)	138
	71+	84	51	82 (78–86)	120
	Total	103	59	96 (91–101)	153
Māori					
Males	15–18	149	82	141 (101–181)	224
	19–30	161	78	148 (120–176)	260
	31–50	122	65	114 (96–132)	189
	51+	89	46	83 (69–97)	141
	Total	131	76	124 (111–137)	195
Females	15–18	111	61	102 (78–127)	170
	19–30	128	81	123 (105–141)	180
	31–50	110	57	102 (90–114)	174
	51+	83	43	78 (67–89)	130
	Total	110	58	103 (96–110)	172
Pacific					
Males	15–18	126	77	122#	180
	19–30	145	87	139 (97–181)	208
	31–50	108	39	95 (79–111)	195
	51+	101	63	98 (68–128)	142
	Total	125	53	113 (100–126)	213
Females	15–18	114	76	111 (83–139)	156
	19–30	121	71	115 (86–144)	179
	31–50	101	67	99 (89–109)	139
	51+	77	30	65 (47–83)	138
	Total	106	54	98 (90–106)	165

		Total sugars (g)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
NZEO					
Males	15–18	143	71	132 (115–149)	230
	19–30	144	86	137 (119–155)	209
	31–50	137	92	135 (120–150)	181
	51+	108	61	102 (96–108)	161
	Total	128	72	121 (115–127)	194
Females	15–18	117	71	111 (101–121)	169
	19–30	121	77	118 (105–131)	170
	31–50	97	58	93 (88–98)	140
	51+	93	56	89 (85–93)	136
	Total	101	59	96 (92–100)	149
By NZDep2006 quintile					
Males	1	124	75	119 (110–128)	178
	2	132	69	125 (114–136)	205
	3	127	75	120 (104–136)	187
	4	127	76	122 (110–134)	184
	5	124	74	117 (106–128)	182
Females	1	99	61	94 (86–102)	144
	2	102	67	98 (90–106)	141
	3	108	67	103 (94–112)	154
	4	99	58	93 (86–100)	145
	5	101	53	94 (87–101)	156

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.18: Total sugars sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Fruit	17.8 (16.9–18.6)	12.9 (10.0–15.8)	12.2 (9.5–14.8)	14.0 (12.1–15.9)	17.2 (14.7–19.6)	22.9 (20.7–25.1)	15.2 (14.0–16.4)	13.6 (11.6–15.6)	15.0 (12.6–17.4)	18.9 (16.8–21.0)	24.3 (22.0–26.5)	28.5 (26.6–30.4)	20.2 (19.0–21.4)
Non-alcoholic beverages	16.7 (15.8–17.7)	29.1 (25.6–32.5)	28.8 (25.3–32.4)	16.0 (13.5–18.4)	11.6 (9.3–14.0)	6.9 (5.6–8.3)	17.6 (16.2–19.1)	27.4 (24.4–30.3)	22.9 (19.5–26.3)	14.8 (12.6–17.1)	12.3 (10.2–14.3)	8.0 (6.7–9.3)	15.9 (14.7–17.1)
Sugar and sweets	14.6 (13.8–15.4)	9.9 (8.0–11.8)	13.3 (10.7–16.0)	17.5 (15.4–19.7)	16.8 (14.5–19.0)	17.6 (15.8–19.5)	15.9 (14.7–17.1)	12.5 (10.3–14.7)	14.2 (11.6–16.8)	15.1 (13.4–16.8)	11.5 (9.8–13.2)	11.3 (10.1–12.5)	13.4 (12.4–14.4)
Milk	9.7 (9.2–10.2)	9.2 (7.4–10.9)	7.8 (5.8–9.9)	9.9 (8.7–11.1)	10.9 (9.5–12.4)	10.9 (9.9–11.9)	9.8 (9.1–10.5)	6.8 (5.6–7.9)	6.9 (5.7–8.1)	10.8 (9.7–12.0)	10.0 (8.8–11.1)	11.0 (10.1–11.9)	9.6 (9.0–10.2)
Vegetables	6.0 (5.6–6.3)	2.5 (1.8–3.2)	3.8 (2.7–4.9)	5.2 (4.4–5.9)	6.7 (5.5–7.9)	6.5 (5.9–7.2)	5.2 (4.7–5.7)	3.3 (2.6–4.0)	5.5 (3.8–7.3)	6.2 (5.4–7.0)	8.5 (7.5–9.6)	7.6 (6.9–8.3)	6.6 (6.1–7.2)
Cakes and muffins	4.7 (4.2–5.1)	2.1 (1.3–2.8)	2.6 (1.2–3.9)	5.1 (3.8–6.4)	4.7 (3.3–6.2)	4.8 (3.7–5.9)	4.2 (3.5–4.9)	5.4 (4.1–6.6)	4.0 (2.5–5.5)	4.8 (3.7–5.8)	5.9 (4.5–7.3)	6.2 (4.8–7.6)	5.1 (4.5–5.7)
Bread	4.4 (4.1–4.7)	4.3 (3.5–5.0)	3.5 (2.8–4.3)	5.5 (4.6–6.5)	5.1 (4.2–6.0)	5.4 (4.8–6.0)	4.9 (4.4–5.3)	3.4 (2.8–4.0)	3.2 (2.5–3.9)	4.0 (3.4–4.7)	4.1 (3.5–4.7)	5.0 (3.8–6.3)	4.0 (3.6–4.3)
Dairy products	4.2 (3.8–4.6)	4.9 (3.6–6.2)	3.5 (1.8–5.2)	4.0 (3.0–5.0)	3.6 (2.7–4.5)	3.9 (3.1–4.8)	3.9 (3.3–4.4)	4.9 (3.8–6.0)	5.4 (3.6–7.3)	3.6 (2.8–4.4)	4.6 (3.7–5.5)	4.9 (4.1–5.7)	4.4 (3.9–5.0)
Alcoholic beverages	3.5 (3.0–4.1)	2.1 (0.7–3.5)	5.1 (2.9–7.3)	3.9 (2.5–5.2)	3.6 (2.4–4.9)	2.5 (1.8–3.1)	3.8 (3.0–4.6)	2.8 (1.4–4.3)	5.7 (2.5–8.9)	3.5 (2.3–4.8)	1.9 (1.2–2.6)	1.3 (0.9–1.7)	3.3 (2.5–4.0)
Breakfast cereals	2.7 (2.4–3.0)	2.1 (1.5–2.7)	1.8 (0.8–2.8)	2.1 (1.4–2.7)	3.7 (2.6–4.8)	2.4 (2.0–2.8)	2.5 (2.0–2.9)	1.7 (1.2–2.1)	2.3 (1.5–3.2)	3.2 (2.5–4.0)	3.0 (2.3–3.7)	3.1 (2.5–3.6)	2.9 (2.5–3.3)
Biscuits	2.7	2.6	1.2	2.6	2.7	4.1	2.5	4.4	2.6	2.7	2.8	3.3	2.9
Savoury sauces and condiments	2.3	2.9	2.9	2.6	2.1	1.9	2.5	2.5	2.5	2.4	1.8	1.5	2.2
Puddings and desserts	1.6	1.7	0.5	1.3	1.7	3.2	1.5	1.3	1.6	1.5	1.9	1.8	1.6
Bread-based dishes	1.4	3.7	2.8	1.5	1.6	0.5	1.9	2.4	1.2	1.1	0.5	0.4	1.0
Potatoes, kumara and taro	1.4	1.3	1.0	1.3	1.7	2.1	1.4	0.8	1.2	1.3	1.6	1.8	1.4
Grains and pasta	1.4	2.0	2.3	1.5	1.6	0.6	1.7	1.7	1.3	1.3	0.6	0.6	1.1
Snack bars	0.9	2.1	0.9	1.5	0.5	0.2	1.0	1.5	0.5	0.8	1.2	0.4	0.9
Soups and stocks	0.6	0.2	0.7	0.4	0.3	1.1	0.5	0.4	0.5	0.8	0.9	0.9	0.8
Poultry	0.6	0.5	0.9	0.9	0.7	0.2	0.7	0.7	0.4	0.7	0.3	0.2	0.5
Beef and veal	0.5	0.6	0.7	0.6	0.5	0.6	0.6	0.4	0.3	0.3	0.4	0.2	0.3
Nuts and seeds	0.4	0.6	0.3	0.4	0.6	0.4	0.5	0.3	0.5	0.5	0.4	0.2	0.4
Pies and pasties	0.4	0.5	0.4	0.4	0.4	0.2	0.4	0.5	0.6	0.3	0.3	0.4	0.4

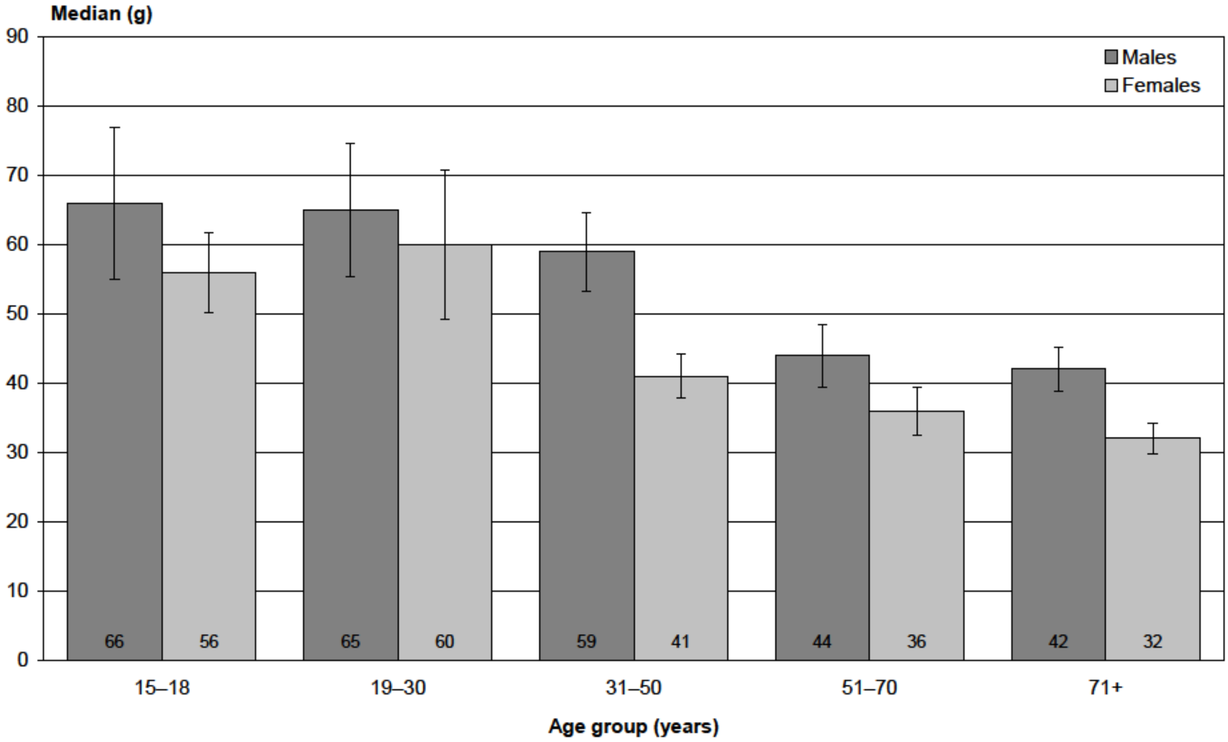
Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Fish and seafood	0.4	0.2	0.3	0.5	0.5	0.3	0.4	0.1	0.2	0.2	0.4	0.4	0.3
Supplements providing energy	0.3	0.7	1.0	0.2	0.1	0.0	0.4	0.3	0.3	0.2	0.1	0.3	0.2
Snack foods	0.2	0.3	0.2	0.1	0.1	0.0	0.1	0.3	0.4	0.4	0.2	0.0	0.3
Pork	0.2	0.4	0.7	0.1	0.4	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1
Eggs and egg dishes	0.2	0.3	0.1	0.2	0.2	0.2	0.2	0.1	0.3	0.1	0.2	0.2	0.2
Sausages and processed meats	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.0	0.1	0.1	0.2	0.1
Lamb and mutton	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1
Cheese	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1
Butter and margarine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other meat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Sucrose intake and dietary sources

Median usual daily sucrose intake was 55 g for males and 42 g for females (Table 3.19). Sucrose intakes by age group and sex are shown in Figure 3.23.

Figure 3.23: Median sucrose intake (g), by age group and sex



The main sources of sucrose were: *Sugar and sweets* (23%), *Non-alcoholic beverages* and *Fruit* (each 16%), *Cakes and muffins* (7%), *Dairy products* (6%) and *Biscuits* (5%) (Table 3.20).

Differences in sources of sucrose across age groups included the following.

- Among males, those aged 15–18 years consumed proportionately less sucrose from *Sugar and sweets* than those aged 31–71+ years, but females aged 31–50 years consumed more sucrose from *Sugar and sweets* than those aged 15–18 years and 51+ years.
- *Non-alcoholic beverages* provided a lower proportion of sucrose to males aged 71+ years compared to all younger males, and to females aged 71+ years compared to those aged 15–50 years (Figure 3.24).
- In contrast, *Fruit* provided more sucrose for males aged 71+ years and females aged 51+ years compared to males and females aged 15–50 years.

Figure 3.24: Percent sucrose from non-alcoholic beverages, by age group and sex

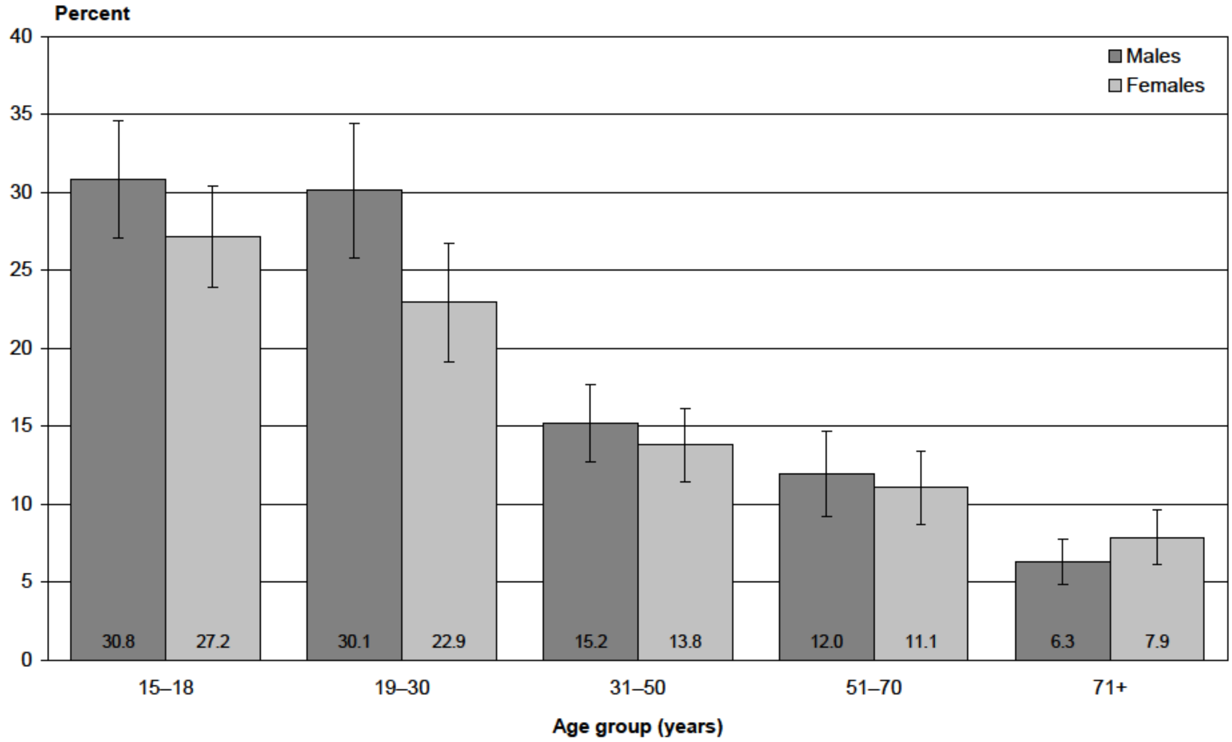


Table 3.19: Sucrose intake, by age group, ethnic group, NZDep2006 and sex

		Sucrose (g)[1]			
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**
Total population		54.2	24.0	48.0 (43.8–52.2)	92.0
By age group (years)					
Males	15–18	71.8	33.0	66.0 (55.0–77.0)	117.0
	19–30	73.2	34.0	65.0 (55.4–74.6)	122.0
	31–50	64.5	31.0	59.0 (53.4–64.6)	105.0
	51–70	49.0	21.0	44.0 (39.5–48.5)	83.0
	71+	45.9	22.0	42.0 (38.9–45.1)	75.0
	Total	61.0	27.0	55.0 (51.2–58.8)	103.0
Females	15–18	62.7	28.0	56.0 (50.3–61.7)	105.0
	19–30	65.8	34.0	60.0 (49.2–70.8)	105.0
	31–50	45.3	21.0	41.0 (37.8–44.2)	74.0
	51–70	40.4	19.0	36.0 (32.5–39.5)	66.0
	71+	33.5	17.7	32.0 (29.9–34.1)	51.4
	Total	48.1	22.0	42.0 (40.1–43.9)	81.0
Māori					
Males	15–18	75.2	36.0	68.0 (46.0–90.0)	124.0
	19–30	86.5	35.0	75.0 (59.1–90.9)	151.0
	31–50	61.9	28.0	56.0 (46.5–65.5)	103.0
	51+	40.3	16.0	35.0 (26.8–43.2)	71.0
	Total	67.4	29.0	60.0 (52.4–67.6)	114.0
Females	15–18	64.3	25.0	54.0 (35.9–72.1)	115.0
	19–30	65.9	39.0	63.0 (51.2–74.8)	96.0
	31–50	54.0	22.0	46.0 (38.9–53.1)	95.0
	51+	38.0	16.0	34.0 (25.7–42.3)	65.0
	Total	55.8	23.0	49.0 (44.8–53.2)	97.0
Pacific					
Males	15–18	51.6	29.0	50.0[#]	76.0
	19–30	74.5	31.0	68.0 (49.1–86.9)	125.0
	31–50	53.1	16.0	45.0 (36.7–53.3)	101.0
	51+	59.3	26.0	54.0 (31.7–76.3)	100.0
	Total	64.4	21.0	55.0 (46.8–63.2)	120.0
Females	15–18	60.5	26.0	53.0 (33.4–72.6)	104.0
	19–30	60.9	24.0	52.0 (43.4–60.6)	108.0
	31–50	49.8	33.8	48.6 (42.1–55.1)	67.6
	51+	40.7	12.0	32.0 (22.8–41.2)	80.0
	Total	54.3	29.0	51.0 (40.8–61.2)	84.0

		Sucrose (g)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
NZEO					
Males	15–18	71.2	29.0	62.0 (51.7–72.3)	124.0
	19–30	67.9	30.0	61.0 (50.6–71.4)	114.0
	31–50	65.1	41.0	63.0 (55.6–70.4)	93.0
	51+	47.3	22.0	43.0 (39.4–46.6)	77.0
	Total	59.7	27.0	54.0 (49.0–59.0)	99.0
Females	15–18	60.7	33.0	56.0 (49.1–62.9)	94.0
	19–30	61.6	33.0	57.0 (48.7–65.3)	96.0
	31–50	43.6	22.0	40.0 (36.5–43.5)	69.0
	51+	38.4	19.2	35.4 (32.7–38.1)	61.0
	Total	46.3	21.0	41.0 (38.9–43.1)	77.0
By NZDep2006 quintile					
Males	1	54.8	27.0	51.0 (44.6–57.4)	87.0
	2	64.0	21.0	53.0 (46.6–59.4)	119.0
	3	60.6	26.0	54.0 (45.4–62.6)	103.0
	4	63.6	37.0	61.0 (53.7–68.4)	94.0
	5	62.3	25.0	55.0 (49.4–60.6)	107.0
Females	1	42.7	20.0	39.0 (35.0–43.0)	70.0
	2	45.1	20.0	41.0 (36.1–45.9)	76.0
	3	52.9	24.0	46.0 (41.3–50.7)	89.0
	4	46.5	23.0	42.0 (37.9–46.1)	76.0
	5	49.8	21.0	45.0 (37.9–52.1)	85.0

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.20: Sucrose sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Sugar and sweets	23.2 (21.9–24.4)	15.6 (12.7–18.5)	21.9 (17.8–26.0)	27.3 (24.0–30.7)	26.7 (23.0–30.4)	27.2 (24.5–29.9)	25.1 (23.3–27.0)	18.1 (15.0–21.2)	22.6 (18.8–26.4)	25.1 (22.4–27.8)	17.3 (14.9–19.7)	18.0 (16.0–20.0)	21.3 (19.8–22.9)
Non-alcoholic beverages	16.4 (15.3–17.6)	30.8 (27.0–34.6)	30.1 (25.8–34.4)	15.2 (12.7–17.7)	12.0 (9.2–14.7)	6.3 (4.8–7.7)	17.8 (16.1–19.4)	27.2 (23.9–30.4)	22.9 (19.1–26.8)	13.8 (11.5–16.2)	11.1 (8.7–13.4)	7.9 (6.1–9.6)	15.2 (13.8–16.6)
Fruit	16.4 (15.5–17.3)	12.4 (8.7–16.1)	11.8 (8.9–14.7)	12.3 (10.3–14.2)	16.6 (13.9–19.3)	20.6 (18.5–22.7)	14.1 (12.9–15.3)	11.3 (9.2–13.4)	11.8 (9.5–14.0)	17.4 (15.2–19.7)	23.3 (20.8–25.9)	27.7 (25.3–30.0)	18.5 (17.3–19.8)
Cakes and muffins	7.1 (6.3–7.8)	3.2 (2.0–4.4)	3.4 (1.6–5.3)	7.8 (5.8–9.8)	6.6 (4.4–8.7)	7.2 (5.5–8.9)	6.2 (5.1–7.2)	7.7 (5.8–9.6)	5.6 (3.4–7.7)	7.7 (6.0–9.5)	9.2 (7.1–11.3)	9.6 (7.4–11.7)	7.9 (6.9–8.9)
Dairy products	5.6 (5.0–6.2)	6.1 (4.5–7.8)	4.5 (2.3–6.7)	5.4 (3.9–6.9)	4.9 (3.3–6.6)	5.7 (4.4–7.0)	5.2 (4.4–6.0)	6.0 (4.6–7.5)	7.3 (4.9–9.6)	4.7 (3.5–6.0)	6.8 (5.3–8.3)	6.6 (5.4–7.8)	6.0 (5.3–6.8)
Biscuits	5.0 (4.5–5.5)	4.5 (3.3–5.7)	2.0 (0.9–3.1)	4.4 (3.2–5.7)	5.5 (3.8–7.1)	8.3 (6.0–10.7)	4.6 (3.9–5.3)	7.1 (4.4–9.7)	4.5 (2.8–6.3)	4.8 (3.7–6.0)	5.7 (4.2–7.1)	7.0 (5.7–8.3)	5.4 (4.7–6.1)
Vegetables	4.3 (3.9–4.8)	1.9 (1.2–2.6)	2.6 (1.5–3.8)	3.8 (2.7–4.9)	5.0 (3.4–6.6)	4.8 (4.1–5.6)	3.8 (3.2–4.4)	2.2 (1.5–2.9)	3.5 (2.1–4.9)	4.6 (3.5–5.6)	6.3 (5.2–7.3)	5.9 (5.1–6.8)	4.8 (4.2–5.4)
Breakfast cereals	3.2 (2.7–3.6)	2.9 (1.9–3.8)	1.9 (0.5–3.3)	2.2 (1.4–3.0)	3.9 (2.4–5.4)	3.1 (2.4–3.8)	2.7 (2.1–3.3)	2.6 (1.7–3.6)	2.5 (1.6–3.4)	4.0 (2.9–5.2)	3.8 (2.8–4.9)	3.7 (3.0–4.5)	3.5 (3.0–4.1)
Savoury sauces and condiments	2.8 (2.5–3.2)	3.7 (2.3–5.2)	3.4 (2.3–4.6)	3.3 (2.4–4.2)	3.0 (1.8–4.1)	2.5 (1.4–3.5)	3.2 (2.7–3.7)	3.0 (2.0–4.1)	2.7 (1.7–3.6)	2.6 (1.9–3.3)	2.4 (1.6–3.2)	2.0 (1.5–2.5)	2.5 (2.1–2.9)
Alcoholic beverages	2.6 (2.0–3.1)	1.8 (0.4–3.2)	4.3 (2.0–6.6)	2.5 (1.2–3.7)	1.8 (0.6–3.0)	1.4 (0.9–2.0)	2.5 (1.8–3.3)	2.9 (1.4–4.5)	5.6 (2.2–9.0)	2.5 (1.1–3.8)	1.2 (0.4–2.1)	0.6 (0.3–0.9)	2.6 (1.7–3.5)
Puddings and desserts	2.3	2.4	0.9	2.1	2.5	4.6	2.2	1.8	2.4	2.2	2.7	2.8	2.4
Potatoes, kumara and taro	1.5	1.3	1.1	1.6	1.6	1.9	1.5	0.8	1.1	1.3	2.0	2.0	1.5
Bread	1.2	1.2	1.0	2.4	1.1	1.4	1.6	0.5	0.7	1.0	1.0	1.0	0.9
Grains and pasta	1.2	1.8	1.7	1.4	1.9	0.6	1.5	1 .0	0.9	1.1	0.6	0.4	0.8
Snack bars	1.0	1.9	1.0	1.8	0.6	0.3	1.2	1.5	0.5	0.9	1.4	0.4	0.9
Milk	1.0	2.0	1.9	1.3	0.2	0.5	1.1	1.6	1.0	1.2	0.5	0.3	0.9
Nuts and seeds	1.0	1.2	0.5	0.8	1.4	0.8	1.0	0.5	1.0	1.2	0.9	0.4	1.0
Bread-based dishes	0.7	1.7	1.1	0.8	1.4	0.2	1.1	1.2	0.5	0.5	0.3	0.3	0.5
Soups and stocks	0.7	0.2	0.6	0.5	0.2	1.1	0.5	0.4	0.6	1.0	1.3	1.2	1.0
Poultry	0.7	0.6	1.0	1.1	0.9	0.2	0.9	0.8	0.5	0.7	0.3	0.2	0.5
Beef and veal	0.5	0.7	0.7	0.5	0.3	0.7	0.5	0.4	0.3	0.3	0.7	0.3	0.4
Snack foods	0.4	0.4	0.2	0.3	0.1	0.0	0.2	0.4	0.7	0.7	0.3	0.0	0.5

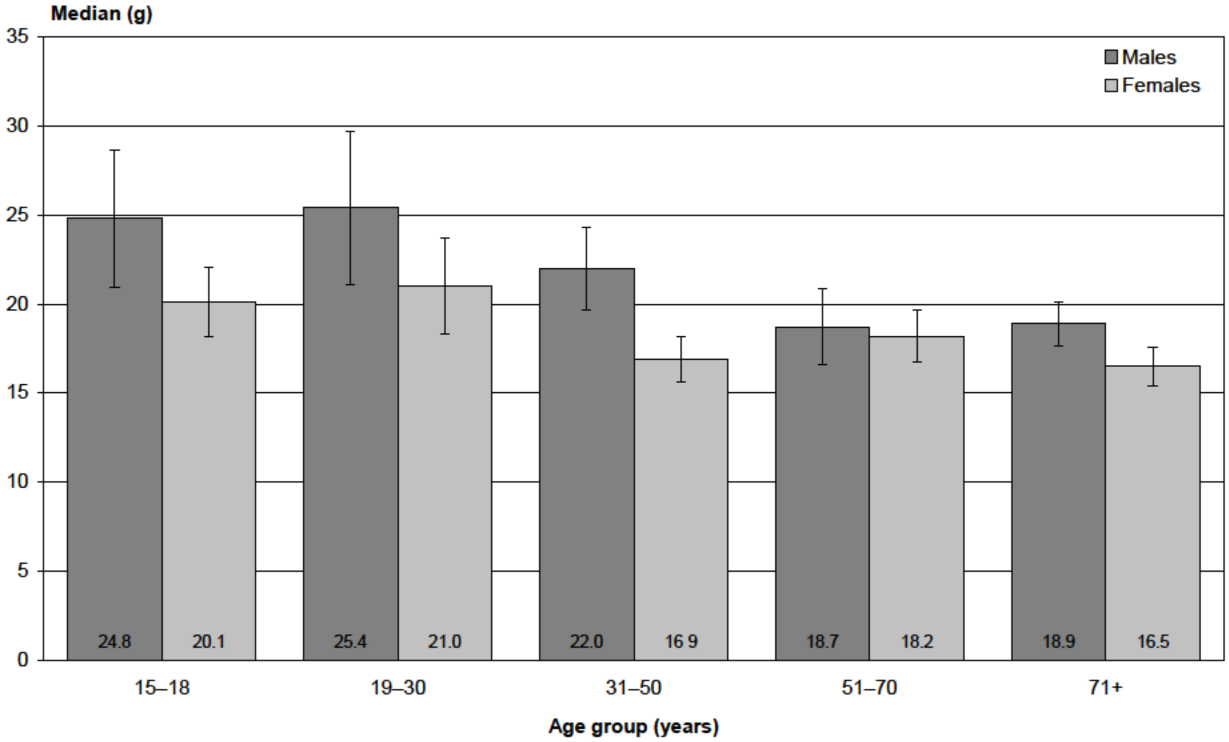
Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Fish and seafood	0.2	0.1	0.2	0.1	0.6	0.1	0.3	0.0	0.1	0.1	0.3	0.8	0.2
Supplements providing energy	0.2	0.7	1.0	0.2	0.1	0.0	0.4	0.4	0.2	0.0	0.0	0.3	0.1
Pies and pasties	0.2	0.1	0.1	0.2	0.3	0.1	0.2	0.1	0.5	0.2	0.1	0.2	0.2
Pork	0.2	0.4	0.7	0.1	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.0	0.1
Sausages and processed meats	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.1	0.0	0.1	0.2	0.2	0.1
Lamb and mutton	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.0	0.1	0.2	0.0	0.1
Eggs and egg dishes	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1
Other meat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butter and margarine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Fructose intake and dietary sources

Median usual daily fructose intake was 21.6 g for males and 18.3 g for females (Table 3.21). Fructose intakes by age group and sex are shown in Figure 3.25.

Figure 3.25: Median fructose intake (g), by age group and sex



The *Fruit* group provided 29% of fructose (males 25%; females 33%), followed by *Non-alcoholic beverages* (18%), *Vegetables* (13%), *Sugar and sweets* (7%) and *Alcoholic beverages* (5%) (Table 3.22).

Older males and females (71+ years) obtained proportionately more fructose from *Fruit* than all younger age groups (Figure 3.26). In contrast, younger males aged 15–30 years and females aged 15–18 years obtained more fructose from *Non-alcoholic beverages* than all older males and females. Fructose intake from *Vegetables* was lower for males and females aged 15–18 years than for those aged 31+ years.

Figure 3.26: Percent fructose from *Fruit*, by age group and sex

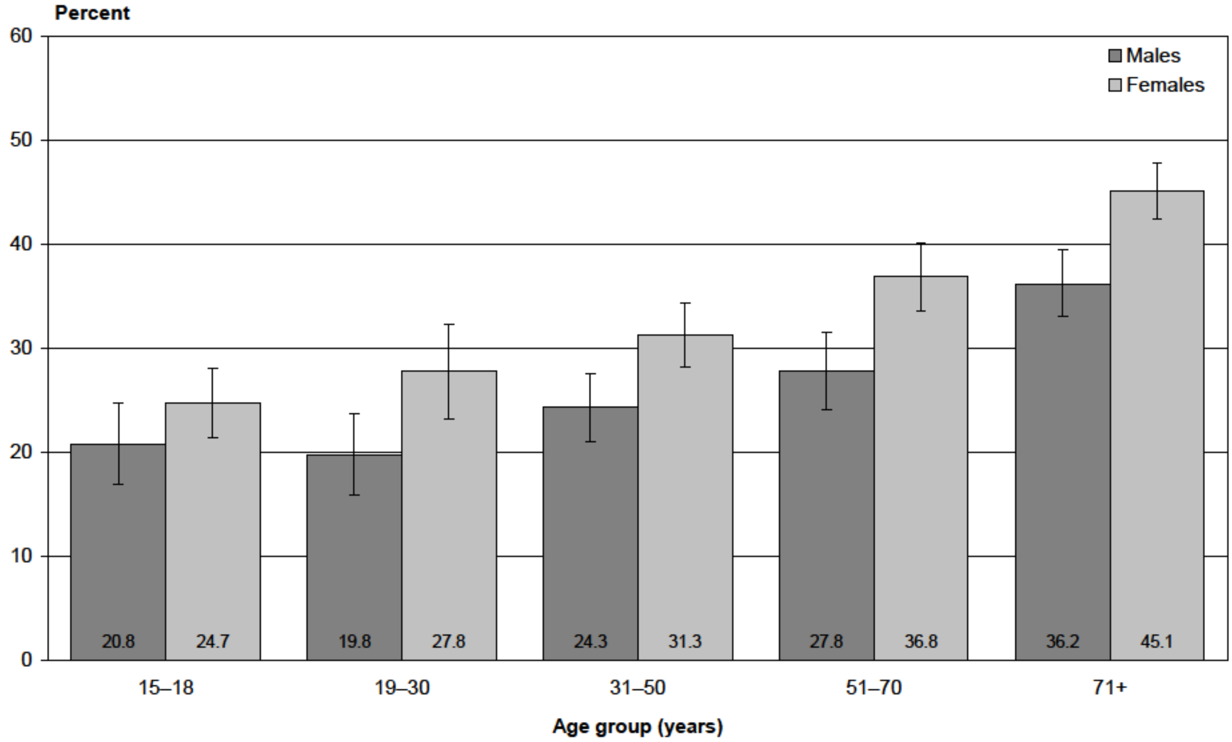


Table 3.21: Fructose intake, by age group, ethnic group, NZDep2006 and sex

		Fructose (g)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
Total population		21.4	10.1	19.8 (19.1–20.5)	34.6
By age group (years)					
Males	15–18	26.1	14.2	24.8 (20.9–28.7)	39.5
	19–30	26.8	14.0	25.4 (21.1–29.7)	41.0
	31–50	23.4	11.1	22.0 (19.7–24.3)	37.8
	51–70	20.1	9.0	18.7 (16.6–20.8)	33.0
	71+	20.2	9.9	18.9 (17.7–20.1)	31.8
	Total	23.4	10.6	21.6 (20.4–22.8)	38.2
Females	15–18	21.2	11.2	20.1 (18.2–22.0)	32.4
	19–30	21.9	13.2	21.0 (18.3–23.7)	31.7
	31–50	17.9	8.7	16.9 (15.6–18.2)	28.5
	51–70	19.7	9.7	18.2 (16.7–19.7)	31.5
	71+	17.6	9.1	16.5 (15.4–17.6)	27.3
	Total	19.6	9.9	18.3 (17.4–19.2)	30.7
Māori					
Males	15–18	28.2	11.6	24.8 (16.1–33.5)	47.5
	19–30	26.9	10.5	25.1 (18.5–31.7)	45.1
	31–50	19.0	7.4	17.0 (12.6–21.4)	32.6
	51+	14.9	6.0	13.2 (9.3–17.1)	25.8
	Total	21.8	9.7	20.0 (17.4–22.6)	36.1
Females	15–18	18.9	7.0	17.1 (12.3–21.9)	32.7
	19–30	21.3	14.4	20.6 (15.3–25.9)	29.0
	31–50	19.2	6.8	16.9 (12.8–21.0)	34.0
	51+	15.1	5.9	13.5 (11.1–15.9)	26.4
	Total	19.0	8.5	17.5 (15.4–19.6)	31.5
Pacific					
Males	15–18	29.7	14.3	27.6 (15.0–40.2)	47.9
	19–30	25.5	10.9	23.3 (15.4–31.2)	43.0
	31–50	18.9	7.8	17.0 (12.9–21.1)	32.6
	51+	12.6	6.4	11.8 (8.3–15.3)	19.7
	Total	21.7	11.1	20.3 (16.9–23.7)	34.3
Females	15–18	20.9	13.3	20.5 (15.7–25.3)	29.0
	19–30	22.8	8.0	20.0 (16.2–23.8)	41.3
	31–50	18.0	11.9	17.6 (15.2–20.0)	24.7
	51+	13.7	4.4	11.3 (8.7–13.9)	25.9
	Total	19.3	9.5	18.0 (16.2–19.8)	30.6

		Fructose (g)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
NZEO					
Males	15–18	25.7	10.8	23.4 (20.0–26.8)	43.4
	19–30	26.6	14.6	25.3 (21.0–29.6)	40.2
	31–50	24.3	13.2	23.3 (20.8–25.8)	36.7
	51+	20.6	9.6	19.2 (17.7–20.7)	33.4
	Total	23.7	11.0	21.9 (20.6–23.2)	38.7
Females	15–18	21.2	11.9	20.3 (18.2–22.4)	31.6
	19–30	21.4	12.7	20.6 (17.9–23.3)	31.0
	31–50	17.7	8.6	16.8 (15.6–18.0)	27.9
	51+	19.6	9.8	18.2 (17.0–19.4)	31.3
	Total	19.5	10.0	18.3 (17.4–19.2)	30.6
By NZDep2006 quintile					
Males	1	24.2	11.6	22.9 (20.9–24.9)	38.4
	2	24.9	10.8	23.0 (20.5–25.5)	41.4
	3	23.4	10.2	21.0 (17.3–24.7)	39.4
	4	21.9	8.0	20.1 (16.9–23.3)	38.1
	5	21.8	12.0	20.7 (18.2–23.2)	33.0
Females	1	21.0	10.1	19.5 (17.6–21.4)	34.0
	2	20.8	11.1	19.6 (17.6–21.6)	31.9
	3	20.5	10.4	19.2 (17.0–21.4)	32.3
	4	18.3	9.9	17.1 (15.0–19.2)	28.3
	5	17.6	8.2	16.2 (14.8–17.6)	28.5

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Table 3.22: Fructose sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Fruit	29.2 (27.8–30.6)	20.8 (16.9–24.7)	19.8 (15.8–23.7)	24.3 (21.0–27.5)	27.8 (24.0–31.5)	36.2 (33.0–39.4)	25.1 (23.2–27.0)	24.7 (21.3–28.0)	27.8 (23.2–32.3)	31.3 (28.2–34.3)	36.8 (33.6–40.1)	45.1 (42.4–47.8)	33.0 (31.1–34.9)
Non-alcoholic beverages	17.7 (16.4–19.0)	32.0 (27.8–36.2)	32.2 (27.4–36.9)	17.1 (14.0–20.2)	12.2 (9.1–15.2)	8.2 (6.4–10.0)	19.2 (17.3–21.1)	31.7 (27.9–35.4)	23.4 (19.1–27.7)	14.9 (12.0–17.7)	12.0 (9.3–14.8)	8.6 (7.0–10.2)	16.3 (14.8–17.8)
Vegetables	12.5 (11.7–13.3)	5.9 (4.1–7.8)	8.5 (6.2–10.8)	12.9 (10.7–15.0)	14.0 (11.6–16.3)	12.9 (11.5–14.4)	11.7 (10.6–12.9)	8.3 (6.5–10.1)	10.5 (7.6–13.4)	13.5 (11.7–15.3)	16.1 (14.0–18.1)	13.5 (12.2–14.7)	13.2 (12.2–14.3)
Sugar and sweets	6.7 (6.1–7.4)	4.0 (2.6–5.4)	3.2 (1.8–4.5)	7.5 (5.7–9.4)	9.3 (7.1–11.5)	12.5 (10.4–14.6)	7.3 (6.3–8.3)	5.4 (4.0–6.8)	5.6 (3.1–8.1)	5.5 (4.4–6.6)	7.4 (5.7–9.1)	7.8 (6.6–9.0)	6.2 (5.4–7.1)
Alcoholic beverages	4.9 (4.3–5.6)	2.3 (0.8–3.8)	5.9 (3.4–8.4)	5.8 (3.9–7.7)	5.3 (3.5–7.1)	4.0 (2.9–5.0)	5.3 (4.3–6.3)	2.8 (1.4–4.2)	6.5 (3.3–9.6)	5.7 (4.0–7.4)	3.1 (2.1–4.0)	2.5 (1.8–3.1)	4.6 (3.7–5.5)
Savoury sauces and condiments	4.0 (3.5–4.5)	5.9 (4.0–7.9)	5.0 (3.3–6.7)	5.4 (3.8–6.9)	3.4 (1.6–5.2)	2.5 (1.9–3.2)	4.6 (3.7–5.4)	4.1 (2.5–5.6)	4.8 (3.4–6.2)	4.1 (3.1–5.1)	2.3 (1.7–3.0)	1.6 (1.2–2.1)	3.5 (3.0–4.0)
Breakfast cereals	3.9 (3.4–4.4)	3.3 (2.1–4.6)	3.0 (1.3–4.7)	3.3 (2.3–4.4)	5.2 (3.5–7.0)	3.2 (2.4–4.0)	3.8 (3.1–4.5)	2.0 (1.3–2.6)	3.5 (1.8–5.3)	4.8 (3.5–6.2)	4.0 (3.0–4.9)	3.8 (3.0–4.6)	4.0 (3.4–4.7)
Bread	3.4 (3.0–3.8)	3.3 (2.3–4.4)	2.9 (1.6–4.2)	5.0 (3.7–6.4)	3.3 (2.5–4.1)	3.8 (3.0–4.6)	3.9 (3.3–4.5)	2.7 (1.8–3.5)	2.7 (1.9–3.5)	3.3 (2.3–4.3)	2.8 (2.0–3.6)	2.7 (2.2–3.3)	3.0 (2.5–3.4)
Bread-based dishes	2.6 (2.2–2.9)	5.4 (3.6–7.3)	5.0 (3.1–7.0)	3.0 (2.1–3.8)	2.6 (1.4–3.9)	0.7 (0.4–1.1)	3.3 (2.7–3.9)	4.4 (3.0–5.7)	2.1 (1.4–2.7)	2.4 (1.3–3.5)	0.8 (0.4–1.2)	0.6 (0.3–1.0)	1.9 (1.4–2.3)
Cakes and muffins	2.4 (2.1–2.7)	0.8 (0.3–1.4)	1.5 (0.6–2.4)	1.9 (1.1–2.7)	3.3 (2.1–4.6)	3.8 (2.6–4.9)	2.3 (1.8–2.8)	1.8 (0.9–2.6)	1.5 (0.6–2.4)	2.3 (1.5–3.0)	3.1 (2.2–4.1)	3.9 (2.7–5.1)	2.5 (2.0–2.9)
Potatoes, kumara and taro	2.3	1.9	1.6	2.1	2.9	3.7	2.3	1.4	2.2	2.5	2.5	2.5	2.4
Grains and pasta	2.0	2.9	3.2	2.1	2.4	0.7	2.3	2.5	2.7	2.0	1.0	0.5	1.7
Dairy products	1.3	2.3	1.1	1.3	1.0	1.0	1.2	1.3	1.3	1.3	1.5	1.4	1.4
Snack bars	1.1	3.0	1.7	1.6	0.6	0.3	1.3	1.7	0.7	0.9	1.1	0.4	0.9
Beef and veal	0.9	1.1	1.3	1.2	1.2	1.0	1.2	0.8	1.0	0.5	0.7	0.3	0.6
Poultry	0.9	0.7	0.7	1.4	0.9	0.3	1.0	0.9	0.7	1.1	0.4	0.3	0.8
Soups and stocks	0.8	0.2	0.7	0.6	0.4	1.5	0.6	0.9	0.6	1.0	1.2	1.0	0.9
Biscuits	0.8	1.0	0.2	0.7	1.0	1.2	0.7	0.7	0.6	0.7	0.9	1.5	0.8
Puddings and desserts	0.7	0.7	0.2	0.4	1.1	1.2	0.6	0.4	0.5	0.7	0.9	0.7	0.7
Pork	0.4	0.9	1.0	0.3	0.6	0.3	0.5	0.1	0.3	0.2	0.2	0.2	0.2
Pies and pasties	0.3	0.4	0.1	0.4	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Fish and seafood	0.2	0.2	0.2	0.3	0.5	0.1	0.3	0.0	0.1	0.1	0.2	0.3	0.1

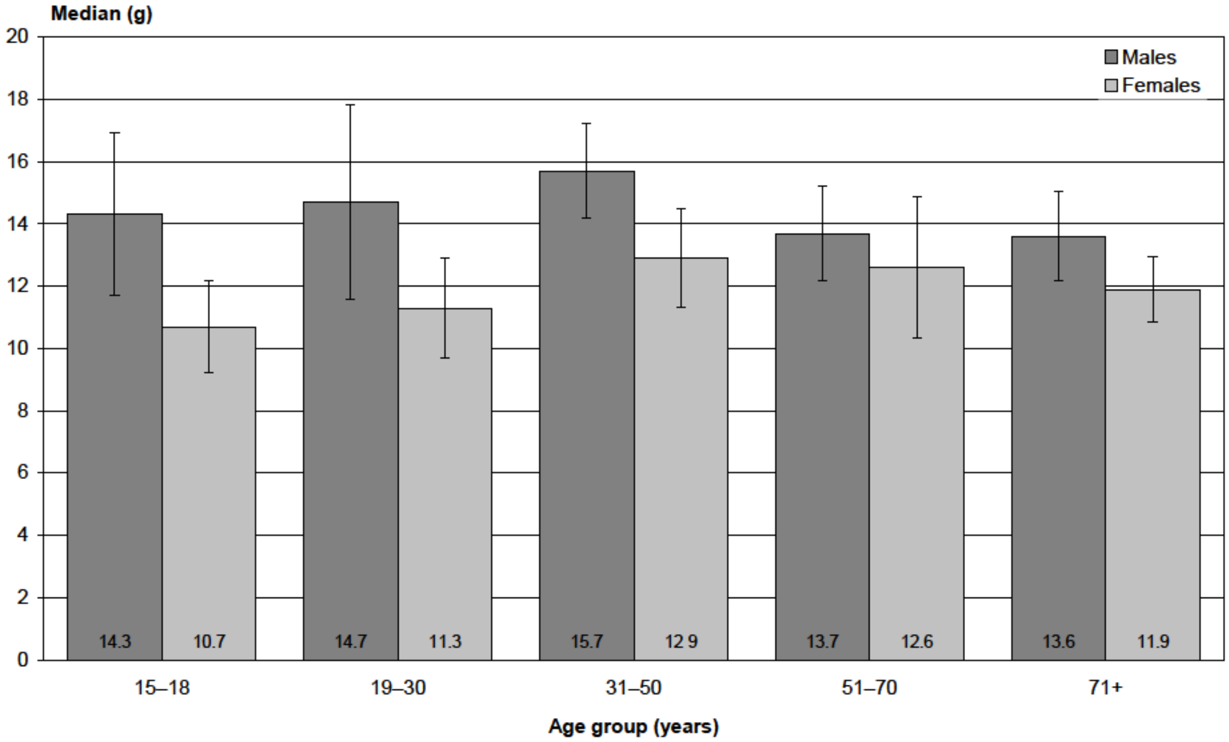
Food group	Total population	Males						Females					
		15–18	**19–30**	**31–50**	**51–70**	**71+**	**Total**	**15–18**	**19–30**	**31–50**	**51–70**	**71+**	**Total**
Sausages and processed meats	0.2	0.2	0.2	0.4	0.1	0.2	0.2	0.3	0.0	0.1	0.1	0.1	0.1
Milk	0.2	0.1	0.0	0.3	0.0	0.0	0.1	0.4	0.2	0.3	0.1	0.0	0.2
Eggs and egg dishes	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1
Snack foods	0.1	0.1	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.3	0.2	0.0	0.2
Nuts and seeds	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.1	0.0	0.1	0.1	0.0	0.1
Lamb and mutton	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.1	0.1	0.2	0.0	0.1
Other meat	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0
Cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supplements providing energy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butter and margarine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Lactose intake and dietary sources

Median usual daily lactose intake was 14.3 g for males and 12.2 g for females (Table 3.23). Lactose intakes by age group and sex are shown in Figure 3.27.

Figure 3.27: Median lactose intake (g), by age group and sex



Milk was the major source of lactose, providing 52%, followed by *Dairy products* (11%), *Non-alcoholic beverages* (8%) and *Bread* (5%) (Table 3.24).

Males aged 31+ years and females aged 71+ years obtained more lactose from *Milk* than those aged 15–30 years (Figure 3.28). Females aged 31–50 years obtained less lactose from *Dairy products* than females aged 71+ years (9% versus 14%). Males aged 19–30 years obtained more lactose from *Non-alcoholic beverages* than all other males; females aged 71+ years obtained less lactose from *Non-alcoholic beverages* than females aged 19–70 years.

Figure 3.28: Percent lactose from *Milk*, by age group and sex

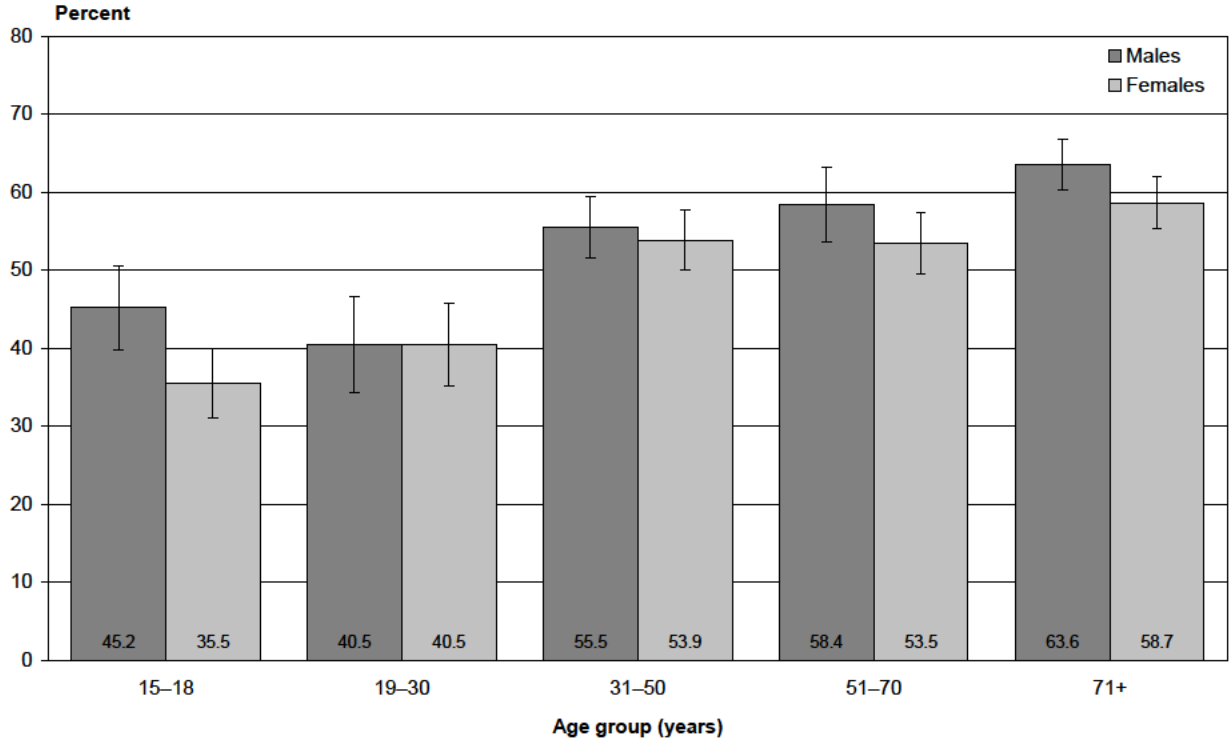


Table 3.23: Lactose intake, by age group, ethnic group, NZDep2006 and sex

		Lactose (g)[1]			
		Mean	**10th**[2]	**Median (50th),**[2] **(95% CI)**	**90th**[2]
Total population		14.6	5.3	13.2 (12.7–13.7)	25.6
By age group (years)					
Males	15–18	15.9	6.6	14.3 (11.7–16.9)	26.9
	19–30	15.5	7.6	14.7 (11.6–17.8)	24.6
	31–50	17.0	7.6	15.7 (14.2–17.2)	28.1
	51–70	15.0	5.8	13.7 (12.2–15.2)	26.1
	71+	14.7	6.3	13.6 (12.2–15.0)	24.6
	Total	15.9	5.9	14.3 (13.5–15.1)	27.8
Females	15–18	11.3	5.7	10.7 (9.2–12.2)	17.6
	19–30	12.7	4.0	11.3 (9.7–12.9)	22.8
	31–50	14.3	5.4	12.9 (11.3–14.5)	24.8
	51–70	13.3	6.9	12.6 (10.3–14.9)	20.8
	71+	13.0	5.3	11.9 (10.8–13.0)	21.7
	Total	13.4	4.9	12.2 (11.6–12.8)	23.2
Māori					
Males	15–18	17.1	7.1	15.5 (13.6–17.4)	29.0
	19–30	14.6	7.5	13.6 (9.5–17.7)	23.0
	31–50	14.1	5.8	12.5 (10.1–14.9)	24.4
	51+	13.8	5.5	12.6 (8.8–16.4)	23.5
	Total	14.0	6.2	12.9 (11.3–14.5)	23.4
Females	15–18	8.8	2.9	7.5 (4.0–11.0)	16.4
	19–30	14.7	6.9	13.5 (10.2–16.8)	23.7
	31–50	14.5	5.6	13.3 (11.3–15.3)	24.9
	51+	11.9	4.9	10.9 (8.7–13.1)	19.6
	Total	13.5	5.1	12.4 (11.1–13.7)	23.1
Pacific					
Males	15–18	6.0	1.7	4.9 (0.2–9.6)	11.7
	19–30	14.6	5.0	12.7 (7.9–17.5)	26.5
	31–50	11.2	2.0	8.3 (5.7–10.9)	23.9
	51+	8.5	1.9	7.0 (4.2–9.8)	17.1
	Total	11.9	1.9	9.0 (6.9–11.1)	25.4
Females	15–18	9.4	3.5	8.6 (5.1–12.1)	16.3
	19–30	11.1	5.1	10.3 (7.1–13.5)	18.3
	31–50	11.9	3.6	10.6 (8.8–12.4)	21.5
	51+	9.0	4.8	8.5 (6.3–10.7)	13.8
	Total	11.1	4.0	10.0 (8.7–11.3)	19.6

		Lactose (g)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
NZEO					
Males	15–18	16.8	6.1	14.7 (12.2–17.2)	30.2
	19–30	15.7	8.3	14.9 (11.8–18.0)	24.1
	31–50	17.6	10.4	17.0 (15.2–18.8)	25.7
	51+	15.2	6.2	14.0 (12.5–15.5)	25.7
	Total	16.3	7.5	15.1 (14.0–16.2)	26.8
Females	15–18	11.7	6.0	11.1 (9.5–12.7)	18.2
	19–30	12.7	3.7	11.3 (8.3–14.3)	23.1
	31–50	14.4	6.3	13.2 (11.6–14.8)	23.9
	51+	13.5	6.2	12.6 (11.7–13.5)	21.8
	Total	13.6	5.9	12.6 (11.2–14.0)	22.6
By NZDep2006 quintile					
Males	1	17.0	6.6	15.2 (13.3–17.1)	29.5
	2	16.4	8.2	15.4 (13.5–17.3)	25.7
	3	15.3	7.2	14.6 (11.5–17.7)	24.2
	4	15.6	6.5	14.5 (11.2–17.8)	26.0
	5	14.4	5.8	13.1 (10.3–15.9)	24.8
Females	1	13.2	7.7	12.9 (11.0–14.8)	19.1
	2	14.4	6.5	13.5 (11.7–15.3)	23.2
	3	12.7	4.6	11.1 (9.7–12.5)	22.8
	4	13.1	5.7	12.4 (10.8–14.0)	21.5
	5	13.4	5.0	12.3 (10.8–13.8)	23.1

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Table 3.24: Lactose sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Milk	51.7 (50.1–53.3)	45.2 (39.8–50.6)	40.5 (34.4–46.6)	55.5 (51.6–59.4)	58.4 (53.6–63.2)	63.6 (60.4–66.7)	53.1 (50.8–55.5)	35.5 (31.1–40.0)	40.5 (35.2–45.8)	53.9 (50.0–57.8)	53.5 (49.5–57.4)	58.7 (55.3–62.1)	50.4 (48.2–52.6)
Dairy products	10.6 (9.7–11.6)	10.4 (7.5–13.3)	8.5 (5.3–11.7)	10.2 (7.9–12.5)	9.3 (6.9–11.7)	9.4 (7.8–11.1)	9.6 (8.3–10.8)	13.5 (10.7–16.4)	13.4 (9.4–17.5)	8.9 (7.1–10.8)	12.8 (10.2–15.3)	13.6 (11.4–15.9)	11.6 (10.3–12.9)
Non-alcoholic beverages	8.1 (7.2–9.0)	4.2 (2.7–5.7)	13.9 (9.7–18.2)	7.0 (5.1–9.0)	5.5 (3.2–7.8)	2.3 (1.5–3.2)	7.4 (6.1–8.6)	7.2 (4.8–9.5)	9.3 (6.3–12.3)	9.6 (7.0–12.1)	9.2 (6.8–11.5)	4.7 (3.2–6.3)	8.7 (7.4–10.0)
Bread	5.2 (4.6–5.8)	6.1 (4.2–8.0)	4.4 (2.6–6.1)	5.6 (4.1–7.1)	6.0 (4.1–8.0)	4.5 (3.4–5.5)	5.4 (4.6–6.3)	5.9 (4.3–7.5)	5.5 (2.9–8.2)	3.5 (2.7–4.3)	6.1 (4.2–8.0)	5.7 (3.4–8.0)	5.0 (4.1–5.8)
Sugar and sweets	3.3 (2.7–3.9)	2.4 (0.8–3.9)	5.8 (2.7–8.8)	3.4 (2.0–4.9)	1.8 (0.5–3.1)	0.9 (0.3–1.6)	3.2 (2.3–4.1)	6.0 (4.1–7.8)	4.5 (2.2–6.7)	4.2 (2.7–5.7)	1.7 (0.9–2.4)	1.4 (0.6–2.1)	3.4 (2.6–4.2)
Cakes and muffins	3.1 (2.7–3.6)	2.1 (1.1–3.2)	2.5 (0.8–4.1)	3.7 (2.5–4.9)	3.1 (1.5–4.8)	2.0 (1.4–2.6)	3.0 (2.3–3.7)	5.5 (3.8–7.1)	3.7 (1.8–5.6)	2.5 (1.7–3.3)	3.7 (2.2–5.2)	2.9 (2.1–3.7)	3.3 (2.7–3.9)
Biscuits	1.6 (1.3–1.9)	2.4 (0.9–4.0)	1.4 (0.3–2.5)	1.0 (0.5–1.5)	1.6 (0.7–2.4)	2.3 (1.5–3.1)	1.5 (1.1–1.9)	4.3 (2.3–6.4)	2.0 (0.9–3.1)	1.6 (0.8–2.3)	1.4 (0.8–1.9)	1.1 (0.7–1.5)	1.7 (1.3–2.2)
Grains and pasta	1.6 (1.2–2.0)	3.2 (0.8–5.5)	4.2 (1.7–6.7)	0.9 (0.5–1.4)	1.3 (0.3–3.7)	0.6 (0.1–1.1)	1.8 (1.1–2.6)	3.3 (1.9–4.8)	2.3 (0.3–4.3)	1.4 (0.6–2.3)	0.2 (0.1–0.4)	1.1 (0.3–1.9)	1.4 (0.9–1.9)
Potatoes, kumara and taro	1.5 (1.2–1.8)	2.2 (0.8–3.6)	0.7 (0.3–1.1)	1.1 (0.5–1.8)	1.6 (1.0–2.3)	1.9 (1.1–2.7)	1.3 (1.0–1.7)	1.4 (0.4–2.5)	1.4 (0.7–2.2)	2.0 (0.8–3.2)	1.3 (0.5–2.1)	1.6 (0.9–2.4)	1.6 (1.1–2.1)
Puddings and desserts	1.5 (1.1–1.8)	0.9 (0.2–1.6)	0.5 (0.1–1.5)	1.5 (0.6–2.3)	0.6 (0.2–1.1)	3.4 (2.0–4.9)	1.2 (0.8–1.5)	1.6 (0.7–2.6)	2.6 (0.4–4.7)	1.6 (0.4–2.8)	1.3 (0.6–2.0)	1.6 (1.1–2.2)	1.7 (1.1–2.3)
Bread-based dishes	1.4	3.1	4.2	1.2	1.0	0.2	1.8	2.6	1.6	1.1	0.3	0.2	1.0
Eggs and egg dishes	1.1	2.0	1.0	1.1	1.2	1.1	1.2	0.9	1.9	1.0	0.7	0.7	1.1
Alcoholic beverages	1.0	1.7	2.6	1.2	1.5	1.7	1.6	0.2	0.5	0.5	0.3	0.2	0.4
Savoury sauces and condiments	1.0	1.6	0.5	0.7	1.4	1.1	0.9	1.5	0.8	1.0	1.1	1.0	1.0
Fish and seafood	0.9	1.5	1.1	1.2	1.0	0.9	1.1	0.6	0.8	0.5	1.2	0.6	0.8
Supplements providing energy	0.9	2.7	3.1	0.5	0.1	0.1	1.0	1.1	1.2	0.8	0.2	0.7	0.7
Pies and pasties	0.9	1.8	1.1	0.6	0.7	0.5	0.8	1.1	0.7	1.1	0.8	0.9	0.9
Snack bars	0.6	1.7	0.5	0.9	0.3	0.1	0.7	1.6	0.3	0.2	1.1	0.2	0.6
Breakfast cereals	0.6	0.3	0.2	0.3	1.5	1.2	0.7	0.3	0.3	0.6	0.2	0.8	0.5

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Soups and stocks	0.5	0.5	0.6	0.2	0.4	0.8	0.4	0.7	0.2	1.0	0.4	0.4	0.6
Cheese	0.5	0.1	0.1	0.3	0.1	0.2	0.2	0.7	0.8	0.5	0.9	0.6	0.7
Butter and margarine	0.5	0.5	0.2	0.5	0.5	0.7	0.5	0.2	0.4	0.6	0.4	0.5	0.4
Snack foods	0.3	0.4	1.0	0.2	0.1	0.0	0.3	1.7	0.6	0.3	0.0	0.0	0.4
Poultry	0.3	0.6	0.5	0.4	0.1	0.1	0.3	0.8	0.6	0.2	0.1	0.1	0.3
Vegetables	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.4	0.5	0.3	0.3	0.0	0.3
Nuts and seeds	0.2	0.5	0.0	0.1	0.0	0.0	0.1	0.6	1.0	0.0	0.0	0.2	0.3
Lamb and mutton	0.1	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.7	0.0	0.1	0.0	0.2
Sausages and processed meats	0.1	0.5	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0
Beef and veal	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.0	0.0
Pork	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Other meat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Fruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

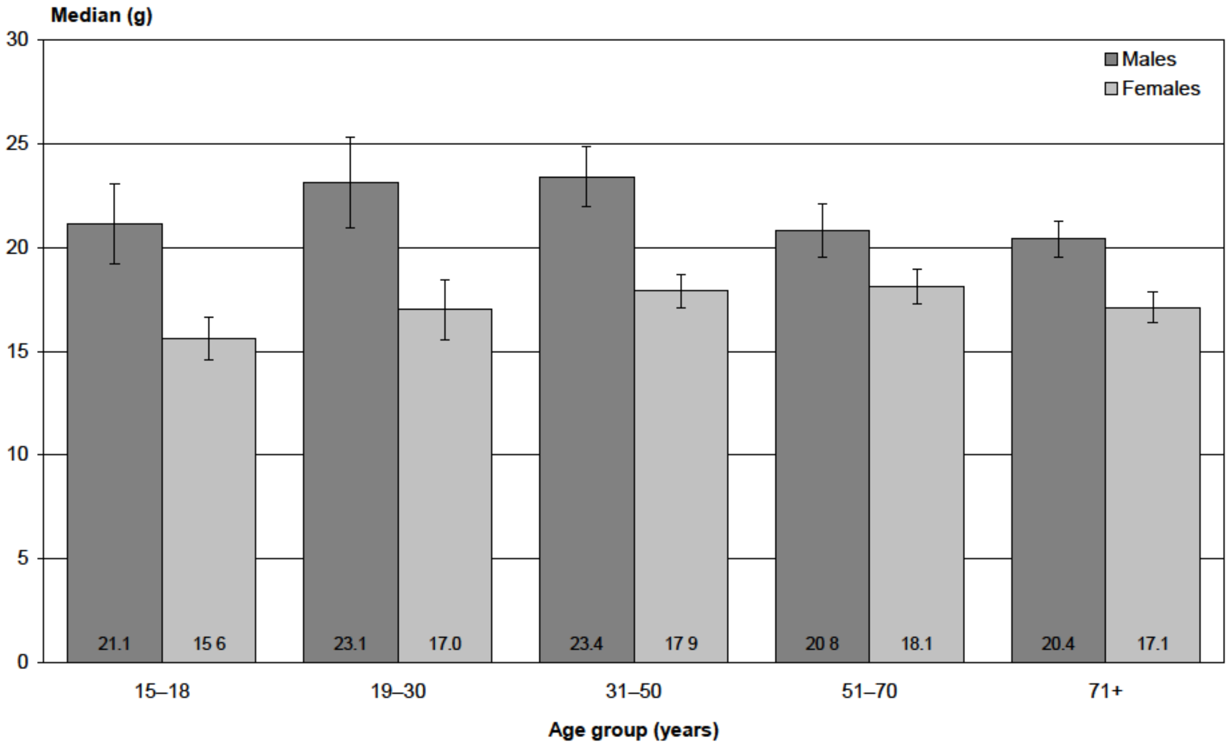
3.8 Dietary fibre

Dietary fibre is required for healthy bowel function. Dietary fibre also reduces the risk of cardiovascular disease and diabetes by improving blood lipid and blood glucose levels and reducing indicators of inflammation. Foods high in dietary fibre may help to maintain a healthy body weight and prevent obesity (American Dietetic Association 2008).

Dietary fibre intake

The median usual daily intake of dietary fibre was 19.6 g (males 22.1 g; females 17.5 g) (Table 3.25). Dietary fibre intakes were higher for males than for females across all age groups (Figure 3.29). Males aged 71+ years had lower dietary fibre intakes than males aged 31–50 years, and females aged 15–18 years had lower intakes than females aged 31–70 years.

Figure 3.29: Median dietary fibre intake (g), by age group and sex



The usual median daily intake of dietary fibre was 21.5 g for Māori males and 16.2 g for Māori females. The usual median daily intake of dietary fibre was 21.4 g for Pacific males and 17.5 g for Pacific females.

Females living in NZDep2006 quintile 5 consumed less dietary fibre than females living in NZDep2006 quintile 3 (16.4 g versus 18.6 g). Overall, dietary fibre intake decreased with increasing neighbourhood deprivation, but this association did not remain after adjusting for age, sex and ethnic group.

Dietary sources of dietary fibre

The *Bread* group was the largest single contributor of dietary fibre (17%), followed by *Vegetables* (16%), *Potatoes, kumara and taro* and *Fruit* (each 12%), *Grains and pasta* (8%) and *Breakfast cereals* (7%), and *Bread-based dishes* (5%) (Table 3.26).

Older females (71+ years) obtained more dietary fibre from *Bread* than younger females aged 19–30 years and 51–70 years (20%; 14%; 15%). *Vegetables* provided more dietary fibre for older males (71+ years) than males in younger age groups, but females aged 15–18 years obtained less dietary fibre from *Vegetables* than females in older age groups (Figure 3.30). In contrast, males and females aged 15–18 years obtained more dietary fibre from *Potatoes, kumara and taro* than males aged 71+ years and females aged 31+ years, respectively.

Older males (71+ years) and females aged 51+ years obtained more dietary fibre from *Fruit* than younger age groups. Males aged 19–30 years obtained more dietary fibre from *Grains and pasta* (11%) than those aged 71+ years (7%), and females aged 71+ years obtained less than those aged 15–50 years. *Breakfast cereals* provided more dietary fibre for males aged 51–70 years than for those aged 19–50 years, and for females aged 71+ years than for those aged 15–30 years. Males aged 15–18 years obtained more dietary fibre from *Bread-based dishes* than males aged 31+ years, and females aged 71+ years obtained less from *Bread-based dishes* than females aged 15–50 years.

Figure 3.30: Percent dietary fibre from *Vegetables*, by age group and sex

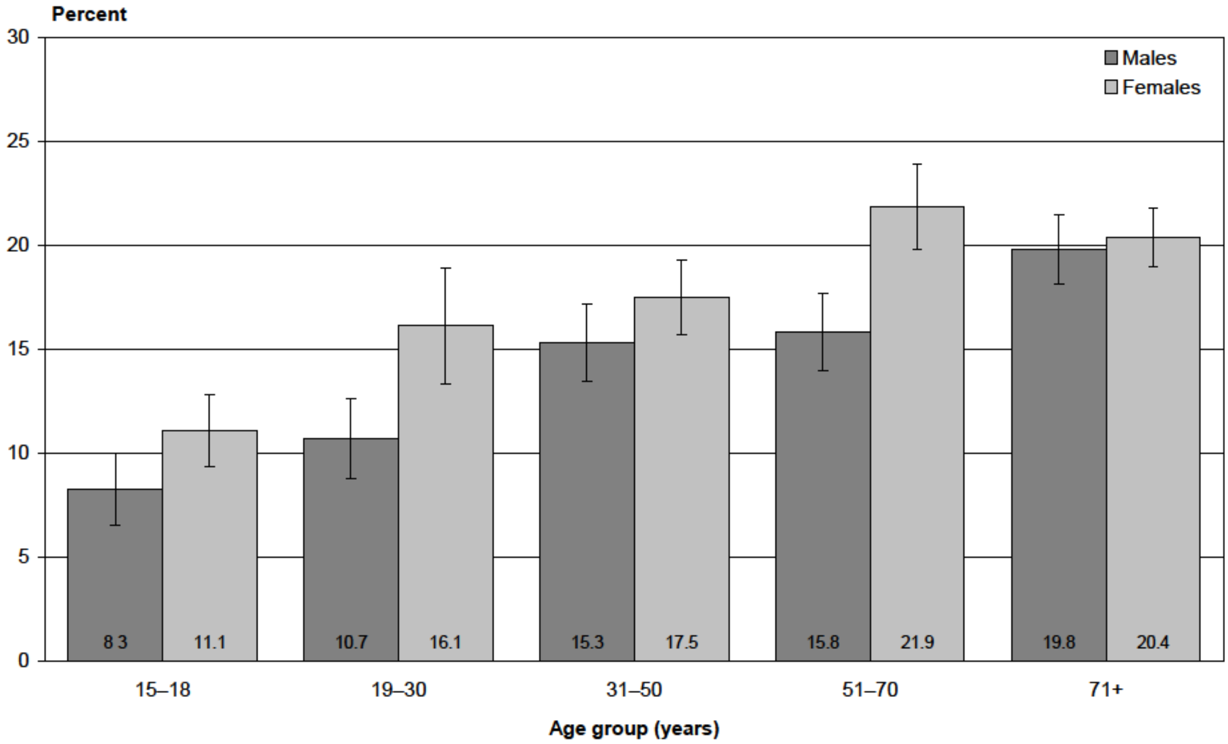


Table 3.25: Total dietary fibre intake, by age group, ethnic group, NZDep2006 and sex

		Dietary fibre (g)[1 2]			
		Mean	10th[3]	Median (50th),[3] (95%CI)	90th[3]
Total population		20.3	12.8	19.6 (19.0–20.2)	28.5
By age group (years)					
Males	15–18	21.9	14.1	21.1 (19.2–23.0)	30.7
	19–30	23.4	18.1	23.1 (20.9–25.3)	29.0
	31–50	24.1	15.3	23.4 (21.9–24.9)	34.0
	51–70	21.5	13.6	20.8 (19.5–22.1)	30.2
	71+	21.0	13.7	20.4 (19.5–21.3)	28.9
	Total	22.8	15.0	22.1 (21.4–22.8)	31.5
Females	15–18	16.0	10.5	15.6 (14.6–16.6)	22.1
	19–30	17.3	11.8	17.0 (15.6–18.4)	23.2
	31–50	18.1	12.8	17.9 (17.1–18.7)	23.9
	51–70	18.7	12.0	18.1 (17.2–19.0)	26.0
	71+	17.6	12.1	17.1 (16.4–17.8)	23.8
	Total	17.9	11.9	17.5 (17.1–17.9)	24.5
Māori					
Males	15–18	20.7	16.9	20.4 (17.4–23.4)	25.0
	19–30	23.8	14.6	22.4 (19.1–25.7)	34.5
	31–50	22.8	14.3	22.4 (20.3–24.5)	31.8
	51+	19.2	10.9	18.3 (15.8–20.8)	28.4
	Total	22.2	14.1	21.5 (20.3–22.7)	31.1
Females	15–18	14.3	8.4	13.4 (10.5–16.3)	21.2
	19–30	17.4	9.7	17.0 (14.1–19.9)	25.5
	31–50	16.6	11.4	16.3 (14.8–17.8)	22.1
	51+	16.0	9.8	15.2 (13.8–16.6)	23.2
	Total	16.6	11.2	16.2 (15.0–17.4)	22.4
Pacific					
Males	15–18	22.3	15.1	22.1[#]	29.8
	19–30	20.9	13.5	20.2 (16.2–24.2)	29.2
	31–50	21.9	17.2	21.6 (18.8–24.4)	27.0
	51+	20.4	9.8	19.4 (15.7–23.1)	32.4
	Total	21.8	14.9	21.4 (19.6–23.2)	29.3
Females	15–18	14.1	9.6	14.0 (11.9–16.1)	18.7
	19–30	17.9	10.2	17.3 (15.5–19.1)	26.5
	31–50	18.6	15.1	18.4 (16.6–20.2)	22.3
	51+	16.6	10.8	16.2 (14.3–18.1)	22.9
	Total	17.6	14.2	17.5 (16.3–18.7)	21.2

		Dietary fibre (g)[1 2]			
		Mean	**10th[3]**	**Median (50th),[3] (95%CI)**	**90th[3]**
NZEO					
Males	15–18	21.7	13.6	20.8 (18.8–22.8)	30.8
	19–30	23.2	17.8	22.8 (20.3–25.3)	28.9
	31–50	24.5	15.4	23.7 (22.1–25.3)	34.8
	51+	21.5	14.7	21.0 (20.1–21.9)	29.0
	Total	22.9	15.3	22.3 (21.5–23.1)	31.4
Females	15–18	16.2	10.0	15.6 (14.4–16.8)	23.2
	19–30	17.4	10.3	16.8 (15.2–18.4)	25.1
	31–50	18.3	12.1	17.9 (17.1–18.7)	24.8
	51+	18.5	12.4	17.9 (17.2–18.6)	25.4
	Total	18.0	11.6	17.6 (17.1–18.1)	25.0
By NZDep2006 quintile					
Males	1	24.2	13.5	22.9 (20.9–24.9)	36.9
	2	23.8	16.3	23.4 (21.9–24.9)	31.9
	3	22.0	16.7	21.7 (20.0–23.4)	27.6
	4	21.4	15.0	21.0 (19.1–22.9)	28.5
	5	22.3	13.8	21.2 (19.4–23.0)	32.1
Females	1	18.0	12.6	17.8 (16.7–18.9)	23.7
	2	18.4	11.8	17.8 (16.8–18.8)	26.0
	3	18.8	13.5	18.6 (17.6–19.6)	24.6
	4	17.0	10.7	16.5 (15.3–17.7)	23.9
	5	16.8	11.8	16.4 (15.4–17.4)	22.2

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Dietary fibre is estimated using the Englyst method, which measures non-starch polysaccharides and does not include resistant starch.

3 Percentiles.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.26: Total dietary fibre sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	17.1 (16.4–17.8)	16.4 (13.7–19.1)	16.2 (13.5–19.0)	19.3 (17.2–21.5)	18.6 (16.1–21.0)	20.2 (18.2–22.2)	18.3 (17.2–19.5)	15.7 (13.8–17.6)	14.4 (11.9–16.9)	16.3 (14.6–17.9)	15.3 (13.8–16.7)	19.8 (17.5–22.2)	16.0 (15.1–16.9)
Vegetables	16.4 (15.6–17.2)	8.3 (6.6–10.0)	10.7 (8.8–12.6)	15.3 (13.4–17.2)	15.8 (14.0–17.7)	19.8 (18.2–21.5)	14.4 (13.4–15.3)	11.1 (9.3–12.8)	16.1 (13.4–18.9)	17.5 (15.7–19.3)	21.9 (19.8–24.0)	20.4 (19.0–21.8)	18.2 (17.2–19.3)
Potatoes, kumara and taro	11.7 (11.0–12.4)	15.6 (12.9–18.4)	12.7 (9.8–15.6)	12.2 (10.3–14.1)	11.6 (9.7–13.4)	11.2 (10.0–12.3)	12.3 (11.3–13.4)	14.9 (12.5–17.2)	13.7 (10.9–16.5)	10.8 (9.2–12.4)	9.1 (7.6–10.5)	9.4 (8.3–10.4)	11.1 (10.1–12.0)
Fruit	11.5 (11.0–12.1)	9.0 (7.2–10.8)	8.3 (6.4–10.1)	8.8 (7.5–10.2)	10.2 (8.9–11.6)	13.7 (12.4–15.0)	9.5 (8.8–10.3)	10.8 (9.3–12.3)	11.7 (9.8–13.5)	12.1 (10.9–13.4)	15.4 (13.9–16.9)	17.7 (16.5–18.9)	13.4 (12.6–14.2)
Grains and pasta	8.3 (7.7–8.9)	8.4 (6.5–10.3)	11.1 (8.5–13.6)	8.6 (7.2–10.1)	8.0 (5.9–10.1)	6.9 (5.4–8.5)	8.8 (7.8–9.8)	8.9 (7.3–10.5)	10.6 (8.2–13.0)	8.1 (6.8–9.3)	6.2 (5.1–7.4)	5.3 (4.4–6.3)	7.8 (7.1–8.6)
Breakfast cereals	7.2 (6.6–7.8)	7.2 (5.6–8.8)	6.1 (4.1– 8.0)	6.7 (5.3–8.1)	10.3 (8.2–12.5)	8.4 (7.2–9.6)	7.7 (6.9–8.6)	5.5 (4.1–6.8)	4.7 (3.2–6.2)	6.7 (5.5–7.9)	7.8 (6.4–9.3)	8.1 (7.0–9.2)	6.7 (5.9–7.4)
Bread-based dishes	5.1 (4.5–5.7)	11.9 (9.2–14.6)	8.9 (5.8–11.9)	5.2 (4.0–6.5)	5.1 (3.2–7.0)	1.6 (1.0–2.2)	6.1 (5.1–7.1)	8.7 (6.7–10.7)	5.4 (3.7–7.1)	4.4 (3.1–5.8)	2.3 (1.5–3.1)	1.6 (1.0–2.2)	4.1 (3.4–4.7)
Non-alcoholic beverages	3.7 (3.4–3.9)	1.2 (0.9–1.5)	3.3 (2.3–4.4)	4.0 (3.4–4.6)	4.2 (3.4–4.9)	2.6 (2.2–2.9)	3.6 (3.2–3.9)	1.8 (1.4–2.2)	3.3 (2.6–4.0)	5.1 (4.4–5.8)	3.3 (2.7–3.9)	2.7 (2.3–3.1)	3.8 (3.4–4.2)
Cakes and muffins	2.3 (2.0–2.6)	1.1 (0.7–1.5)	1.6 (0.8–2.5)	2.2 (1.5–3.0)	2.9 (1.7–4.0)	2.0 (1.6–2.5)	2.2 (1.7–2.6)	2.7 (2.0–3.3)	3.1 (1.8–4.4)	1.8 (1.4–2.2)	2.7 (1.9–3.5)	2.7 (2.0–3.5)	2.4 (2.1–2.8)
Pies and pasties	2.1 (1.8–2.4)	3.6 (2.4–4.9)	4.4 (2.6–6.1)	2.6 (1.8–3.4)	1.4 (0.8–2.0)	1.3 (0.8–1.8)	2.6 (2.1–3.1)	2.3 (1.6–3.1)	2.4 (1.2–3.6)	1.7 (1.0–2.5)	1.3 (0.7–1.8)	0.9 (0.5–1.3)	1.7 (1.3–2.1)
Biscuits	1.9	1.9	0.7	1.6	1.9	2.1	1.6	3.0	1.5	2.3	2.3	2.2	2.2
Sausages and processed meats	1.8	1.9	2.6	2.1	1.4	1.4	1.9	2.3	1.3	2.0	1.5	1.3	1.6
Soups and stocks	1.6	0.6	1.6	0.9	0.7	2.3	1.1	1.2	1.7	1.8	2.4	2.7	2.0
Nuts and seeds	1.3	1.2	0.7	1.1	1.4	1.0	1.1	0.7	0.9	1.9	1.7	0.7	1.4
Poultry	1.1	1.9	1.7	1.6	0.7	0.3	1.3	1.9	1.1	1.2	0.5	0.3	1.0
Sugar and sweets	1.1	0.9	1.4	1.0	0.6	0.6	0.9	1.6	1.6	1.4	0.8	0.5	1.2
Savoury sauces and condiments	1.0	1.4	1.4	1.3	0.7	0.6	1.1	1.0	1.3	0.9	0.7	0.7	0.9
Beef and veal	0.9	1.1	1.9	1.2	0.8	1.1	1.2	0.9	0.6	0.5	1.0	0.6	0.7
Snack foods	0.9	1.8	1.4	0.7	0.4	0.1	0.8	1.6	1.4	1.0	0.6	0.0	0.9
Snack bars	0.7	1.9	0.5	1.3	0.4	0.2	0.8	1.4	0.5	0.6	0.8	0.3	0.7
Puddings and desserts	0.6	0.7	0.2	0.4	0.8	0.9	0.5	0.5	0.6	0.5	0.7	0.6	0.6
Dairy products	0.5	0.6	0.8	0.5	0.3	0.5	0.5	0.7	0.8	0.4	0.6	0.6	0.6
Fish and seafood	0.5	0.5	0.5	0.7	0.6	0.4	0.6	0.1	0.6	0.4	0.5	0.5	0.4

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Pork	0.2	0.4	0.6	0.1	0.3	0.2	0.3	0.0	0.3	0.1	0.1	0.1	0.1
Lamb and mutton	0.2	0.2	0.3	0.1	0.3	0.2	0.2	0.1	0.2	0.1	0.3	0.1	0.2
Milk	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.4	0.3	0.2	0.2	0.1	0.2
Eggs and egg dishes	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1
Supplements providing energy	0.1	0.3	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.0
Alcoholic beverages	0.1	0.1	0.1	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Other meat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butter and margarine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

3.9 Alcohol

Alcohol is a concentrated source of energy, providing 29 kJ per gram (Mann and Truswell 2007). Alcohol has both a direct and an indirect effect on energy intake: it contributes to energy intake and can also affect food intake (Mann and Truswell 2007; Foster and Harriott 2006).

Alcohol intake

Alcohol was not consumed by all individuals on the day of the 24-hour diet recall. Therefore the median intakes of alcohol (0.0 g) do not provide meaningful information, but the levels of 90th percentiles of intake and mean intakes do provide useful information on the alcohol intakes of the New Zealand population.

Unlike data for energy and nutrients, alcohol intake data are not adjusted for intra-individual variation since on any particular day zero intake would not be uncommon. Because the data are extremely skewed, no statistical comparisons can be undertaken.

The mean daily intake of alcohol was 14.0 g (males 18.4 g; females 9.9 g) (Table 3.27).

Dietary sources of alcohol

The largest contributors of alcohol to the diet among those who were consumers were *Wine* (42%) and *Beer* (37%), followed by *Spirits* (11%), and *Other alcoholic beverages*, which were primarily ready-to-drink beverages (RTDs) (8%) (Table 3.28).

For all categories of alcoholic beverages there was marked variation among the age groups and between sexes. There were some differences, however. Females consuming alcohol obtained much more of their alcohol from *Wine* than males (66% versus 24%). Younger males aged 15–30 years and females aged 15–18 years obtained 11% or less of their alcohol from *Wine,* much lower than the proportions of alcohol from *Wine* among older males and females.

In contrast, males obtained much more of their alcohol from *Beer* than females (56% versus 11%). Within all ethnic groups, males obtained more of their alcohol from *Beer* than females.

The category *Other alcoholic beverages* (predominantly RTDs) was the single largest source of alcohol for females aged 15–18 years (55%). Females aged 15–30 years obtained more alcohol from this category than females aged 51+ years.

Table 3.27: Alcohol intake, by age group, ethnic group, NZDep2006 and sex

		Alcohol (g)[1]				Percent energy from alcohol[2]			
		Mean (95% CI)	**10th[3]**	**Median (50th)[3]**	**90th[3]**	**Mean (95% CI)**	**10th[3]**	**Median (50th)[3]**	**90th[3]**
Total population		14.0 (12.4–15.6)	0.0	0.0	35.1	3.8 (3.4–4.2)	0.0	0.0	11.3
By age group (years)									
Males	15–18	8.7 (3.9–3.5)	0.0	0.0	13.4	1.8 (0.9–2.6)	0.0	0.0	3.3
	19–30	19.3 (12.6–26.1)	0.0	0.0	80.2	4.1 (2.8–5.3)	0.0	0.0	15.7
	31–50	20.0.6 (15.9–25.4)	0.0	0.0	53.7	4.7 (3.7–5.7)	0.0	0.0	13.9
	51–70	19.3 (14.6–24.0)	0.0	0.0	47.6	5.1 (4.0–6.1)	0.0	0.0	15.3
	71+	13.4 (10.6–16.2)	0.0	0.0	40.7	4.4 (3.4–5.4)	0.0	0.0	13.2
	Total	18.4 (15.8–21.0	0.0	0.0	45.9	4.4 (3.9–4.9)	0.0	0.0	13.4
Females	15–18	4.7 (2.3–7.1)	0.0	0.0	0.0	1.2 (0.6–1.8)	0.0	0.0	0.0
	19–30	11.9 (6.2–17.7)	0.0	0.0	19.7	2.9 (1.7–4.2)	0.0	0.0	6.8
	31–50	10.7 (7.7–13.8)	0.0	0.0	35.5	3.7 (2.8–4.5)	0.0	0.0	11.9
	51–70	10.1 (7.4–12.9)	0.0	0.0	29.6	3.6 (2.7–4.4)	0.0	0.0	11.0
	71+	6.0 (4.3–7.8)	0.0	0.0	18.4	2.7 (1.9–3.5)	0.0	0.0	9.2
	Total	9.9 (8.2–1.6)	0.0	0.0	23.7	3.2 (2.8–3.7)	0.0	0.0	9.4
Māori									
Male	15–18	15.4#	0.0	0.0	26.9	3.0#	0.0	0.0	4.5
	19–30	22.4 (10.0–34.8)	0.0	0.0	88.9	4.3 (1.9–6.6)	0.0	0.0	20.6
	31–50	17.2 (8.2–26.1)	0.0	0.0	53.1	3.2 (1.7–4.7)	0.0	0.0	11.1
	51+	9.9 (4.5–15.2)	0.0	0.0	29.6	2.7 (1.3–4.1)	0.0	0.0	10.3
	Total	16.8 (11.5–22.1)	0.0	0.0	53.7	3.4 (2.4–4.3)	0.0	0.0	12.3
Female	15–18	4.5 (0.0–9.0)	0.0	0.0	0	1.3 (0.1–2.5)	0.0	0.0	0.0
	19–30	8.1 (3.9–12.4)	0.0	0.0	29.8	2.3 (1.0–3.6)	0.0	0.0	6.8
	31–50	7.4 (4.4–10.5)	0.0	0.0	38.8	2.6 (1.4–3.8)	0.0	0.0	11.4
	51+	4.9 (1.8–7.9)	0.0	0.0	14.8	1.9 (0.7–3.0)	0.0	0.0	7.2
	Total	6.7 (4.9–8.6)	0.0	0.0	24.3	2.2 (1.6–2.9)	0.0	0.0	8.3

		Alcohol (g)[1]				Percent energy from alcohol[2]			
		Mean (95% CI)	**10th[3]**	**Median (50th)[3]**	**90th[3]**	**Mean (95% CI)**	**10th[3]**	**Median (50th)[3]**	**90th[3]**
Pacific									
Males	15–18	5.5[#]	0.0	0.0	40.3	1.7[#]	0.0	0.0	14.5
	19–30	10.9 (3.3–18.5)	0.0	0.0	44.0	1.8 (0.7–2.9)	0.0	0.0	7.1
	31–50	16.8 (2.0–31.6)	0.0	0.0	35.7	4.3 (0.2–8.5)	0.0	0.0	6.7
	51+	6.4[#]	0.0	0.0	13.4	2.1 (0.1–4.1)	0.0	0.0	3.6
	Total	11.4 (5.1–17.8)	0.0	0.0	29.6	2.8 (1.1–4.5)	0.0	0.0	7.1
Females	15–18	4.4[#]	0.0	0.0	0.0	0.9[#]	0.0	0.0	0.0
	19–30	8.4 (0.3–16.5)	0.0	0.0	0.1	1.1 (0.3–2.0)	0.0	0.0	0.0
	31–50	4.1 (1.7–6.5)	0.0	0.0	10.9	1.3 (0.5–2.1)	0.0	0.0	3.3
	51+	1.5[#]	0.0	0.0	0.0	0.5[#]	0.0	0.0	0.0
	Total	4.9 (2.3–7.4)	0.0	0.0	0.1	1.0 (0.6–1.4)	0.0	0.0	0.0
NZEO									
Males	15–18	10.2 (4.3–16.0)	0.0	0.0	14.8	2.0 (1.0–3.0)	0.0	0.0	3.6
	19–30	19.4 (11.7–27.1)	0.0	0.0	80.2	4.2 (2.8–5.5)	0.0	0.0	15.9
	31–50	21.0 (15.8–26.2)	0.0	0.0	63.5	4.8 (3.7–5.9)	0.0	0.0	16.1
	51+	18.6 (14.7–22.4)	0.0	0.0	44.9	5.1 (4.2–6.0)	0.0	0.0	14.4
	Total	19.0 (16.2–21.8)	0.0	0.0	49.0	4.6 (4.0–5.2)	0.0	0.0	14.4
Females	15–18	4.4 (1.8–7.0)	0.0	0.0	0.0	1.1 (0.4–1.8)	0.0	0.0	0.0
	19–30	12.6 (5.8–19.5)	0.0	0.0	37.6	3.1 (1.7–4.6)	0.0	0.0	9.2
	31–50	11.6 (8.1–15.1)	0.0	0.0	40.8	4.0 (3.0–4.9)	0.0	0.0	14.9
	51+	9.5 (7.3–11.6)	0.0	0.0	25.7	3.5 (2.8–4.2)	0.0	0.0	10.7
	Total	10.5 (8.6–12.4)	0.0	0.0	27.6	3.5 (2.9–4.0)	0.0	0.0	10.7

		Alcohol (g)[1]				Percent energy from alcohol[2]			
		Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]	Mean (95% CI)	10th[3]	Median (50th)[3]	90th[3]
By NZDep2006 quintile									
Males	1	16.9 (13.4–20.4)	0.0	0.0	44.4	4.6 (3.7–5.5)	0.0	0.0	12.6
	2	24.1 (17.6–30.6)	0.0	0.0	61.5	5.6 (4.2–6.9)	0.0	0.0	15.3
	3	17.1 (10.7–23.4)	0.0	0.0	44.0	4.1 (2.9–5.4)	0.0	0.0	15.0
	4	18.6 (11.3–25.8)	0.0	0.0	40.3	4.3 (2.9–5.6)	0.0	0.0	12.7
	5	15.3 (10.7–19.9)	0.0	0.0	45.8	3.3 (2.4–4.2)	0.0	0.0	11.5
Females	1	12.8 (7.4–18.3)	0.0	0.0	35.5	4.5 (3.1–5.9)	0.0	0.0	14.1
	2	10.9 (7.4–14.4)	0.0	0.0	27.6	3.5 (2.6–4.4)	0.0	0.0	10.7
	3	10.6 (5.9–15.3)	0.0	0.0	26.1	3.1 (2.0–4.2)	0.0	0.0	9.1
	4	7.6 (5.2–10.0)	0.0	0.0	21.1	2.6 (1.8–3.3)	0.0	0.0	9.0
	5	7.7 (5.4–9.9)	0.0	0.0	14.8	2.6 (1.8–3.4)	0.0	0.0	6.0

1 These data were not adjusted for intra-individual variation because intake clusters at zero.

2 These data were not adjusted for intra-individual variation because the only methods that have been developed for ratios use multiple day repeats. Percent energy from alcohol for each participant was calculated as the energy from alcohol (conversion factor = 29.3kJ/g) divided by the total energy intake.

3 Percentiles.

\# Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 3.28: Alcohol sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Wine	42.0 (37.9–46.2)	7.3 (1.5-19.3)	1.9 (0.4–5.5)	26.3 (17.8–34.8)	33.2 (23.3–43.2)	35.1 (27.6–42.5)	24.2 (19.4–29.1)	10.9 (0.6–21.3)	51.2 (33.6–68.8)	64.4 (55.0–73.8)	78.1 (69.9–86.3)	66.5 (57.5–75.5)	65.9 (60.4–71.4)
Beer	36.9 (33.1–40.7)	69.4 (51.0–87.8)	68.5 (56.6–80.4)	58.0 (48.7–67.2)	48.9 (39.1–58.7)	42.9 (33.5–52.3)	55.9 (50.5–61.3)	13.9 (3.0–24.8)	9.1 (2.3–15.9)	18.6 (11.3–25.8)	4.1 (1.1–7.2)	9.0 (4.3–13.8)	11.4 (8.0–14.8)
Spirits	10.6 (8.1–13.1)	6.8 (1.2-19.4)	12.8 (4.2–21.4)	8.9 (3.6–14.1)	15.0 (7.8–22.2)	16.9 (10.7–23.0)	12.3 (8.8–15.8)	19.3 (7.2–31.3)	4.2 (0.9–7.4)	5.8 (1.4–10.2)	9.3 (3.5–15.1)	19.5 (12.3–26.7)	8.5 (5.7–11.3)
Other, eg, RTDs	7.5 (5.3–9.7)	9.8 (2.1–25.2)	14.7 (4.7–24.7)	5.8 (1.3–10.2)	1.6 (0.3–4.9)	2.3 (0.5–4.0)	5.9 (3.3–8.6)	54.5 (36.2–72.9)	26.7 (10.0–43.3)	7.8 (1.8–13.7)	3.4 (0.4–6.4)	2.5 (0.4–4.7)	9.6 (5.8–13.4)
Liqueurs and cocktails	1.6 (0.6–2.5)	6.6 (0.2-30.8)	0.3 (0.0–1.4)	0.2 (0.0-0.8)	0.1 (0.0–0.3)	0.6 (0.1–2.0)	0.4 (0.0–0.8)	1.4 (0.0–6.4)	7.8 (0.4–15.3)	2.8 (0.6–7.7)	2.2 (0.1–11.5)	1.1 (0.1–4.1)	3.1 (1.0–5.3)

1 Proportion of total nutrient intake obtained from each food sub-group of *Alcoholic beverages* for consumers of alcohol only.

4 Nutrient Intakes and Dietary Sources: Micronutrients

New Zealanders obtain the energy and nutrients they require from a wide variety of foods and beverages, and in some cases from dietary supplements as well. This chapter on micronutrients presents the intake of nutrients from food and beverages, without adding the nutrients from supplements (other than supplements providing energy).

4.1 Explanatory notes

Usual intake distributions

Using repeat 24-hour diet recalls on a subsample (25%) of participants, nutrient intakes for each subgroup were adjusted for intra-individual variability using the PC-SIDE programme to obtain usual intake distributions.

Note that comparisons between NZDep2006 quintiles are based on nutrient intake, adjusted for intra-individual variation using PC-SIDE, whereas the overall test for trend (gradient) by neighbourhood deprivation is not adjusted for intra-individual variation.

Accuracy of nutrient intake estimates

The accuracy of nutrient estimates depend on two factors: the accuracy of information provided by participants in the 24-hour diet recall and the accuracy of the food composition data. These two potential sources of error are briefly outlined briefly below (see Chapter 2 and the Methodology Report for more information).

Misreporting of a food intake, especially under-reporting, is a well-known problem in all types of dietary surveys. If food intake is under-reported, nutrient intakes may also be underestimated, and the prevalence of inadequate intake may be overestimated.

The New Zealand Food Composition Database (NZFCDB) was the main source of nutrient data for the survey. The NZFCDB includes approximately 2740 foods, and an additional 5000 nutrient lines were created for the survey based on data from the NZFCDB and other sources (eg, overseas databases). Where food composition data were considered insufficiently reliable (ie, iodine, folate, sodium and vitamin D), nutrient intake data have not been presented in this report (see the Methodology Report for more information).

Nutrient adequacy

For selected nutrients, the probability of inadequate intake was estimated by comparing the *usual* intake distribution to the estimated average requirement (EAR) from the Nutrient Reference Values (NRV) for Australia and New Zealand (NHMRC 2006). Nutrient adequacy could not be determined if there was no EAR for a nutrient. When interpreting the prevalence of inadequate intakes it is important to note the following.

- Nutrient intake estimates are from food and drinks only and exclude intake from dietary supplements (other than supplements providing energy, eg, meal replacements).
- Nutrient intake estimates depend on the accuracy of the information provided by participants in the 24-hour diet recall and the accuracy of the food composition data.
- The prevalence of inadequate intakes partly reflects the criterion on which the requirement is based. For example, if the requirement for nutrient X is based on maintaining body stores (assuming normal losses), and it is estimated that 15% of the population have inadequate intakes, this indicates that 15% are not consuming enough nutrient X to maintain body stores but does not indicate functional impairment or a deficiency disorder. It also does not indicate which specific individuals in the population have inadequate intakes to maintain their body stores. A cautionary comment on the interpretation of adequacy of intake for a nutrient has been made when the derivation of the reference value is either unclear or scientifically debatable.
- Accurate assessment of nutritional status requires a combination of dietary, anthropometric, biochemical and clinical measurements (Gibson 2005). Adequacy or inadequacy of nutritional status cannot be determined from dietary data alone.

Dietary sources

For each nutrient, the percentage contribution from different food groups is presented. In this way, the adequacy of nutrient intake can be understood in the context of the foods from which each was sourced.

It is important to understand how foods were classified when interpreting information on dietary sources. If a participant was able to provide a detailed description for a mixed dish, then the individual ingredients were assigned to their separate food groups. However, if a detailed description could be provided, then the dish was assigned to the food group of its main ingredient. For example, macaroni cheese would be assigned to the *Grains and pasta* group because pasta is its main ingredient, even though it contains milk and cheese. Food group descriptors are written in italics to indicate these are food groups rather than foods per se.

Details of the food groups used and the types of foods included within each group are summarised in Chapter 2 (Table 2.2). It is important to review the foods included in each group rather than simply focusing on the food group descriptor, which was created for the 1997 National Nutrition Survey. The order of foods listed as examples does not necessarily reflect current consumption patterns. For example, the *Butter and margarine* group includes more margarine than butter.

In this report, comments in the text are restricted to the top 10 dietary sources for each nutrient. Note that the largest single contributor to nutrient intake partly depends on how foods are grouped and how many participants consumed items within each group. Foods frequently consumed (eg, *Bread*) are more likely to feature in the top 10 dietary sources than food groups consumed by only a small proportion of participants (eg, *Fats and oils* and *Other meat)*. Note that most fats and oils added during food preparation and cooking are included in the foods to which they were added (eg, *Potatoes, kumara and taro*) rather than in the *Fats and oils* group.

4.2 Vitamin A

'Vitamin A' is a generic term which describes retinol and related structures and the pro-vitamin A carotenoids. The activity of retinol is described by retinol equivalents (RE), whereby 1 µg RE is equivalent to 1 µg retinol, 6 µg of β-carotene or 12 µg of other carotenoids (Mann and Truswell 2007).

The major roles of vitamin A in the body include:

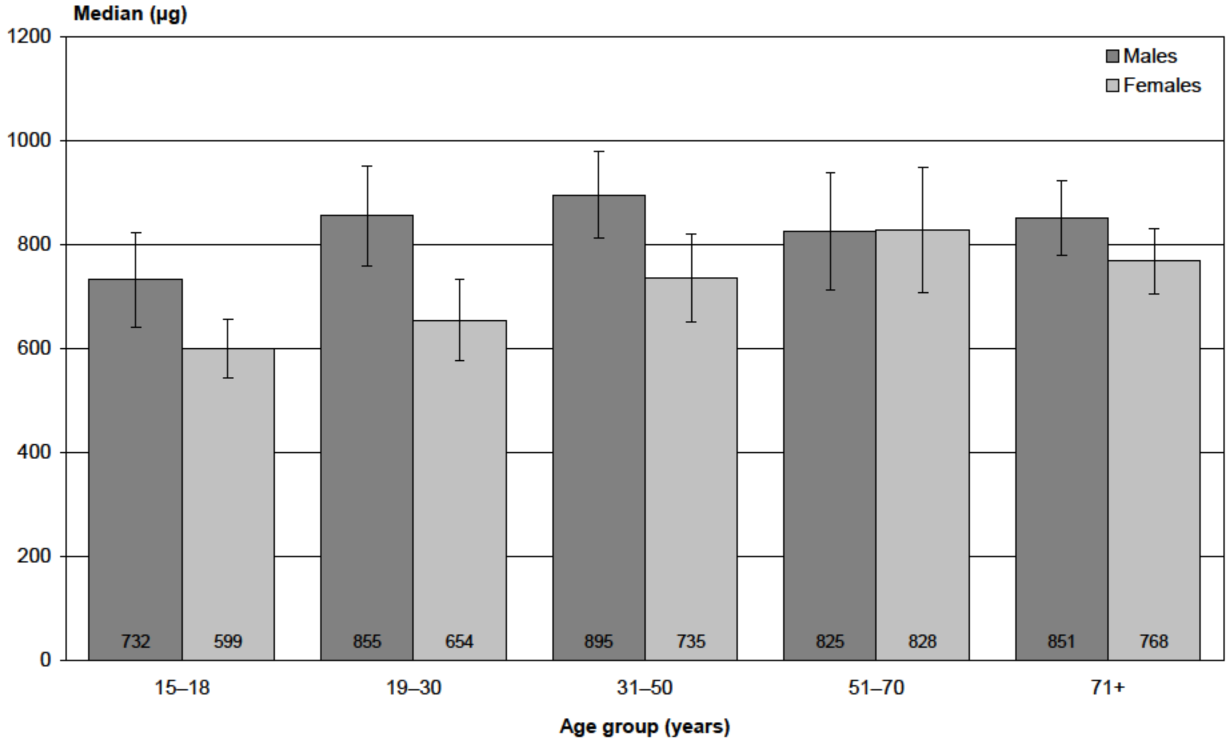
- maintaining healthy corneas, the epithelial cells and mucous membranes of the eye
- supporting reproduction and growth
- maintaining the health of the epithelial tissues and the skin through its role in protein synthesis and cell differentiation (Mann and Truswell 2007; Rolfes et al 2009).

Animal foods such as liver, milk, butter, cheese, egg yolk, some fatty fish and table margarine (which is usually fortified with vitamin A to a similar level to that found in butter) provide retinol. The pro-vitamin A carotenoids come from plant foods such as dark green leafy vegetables and some yellow or orange-coloured fruits and vegetables (Mann and Truswell 2007; Rolfes et al 2009).

Vitamin A intake

The median usual daily vitamin A intake was 846 µg RE for males and 727 µg RE for females (Table 4.1). Less than half (42%) of vitamin A intake was from retinol and the remainder came from carotenoids. β-carotene and retinol are concentrated in relatively few foods, so estimates (even after adjusting for intra-individual variation) have wide confidence intervals.

Figure 4.1: Median vitamin A equivalents intake (µg RE), by age group and sex



There was more variation among the age groups for β-carotene (plant sources of vitamin A) compared to the intake from retinol, which varied little across age groups for males and females. The median usual daily intake of β-carotene for males aged 71+ years was higher than for males aged 15–30 years and 51–70 years. For females, the highest reported intake was for those aged 51–70 years (2910 µg), and the lowest was for those aged 15–18 years (1873 µg). This contributed to the low intake of vitamin A RE of younger females aged 15–18 years (599 µg RE) and 19–30 years (654 µg RE).

Within each ethnic group patterns of intake by age group were similar, except that Māori females aged 51+ years had a higher median usual daily intake of vitamin A than Māori females aged 15–18 years (776 µg RE versus 471 µg RE).

For both males and females there were no differences in intake of vitamin A (retinol equivalents) between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles for intake of vitamin A (retinol equivalents), after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of vitamin A (retinol equivalents) was 17.2% (males 22.7%, females 12.1%). The prevalence of inadequate intake for males and females aged 15–18 years was 37.5% and 27.4% respectively. The lower intakes of β-carotene by younger people contributed to inadequate intakes of vitamin A.

Figure 4.2: Percent vitamin A from *Vegetables*, by age group and sex

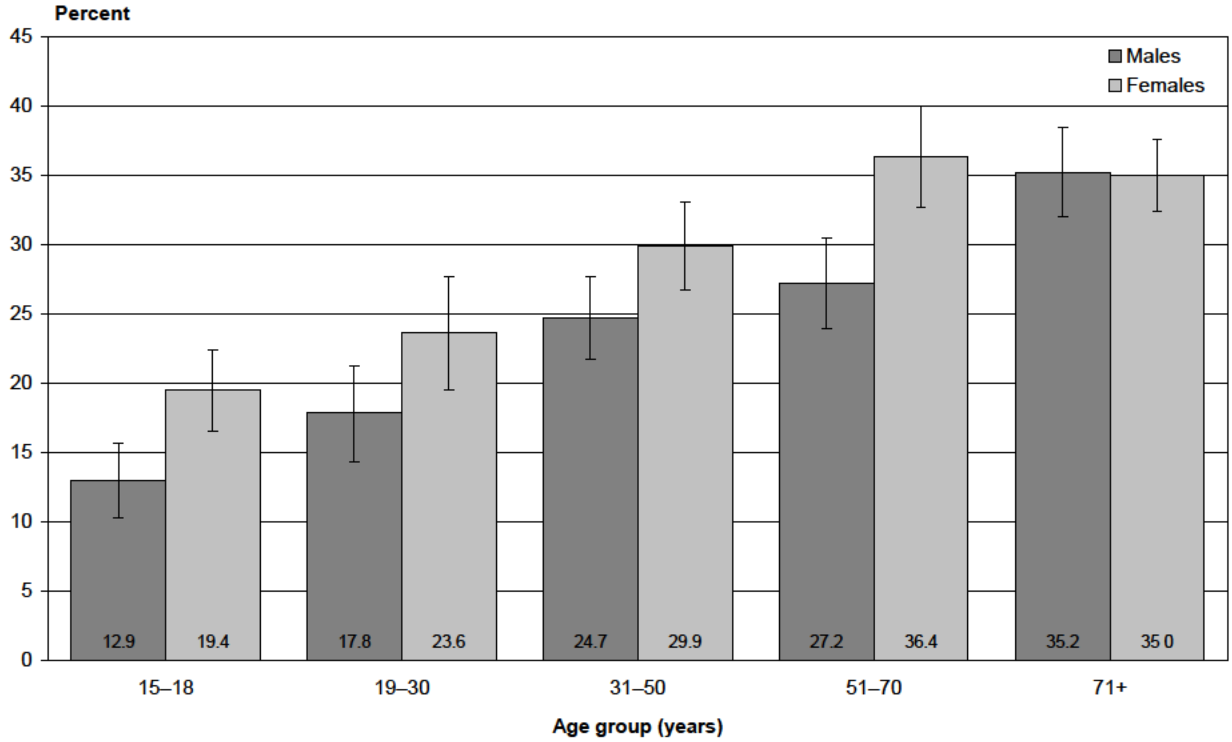


Table 4.1: Vitamin A equivalents intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin A equivalents (µg RE)[1,2]				
		Mean	**10th[3]**	**Median (50th),[3] (95% CI)**	**90th[3]**	**Inadequate intake (%), (95% CI)[4]**
Total population		879	477	784 (756–812)	1366	17.2
By age group (years)						
Males	15–18	785	381	732 (641–823)	1258	37.5
	19–30	887	566	855 (759–951)	1246	16.3*
	31–50	966	545	895 (811–979)	1473	17.7
	51–70	1102	422	825 (712–938)	1958	30.5
	71+	1236	519	851 (779–923)	1963	21.7
	Total	977	488	846 (802–890)	1572	22.7
Females	15–18	631	366	599 (542–656)	939	27.4
	19–30	666	475	654 (575–733)	872	15.5*
	31–50	780	508	735 (650–820)	1104	9.8*
	51–70	893	516	828 (708–948)	1345	8.7*
	71+	844	481	768 (705–831)	1294	12.0
	Total	787	477	727 (692–762)	1160	12.1
Māori						
Males	15–18	822	436	765 (589–941)	1283	32.5
	19–30	1060	504	961 (728–1194)	1736	19.0
	31–50	962	661	926 (675–1177)	1308	6.7*
	51+	845	475	800 (658–942)	1268	26.1*
	Total	983	633	939 (792–1086)	1388	17.8
Females	15–18	532	263	471 (342–600)	874	52.4
	19–30	738	389	672 (593–751)	1163	23.8
	31–50	736	575	723 (586–860)	914	1.9*
	51+	895	457	776 (610–942)	1458	14.5*
	Total	764	453	710 (631–789)	1141	16.6
Pacific						
Males	15–18	692	419	672 (329–1015)	992	42.5*
	19–30	794	401	737 (496–978)	1261	35.8
	31–50	1063	458	826 (328–1324)	1869	28.4*
	51+	821	217	594 (282–906)	1625	52.8
	Total	838	378	736 (626–846)	1415	37.3
Females	15–18	458	229	430 (295–565)	724	61.9
	19–30	654	279	586 (482–690)	1117	40.2
	31–50	753	489	718 (562–874)	1061	13.1*
	51+	590	263	528 (407–649)	996	45.8
	Total	671	485	655 (561–749)	879	37.1*

		Vitamin A equivalents (µg RE)[1,2]				
		Mean	**10th[3]**	**Median (50th),[3] (95% CI)**	**90th[3]**	**Inadequate intake (%), (95% CI)[4]**
NZEO						
Males	15–18	781	361	724 (623–825)	1275	38.4
	19–30	837	409	772 (664–880)	1350	32.8
	31–50	965	544	909 (813–1005)	1459	17.2
	51+	1151	498	875 (757–993)	1964	23.0
	Total	991	508	855 (799–911)	1583	23.9
Females	15–18	649	417	626 (564–688)	912	20.9*
	19–30	660	369	634 (568–700)	986	28.0
	31–50	796	544	752 (638–866)	1103	6.4*
	51+	885	514	821 (731–911)	1331	8.8*
	Total	796	474	731 (687–775)	1188	12.2
By NZDep2006 quintile						
Males	1	905	501	838 (735–941)	1386	[5]
	2	1133	550	948 (792–1104)	1887	[5]
	3	1163	462	834 (699–969)	2039	[5]
	4	873	473	819 (718–920)	1342	[5]
	5	945	479	852 (757–947)	1513	[5]
Females	1	714	296	641 (353–929)	1208	[5]
	2	795	509	763 (679–847)	1123	[5]
	3	814	543	782 (644–920)	1125	[5]
	4	712	370	643 (578–708)	1132	[5]
	5	785	567	749 (653–845)	1046	[5]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE. As this nutrient is concentrated in relatively few foods, one-day intake distributions are highly skewed. Therefore these estimates of usual intakes have large confidence intervals.

2 For conversion factors to vitamin A equivalents, see Appendix 3.

3 Percentiles.

4 Calculated by probability analysis (see Chapter 2).

5 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

\# Confidence interval could not be calculated. Estimate should be interpreted with caution.

Table 4.2: Vitamin A equivalent sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Vegetables	27.2 (25.9–28.5)	12.9 (10.2–15.6)	17.8 (14.3–21.3)	24.7 (21.7–27.7)	27.2 (24.0–30.5)	35.2 (32.0–38.5)	24.0 (22.4–25.7)	19.4 (16.5–22.4)	23.6 (19.5–27.7)	29.9 (26.7–33.1)	36.4 (32.7–40.0)	35.0 (32.3–37.6)	30.2 (28.3–32.0)
Butter and margarine	10.5 (9.9–11.2)	8.6 (6.7–10.6)	9.5 (7.2–11.7)	10.6 (9.0–12.3)	12.5 (10.5–14.4)	15.2 (13.6–16.8)	11.2 (10.2–12.1)	7.9 (6.0–9.8)	8.5 (6.7–10.2)	9.6 (8.2–11.0)	10.6 (9.1–12.1)	14.1 (12.3–15.8)	10.0 (9.2–10.8)
Milk	6.2 (5.8–6.7)	9.0 (7.2–10.9)	7.1 (5.3–9.0)	6.5 (5.5–7.5)	6.6 (5.1–8.2)	5.3 (4.6–6.1)	6.8 (6.1–7.4)	6.1 (4.8–7.4)	5.7 (4.4–7.0)	6.5 (5.5–7.5)	4.9 (3.9–5.8)	5.3 (4.5–6.0)	5.8 (5.2–6.3)
Bread-based dishes	5.9 (5.2–6.6)	13.2 (10.6–15.9)	11.1 (7.4–14.9)	6.3 (4.7–7.9)	5.1 (3.3–6.8)	1.8 (1.1–2.5)	7.1 (6.0–8.2)	11.6 (8.6–14.5)	6.2 (3.7–8.7)	4.8 (3.5–6.1)	3.1 (2.1–4.2)	1.5 (1.0–2.0)	4.8 (3.9–5.6)
Eggs and egg dishes	4.9 (4.4–5.4)	6.1 (3.6–8.7)	4.0 (2.5–5.5)	5.7 (4.3–7.2)	5.8 (4.1–7.5)	4.5 (3.4–5.5)	5.3 (4.5–6.1)	3.3 (2.1–4.6)	6.2 (4.1–8.3)	3.9 (2.9–4.8)	4.4 (3.3–5.5)	5.2 (3.4–7.1)	4.6 (3.9–5.2)
Cheese	4.9 (4.4–5.4)	4.6 (3.2–5.9)	6.4 (4.3–8.5)	5.9 (4.5–7.3)	3.7 (2.6–4.9)	3.0 (2.3–3.6)	5.0 (4.3–5.8)	4.9 (3.7–6.1)	3.2 (2.2–4.2)	6.4 (5.0–7.9)	4.0 (2.9–5.1)	3.6 (2.8–4.3)	4.8 (4.1–5.4)
Fruit	4.3 (3.9–4.7)	3.2 (2.3–4.2)	3.1 (2.1–4.1)	2.8 (2.1–3.5)	4.1 (2.6–5.6)	5.1 (4.2–6.0)	3.4 (2.9–4.0)	4.7 (3.3–6.0)	4.1 (3.0–5.1)	5.1 (3.8–6.3)	5.7 (4.7–6.6)	6.3 (5.3–7.3)	5.1 (4.5–5.7)
Dairy products	4.2 (3.7–4.6)	4.7 (3.4–6.1)	2.8 (1.7–4.0)	3.9 (2.8–5.0)	4.4 (3.1–5.6)	4.1 (2.9–5.2)	3.9 (3.3–4.5)	5.2 (3.9–6.5)	5.5 (3.8–7.2)	3.8 (2.7–4.9)	4.6 (3.5–5.7)	4.4 (3.6–5.1)	4.5 (3.9–5.1)
Grains and pasta	4.2 (3.6–4.8)	6.1 (3.8–8.3)	6.5 (4.2–8.8)	4.2 (2.8–5.7)	3.1 (1.7–4.5)	1.5 (0.6–2.3)	4.3 (3.5–5.1)	6.0 (4.3–7.7)	7.3 (4.2–10.3)	4.6 (3.2–6.1)	1.4 (0.7–2.1)	1.6 (0.9–2.3)	4.1 (3.2–4.9)
Poultry	3.5 (3.0–3.9)	5.6 (3.5–7.7)	4.0 (2.4–5.6)	4.4 (2.8–6.1)	3.5 (2.1–5.0)	1.2 (0.7–1.7)	3.9 (3.1–4.7)	4.8 (3.1–6.5)	4.3 (3.1–5.5)	3.2 (2.3–4.1)	2.1 (1.2–2.9)	1.4 (0.9–2.0)	3.1 (2.6–3.5)
Non-alcoholic beverages	2.8	2.7	3.8	2.9	2.5	1.6	2.9	3.7	3.0	2.6	2.6	1.8	2.7
Soups and stocks	2.8	0.6	3.1	1.8	1.2	4.6	2.1	2.4	2.6	3.4	4.1	3.9	3.4
Cakes and muffins	2.7	1.4	1.8	2.7	3.4	2.0	2.5	3.3	3.5	2.5	2.8	2.7	2.8
Fish and seafood	2.3	2.0	1.8	2.9	2.6	2.5	2.5	1.1	2.4	2.0	2.3	1.9	2.1
Pies and pasties	2.1	2.9	3.7	2.2	1.8	1.2	2.4	2.4	2.1	1.8	2.0	1.5	1.9
Savoury sauces and condiments	2.0	3.1	2.1	2.3	2.3	0.9	2.2	2.5	2.6	1.9	1.1	1.1	1.8
Beef and veal	1.7	2.3	3.2	2.0	1.5	2.1	2.2	1.8	1.2	1.0	1.5	1.4	1.2
Potatoes, kumara and taro	1.2	1.8	0.9	1.2	1.4	1.2	1.2	1.1	1.9	1.4	0.6	0.8	1.2
Biscuits	1.0	1.2	0.4	1.4	0.7	1.0	1.0	1.6	0.8	1.3	0.9	1.1	1.1
Puddings and desserts	1.0	0.9	0.4	0.8	1.2	1.9	0.9	1.0	1.1	0.9	1.0	1.2	1.0

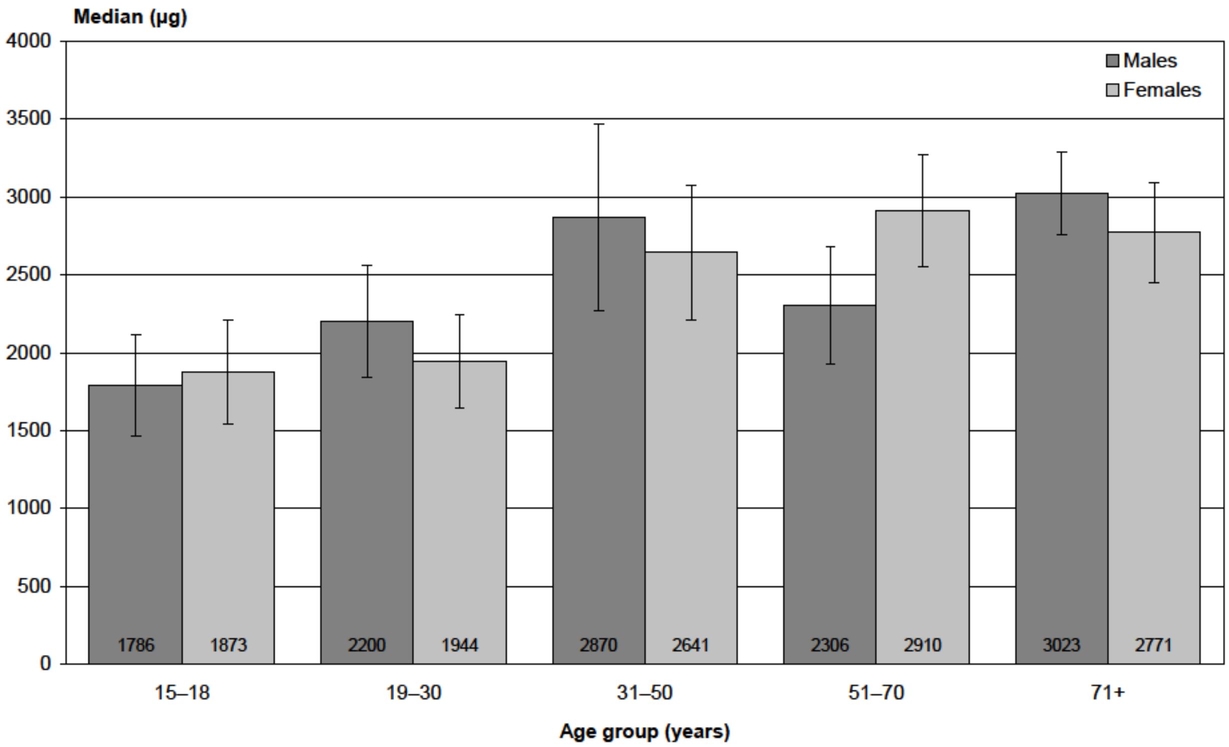
Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Sugar and sweets	0.9	0.6	1.8	0.9	0.4	0.2	0.9	1.7	0.9	1.0	0.5	0.3	0.8
Other meat	0.7	0.0	0.0	0.0	2.6	1.8	0.9	0.2	0.1	0.0	1.3	1.9	0.6
Sausages and processed meats	0.6	1.1	1.0	1.0	0.3	0.3	0.8	0.9	0.7	0.4	0.4	0.3	0.5
Bread	0.6	1.1	0.8	0.8	0.3	0.3	0.7	0.7	0.4	0.7	0.3	0.2	0.5
Pork	0.4	1.0	1.2	0.4	0.5	0.3	0.6	0.2	0.5	0.1	0.2	0.4	0.3
Supplements providing energy	0.3	1.5	0.9	0.2	0.1	0.1	0.4	0.4	0.3	0.2	0.1	0.4	0.2
Lamb and mutton	0.3	0.4	0.2	0.2	0.4	0.4	0.3	0.2	0.4	0.2	0.5	0.2	0.3
Breakfast cereals	0.3	0.2	0.1	0.2	0.5	0.5	0.3	0.2	0.2	0.2	0.2	0.5	0.2
Snack bars	0.2	0.8	0.1	0.4	0.0	0.0	0.2	0.3	0.1	0.1	0.2	0.0	0.1
Snack foods	0.1	0.2	0.2	0.2	0.0	0.0	0.1	0.2	0.1	0.2	0.2	0.0	0.1
Alcoholic beverages	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.5	0.2	0.0	0.0	0.2
Nuts and seeds	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2.

Vitamin A: β-carotene intake and dietary sources

The median usual daily intake of β-carotene was 2598 µg for males and 2564 µg for females (Table 4.3). Intake for males aged 71+ years was higher than for males aged 15–30 years and 51–70 years. For females, the highest reported intake was for those aged 51–70 years (2910 µg), and the lowest was for those aged 15–18 years (1873 µg) (Figure 4.3).

Figure 4.3: Median β-carotene intake (µg), by age group and sex



The *Vegetables* group was the largest single contributor of β-carotene to the diet (44%), followed by *Fruit* (9%), *Bread-based dishes* (6%) and *Grains and pasta* (6%) (Table 4.4).

Older males and females (71+ years) obtained more β-carotene from *Vegetables* than those aged 15–50 years, and 51–70-year-old males and females obtained more β-carotene from *Vegetables* than those aged 15–30 years (Figure 4.4). *Fruit* provided more β-carotene for males aged 71+ years than for those aged 31–50 years (11% versus 6%). In contrast, young males and females (15–18 years) obtained more β-carotene from *Bread-based dishes* than those aged 31+ years.

Figure 4.4: Percent β-carotene from *Vegetables*, by age group and sex

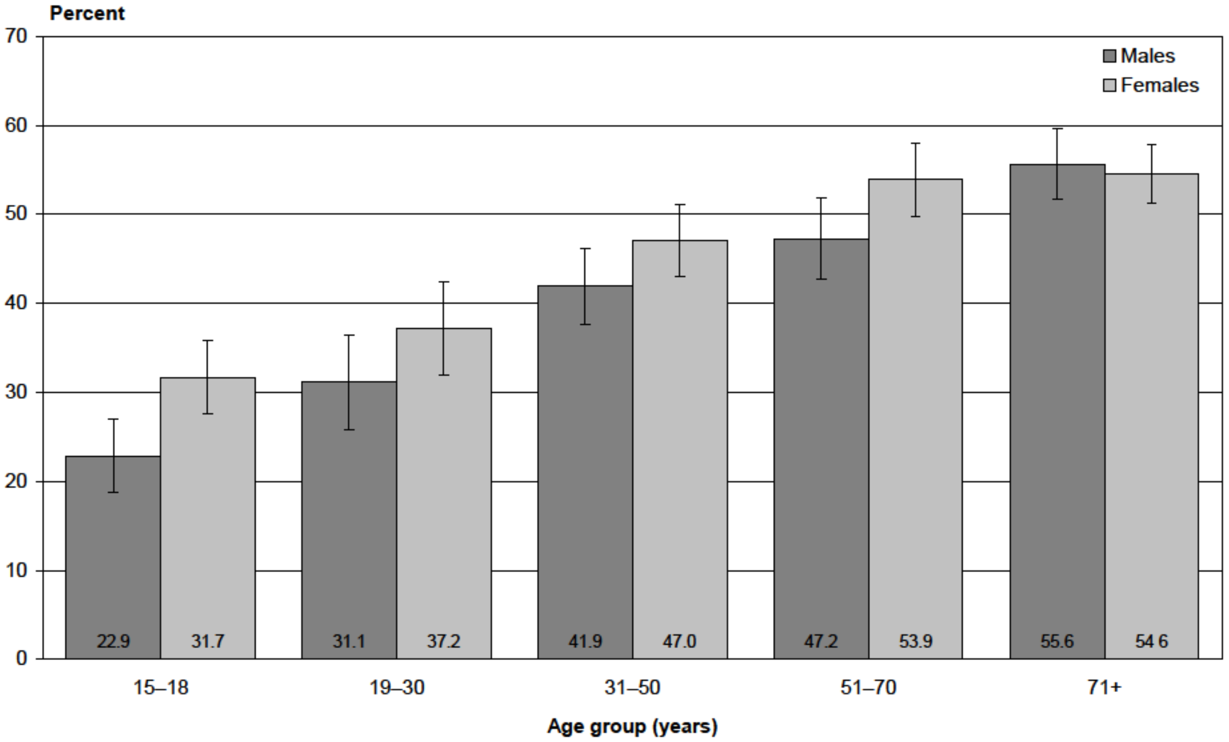


Table 4.3: β-carotene intake, by age group, ethnic group, NZDep2006 and sex

		β-carotene (µg)[1, 2]			
		Mean	**10th**[3]	**Median (50th),**[3] **(95% CI)**	**90th**[3]
Total population		2838	1360	2581 (2430–2732)	4643
By age group (years)					
Males	15–18	2037	859	1786 (1461–2111)	3523
	19–30	2664	880	2200 (1839–2561)	5011
	31–50	3118	1515	2870 (2272–3468)	5033
	51–70	2754	935	2306 (1930–2682)	5126
	71+	3208	1734	3023 (2754–3292)	4910
	Total	2907	1281	2598 (2294–2902)	4921
Females	15–18	2057	933	1873 (1538–2208)	3433
	19–30	2082	1077	1944 (1648–2240)	3269
	31–50	2789	1661	2641 (2208–3074)	4105
	51–70	3178	1512	2910 (2551–3269)	5189
	71+	2947	1674	2771 (2450–3092)	4445
	Total	2772	1430	2564 (2362–2766)	4380
Māori					
Males	15–18	1733	688	1372 (874–1870)	3171
	19–30	3224	946	2560 (1351–3769)	6293
	31–50	2784	1513	2574 (1124–4024)	4318
	51+	2115	1321	2034 (1248–2820)	3014
	Total	2913	1482	2658 (1862–3454)	4662
Females	15–18	1432	443	1171 (703–1639)	2739
	19–30	2187	1163	2010 (1540–2480)	3430
	31–50	2446	789	1970 (1092–2848)	4700
	51+	3046	1861	2889 (1891–3887)	4430
	Total	2486	1124	2218 (1779–2657)	4189
Pacific					
Males	15–18	2006	1038	1835 (816–2854)	3187
	19–30	1923	648	1625 (855–2395)	3570
	31–50	2611	1521	2449 (1408–3490)	3902
	51+	2890	555	1980 (596–3364)	6230
	Total	2595	1188	2332 (1760–2904)	4333
Females	15–18	1073	344	835 (480–1190)	2064
	19–30	1880	472	1416 (1040–1792)	3830
	31–50	2509	1016	2156 (1492–2820)	4429
	51+	1869	811	1684 (1080–2288)	3162
	Total	2104	1088	1931 (1465–2397)	3336

		β-carotene (μg)[1, 2]			
		Mean	**10th[3]**	**Median (50th),[3] (95% CI)**	**90th[3]**
NZEO					
Males	15–18	2016	864	1781 (1460–2102)	3460
	19–30	2589	507	1862 (1484–2240)	5532
	31–50	3157	1552	2888 (2345–3431)	5101
	51+	2900	1485	2677 (2342–3012)	4599
	Total	2923	1343	2634 (2403–2865)	4868
Females	15–18	2091	1025	1926 (1591–2261)	3380
	19–30	2097	1048	1948 (1603–2293)	3344
	31–50	2857	400	1977 (1530–2424)	5861
	51+	3146	1617	2923 (2633–3213)	4963
	Total	2821	1566	2645 (2375–2915)	4302
NZDep2006					
Males	1	2941	1639	2767 (2310–3224)	4463
	2	2905	1279	2579 (2091–3067)	4917
	3	2948	1516	2722 (2089–3355)	4664
	4	2593	861	2160 (1721–2599)	4907
	5	3196	1412	2825 (2262–3388)	5437
Females	1	2894	987	2518 (2108–2928)	5286
	2	2828	1458	2633 (2323–2943)	4455
	3	3213	947	2471 (2069–2873)	6268
	4	2411	1002	2144 (1830–2458)	4181
	5	2599	1192	2354 (1999–2709)	4324

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE. Because this nutrient is concentrated in relatively few foods, one-day intake distributions are highly skewed. Therefore these estimates of usual intakes have large confidence intervals.

2 For conversion factors to vitamin A equivalents, see Appendix 3.

3 Percentiles.

Table 4.4: β-carotene sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Vegetables	43.9 (42.2–45.5)	22.9 (18.7–27.0)	31.1 (25.8–36.5)	41.9 (37.6–46.2)	47.2 (42.7–51.8)	55.6 (51.7–59.6)	40.9 (38.6–43.2)	31.7 (27.5–35.8)	37.2 (32.0–42.5)	47.0 (43.0–51.1)	53.9 (49.7–58.0)	54.6 (51.2–57.9)	46.6 (44.3–49.0)
Fruit	9.2 (8.5–9.9)	8.4 (6.5–10.4)	7.5 (5.1–10.0)	6.3 (4.9–7.8)	8.4 (6.2–10.7)	10.7 (8.8–12.6)	7.7 (6.8–8.6)	10.3 (8.0–12.6)	9.2 (7.0–11.4)	10.7 (8.6–12.8)	11.0 (9.3–12.8)	12.0 (10.4–13.5)	10.6 (9.6–11.6)
Bread-based dishes	5.8 (5.1–6.6)	14.7 (10.9–18.6)	11.5 (7.5–15.6)	6.2 (4.5–7.8)	5.3 (3.1–7.5)	1.2 (0.7–1.7)	7.3 (6.1–8.4)	10.4 (7.2–13.5)	6.4 (3.7–9.1)	4.4 (3.0–5.9)	2.9 (1.6–4.2)	1.2 (0.6–1.8)	4.5 (3.6–5.4)
Grains and pasta	5.6 (4.8–6.3)	8.4 (5.2–11.5)	8.9 (5.8–12.0)	5.9 (3.9–7.9)	4.5 (2.5–6.5)	1.7 (0.7–2.8)	6.0 (4.9–7.0)	6.8 (5.0–8.7)	9.7 (6.1–13.3)	5.5 (3.8–7.2)	2.4 (1.3–3.5)	1.8 (1.0–2.6)	5.2 (4.2–6.2)
Butter and margarine	4.3 (3.9–4.7)	4.0 (2.8–5.2)	2.8 (2.2–3.5)	5.0 (3.8–6.3)	5.7 (3.9–7.5)	4.9 (4.0–5.7)	4.7 (4.0–5.3)	3.3 (2.2–4.4)	3.9 (2.9–4.9)	3.8 (3.1–4.5)	3.6 (2.9–4.3)	5.2 (4.2–6.2)	3.9 (3.5–4.3)
Soups and stocks	3.9 (3.2–4.6)	0.9 (0.2–1.6)	4.0 (1.2–6.7)	2.6 (1.3–3.9)	1.9 (0.8–3.1)	6.7 (4.2–9.1)	2.9 (2.1–3.8)	3.5 (1.8–5.2)	4.2 (1.6–6.9)	4.6 (2.7–6.4)	5.6 (3.4–7.7)	6.0 (4.1–7.8)	4.8 (3.7–5.9)
Milk	3.1 (2.8–3.4)	5.7 (4.0–7.5)	2.6 (1.7–3.5)	3.4 (2.6–4.2)	3.4 (2.3–4.4)	2.1 (1.6–2.6)	3.3 (2.9–3.8)	3.4 (2.5–4.3)	2.8 (2.0–3.5)	3.6 (2.7–4.5)	2.0 (1.5–2.5)	2.5 (1.9–3.0)	2.9 (2.5–3.3)
Savoury sauces and condiments	3.0 (2.5–3.4)	5.1 (2.9–7.4)	3.0 (1.9–4.1)	4.2 (2.8–5.7)	2.9 (1.5–4.3)	1.2 (0.7–1.7)	3.4 (2.6–4.2)	4.5 (2.6–6.4)	4.1 (2.5–5.8)	2.3 (1.6–3.0)	1.6 (0.9–2.3)	1.6 (1.0–2.2)	2.5 (2.0–3.0)
Non-alcoholic beverages	2.6 (2.2–3.0)	3.3 (2.0–4.6)	3.6 (1.7–5.5)	2.9 (1.6–4.2)	2.7 (1.5–3.9)	2.1 (1.2–3.0)	3.0 (2.3–3.6)	3.8 (2.4–5.2)	3.0 (1.9–4.2)	1.6 (1.1–2.1)	2.3 (1.2–3.5)	1.7 (1.1–2.4)	2.2 (1.8–2.7)
Beef and veal	2.5 (2.0–3.0)	3.4 (1.6–5.3)	4.9 (1.9–7.8)	3.0 (1.5–4.5)	2.0 (1.0–3.1)	3.2 (1.8–4.7)	3.2 (2.3–4.1)	2.7 (1.4–3.9)	1.7 (0.1–3.2)	1.5 (0.7–2.2)	2.1 (0.5–3.8)	2.0 (1.1–3.0)	1.8 (1.2–2.4)
Poultry	2.3	3.4	3.4	3.3	2.5	0.6	2.9	3.3	2.6	1.8	1.2	0.8	1.8
Cheese	2.0	2.2	2.9	2.3	1.7	1.0	2.1	2.8	1.1	2.6	1.3	1.6	1.9
Pies and pasties	1.9	3.5	3.9	1.7	1.4	1.0	2.2	2.5	1.6	1.7	1.8	1.0	1.7
Dairy products	1.6	3.2	1.1	1.5	1.6	1.4	1.6	2.2	2.0	1.7	1.3	1.5	1.7
Cakes and muffins	1.3	0.7	0.6	1.4	2.0	0.7	1.3	1.0	2.2	1.0	1.0	1.2	1.3
Potatoes, kumara and taro	1.2	1.7	0.8	1.3	1.1	1.2	1.2	0.8	2.4	1.3	0.8	0.9	1.3
Sausages and processed meats	0.8	1.2	1.3	1.1	0.7	0.4	1.0	1.3	0.6	0.5	0.5	0.4	0.6
Biscuits	0.6	0.6	0.2	0.8	0.6	0.4	0.6	1.1	0.4	1.0	0.4	0.5	0.7
Pork	0.6	1.3	1.7	0.5	0.7	0.6	0.9	0.2	0.9	0.2	0.4	0.4	0.4
Fish and seafood	0.6	0.9	0.3	0.9	1.0	0.3	0.7	0.3	0.4	0.2	0.8	0.7	0.5
Sugar and sweets	0.6	0.4	1.1	0.9	0.3	0.2	0.7	1.2	0.4	0.5	0.3	0.2	0.4
Puddings and desserts	0.5	0.4	0.1	0.3	0.5	1.0	0.4	0.6	1.0	0.6	0.6	0.6	0.6

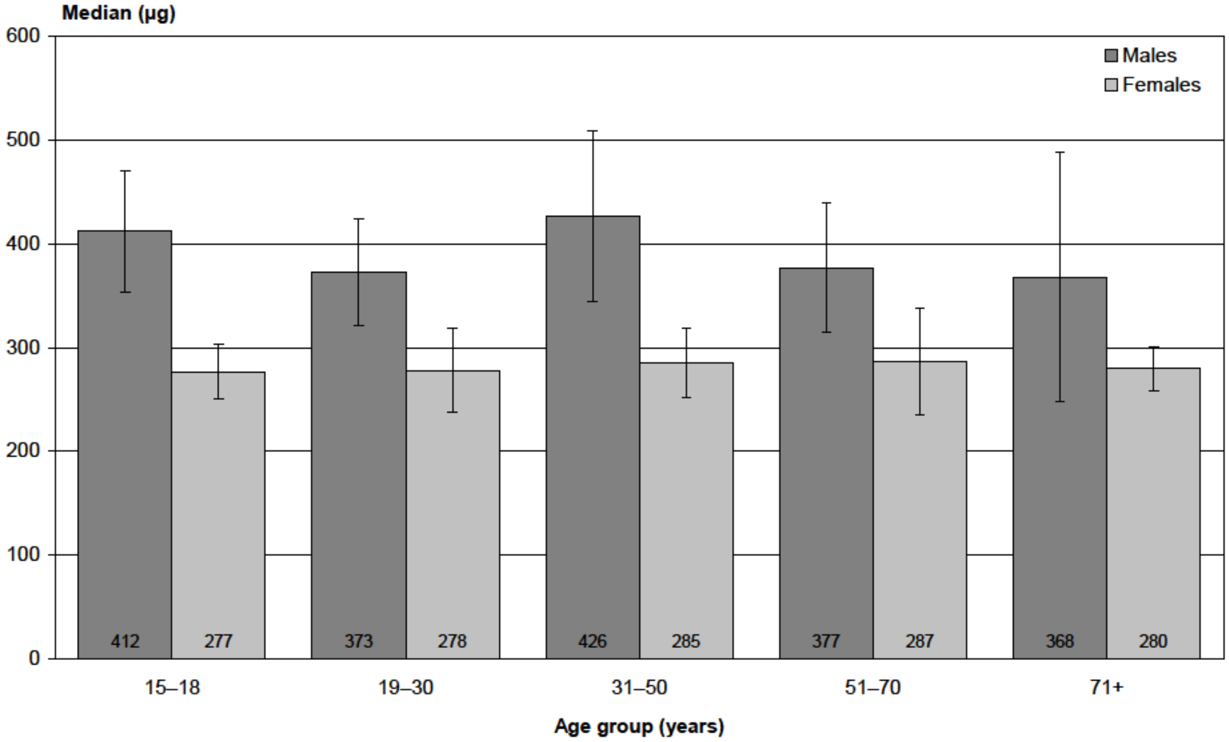
Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Breakfast cereals	0.4	0.3	0.2	0.3	0.7	0.5	0.4	0.3	0.2	0.4	0.5	0.6	0.4
Bread	0.4	0.4	0.8	0.6	0.4	0.2	0.5	0.2	0.2	0.4	0.3	0.2	0.3
Eggs and egg dishes	0.4	0.8	0.3	0.3	0.3	0.4	0.3	0.3	0.7	0.1	0.4	0.5	0.4
Snack foods	0.3	0.4	0.8	0.3	0.0	0.0	0.3	0.4	0.3	0.4	0.3	0.0	0.3
Lamb and mutton	0.2	0.5	0.1	0.1	0.1	0.5	0.2	0.3	0.2	0.1	0.5	0.2	0.2
Snack bars	0.1	0.7	0.1	0.2	0.0	0.0	0.2	0.2	0.1	0.1	0.2	0.0	0.1
Nuts and seeds	0.1	0.2	0.1	0.1	0.1	0.0	0.1	0.2	0.2	0.1	0.1	0.0	0.1
Alcoholic beverages	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.1
Supplements providing energy	0.0	0.1	0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0
Other meat	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Vitamin A: Retinol intake and dietary sources

The median usual daily intake of retinol was 393 µg for males and 281 µg for females (Table 4.5). There was no significant difference in the median usual retinol intake by age for both males and females (Figure 4.5).

Figure 4.5: Median retinol intake (µg), by age group and sex



The *Butter and margarine* group was the largest single contributor of retinol to the diet (18%) followed by *Milk* (12%), *Cheese*, *Eggs and egg dishes* and *Dairy products* (each 8%), *Bread-based dishes* (7%), and *Cakes and muffins* and *Poultry* (each 5%) (Table 4.6).

Older males and females (71+ years) obtained more retinol from *Butter and margarine* than males and females aged 15–50 years (Figure 4.6). Females aged 31–50 years obtained more retinol from *Cheese* than younger age groups and females aged 71+ years. *Bread-based dishes* provided more retinol for young males and females (15–18 years) than for males aged 31+ years and all older females.

Figure 4.6: Percent retinol from *Butter and margarine*, by age group and sex

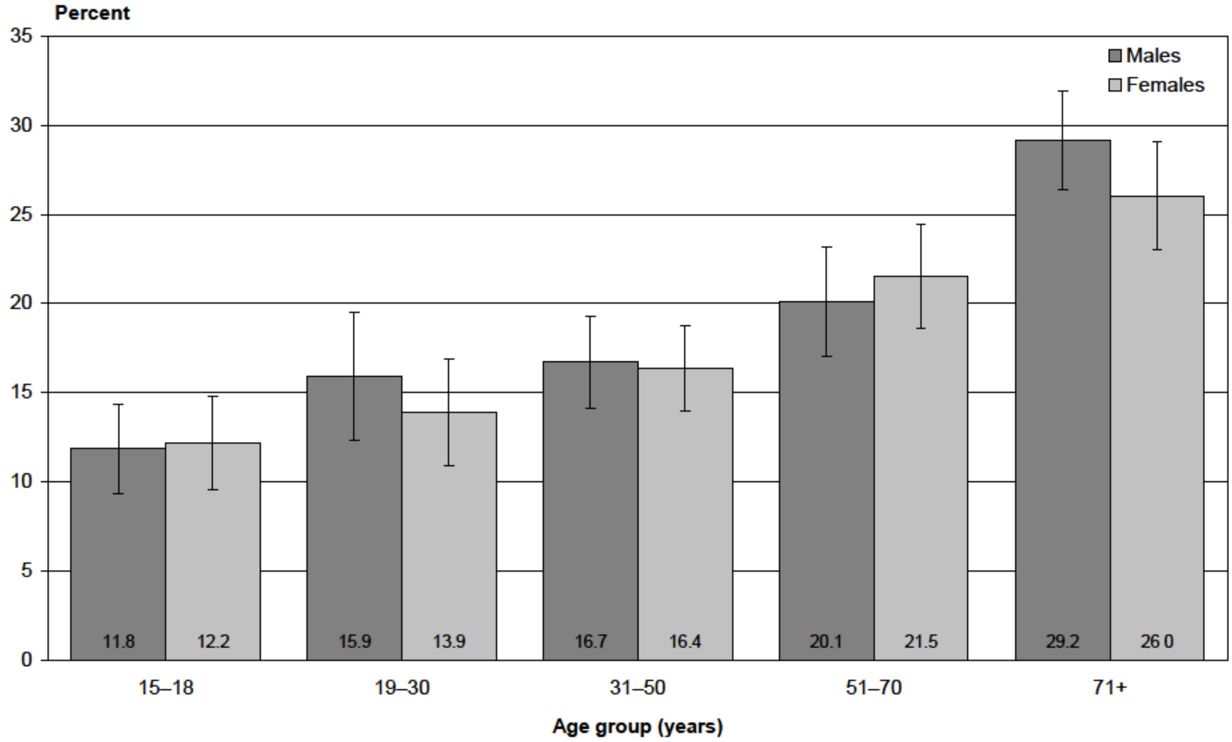


Table 4.5: Retinol intake, by age group, ethnic group, NZDep2006 and sex

		Retinol (µg)[1, 2]			
		Mean	**10th**[3]	**Median (50th),**[3] **(95% CI)**	**90th**[3]
Total population		403	185	332 (317–347)	639
By age group (years)					
Males	15–18	434	230	412 (353–471)	668
	19–30	408	174	373 (321–425)	688
	31–50	444	265	426 (344–508)	644
	51–70	508	185	377 (314–440)	912
	71+	1059	199	368 (248–488)	1560
	Total	485	222	393 (365–421)	781
Females	15–18	283	201	277 (250–304)	373
	19–30	302	148	278 (238–318)	483
	31–50	308	179	285 (252–318)	463
	51–70	352	163	287 (236–338)	600
	71+	377	153	280 (259–301)	631
	Total	323	163	281 (265–297)	507
Māori					
Males	15–18	521	290	497 (386–608)	782
	19–30	491	239	450 (366–534)	791
	31–50	471	252	442 (376–508)	724
	51+	442	233	421 (335–507)	678
	Total	486	274	460 (419–501)	728
Females	15–18	292	124	257 (184–330)	505
	19–30	370	241	361 (308–414)	511
	31–50	323	228	317 (264–370)	426
	51+	399	156	282 (260–324)	619
	Total	351	188	312 (288–336)	538
Pacific					
Males	15–18	281	113	268 (133–403)	463
	19–30	439	215	403 (272–534)	710
	31–50	535	247	452 (33–871)	916
	51+	284	113	256 (198–314)	491
	Total	425	194	367 (217–517)	729
Females	15–18	251	120	235 (132–338)	403
	19–30	321	173	304 (249–359)	492
	31–50	331	163	300 (258–342)	534
	51+	245	115	231 (184–278)	394
	Total	310	151	284 (252–316)	500

		Retinol (µg)[1, 2]			
		Mean	**10th[3]**	**Median (50th),[3] (95% CI)**	**90th[3]**
NZEO					
Males	15–18	434	222	410 (342–478)	678
	19–30	392	172	367 (303–431)	649
	31–50	429	251	412 (378–446)	629
	51+	567	210	389 (306–472)	974
	Total	474	235	393 (362–424)	747
Females	15–18	284	232	282 (251–313)	340
	19–30	292	124	260 (221–299)	499
	31–50	308	195	289 (239–339)	445
	51+	360	161	282 (254–310)	605
	Total	321	169	281 (263–299)	500
By NZDep2006 quintile					
Males	1	417	190	360 (319–401)	673
	2	621	226	442 (350–534)	1115
	3	584	253	407 (304–510)	1003
	4	436	189	377 (326–428)	729
	5	412	169	362 (319–405)	701
Females	1	341	143	270 (237–303)	573
	2	331	189	305 (260–350)	501
	3	289	143	267 (239–295)	461
	4	309	165	268 (240–296)	487
	5	345	216	311 (283–339)	491

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE. Because this nutrient is concentrated in relatively few foods, one-day intake distributions are highly skewed. Therefore these estimates of usual intakes have large confidence intervals.

2 For conversion factors to vitamin A equivalents, see Appendix 3.

3 Percentiles.

Table 4.6: Retinol sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Butter and margarine	18.1 (17.0–19.1)	11.8 (9.3–14.4)	15.9 (12.3–19.5)	16.7 (14.1–19.3)	20.1 (17.1–23.2)	29.2 (26.4–32.0)	18.2 (16.7–19.8)	12.2 (9.5–14.8)	13.9 (10.9–16.9)	16.4 (14.0–18.8)	21.5 (18.6–24.4)	26.0 (23.0–29.1)	18.0 (16.6–19.4)
Milk	12.1 (11.4–12.9)	13.2 (10.8–15.5)	12.8 (9.6–16.0)	12.6 (10.9–14.4)	12.4 (10.1–14.7)	12.3 (10.6–14.1)	12.6 (11.5–13.7)	10.2 (8.3–12.2)	11.0 (8.8–13.3)	12.2 (10.5–14.0)	11.8 (9.4–14.2)	11.4 (10.0–12.7)	11.7 (10.6–12.7)
Cheese	8.5 (7.6–9.3)	6.3 (4.5–8.2)	9.3 (6.5–12.1)	9.5 (7.3–11.6)	6.5 (4.6–8.4)	6.8 (5.3–8.3)	8.2 (7.0–9.3)	7.0 (5.4–8.7)	5.9 (4.0–7.9)	11.5 (9.3–13.7)	8.1 (6.2–10.0)	7.2 (5.8–8.5)	8.8 (7.7–9.8)
Eggs and egg dishes	8.4 (7.5–9.2)	8.4 (5.2–11.7)	5.9 (3.7–8.1)	8.7 (6.6–10.8)	9.7 (7.1–12.3)	8.5 (6.6–10.4)	8.4 (7.2–9.5)	5.3 (3.5–7.0)	11.4 (7.7–15.1)	7.1 (5.4–8.9)	8.2 (6.4–10.1)	9.4 (6.9–12.0)	8.4 (7.1–9.6)
Dairy products	7.7 (7.0–8.4)	6.4 (4.7–8.0)	4.5 (2.9–6.1)	6.6 (4.9–8.4)	7.9 (5.8–10.0)	7.9 (6.0–9.8)	6.6 (5.7–7.6)	8.8 (6.9–10.8)	9.1 (6.5–11.8)	7.4 (5.7–9.2)	9.5 (7.6–11.5)	10.2 (8.6–11.7)	8.7 (7.7–9.7)
Bread-based dishes	7.1 (6.3–7.9)	13.4 (10.8–15.9)	12.6 (8.5–16.7)	7.5 (5.7–9.4)	6.4 (4.3–8.6)	2.7 (1.7–3.8)	8.3 (6.9–9.6)	14.0 (10.7–17.2)	6.6 (4.1–9.1)	6.5 (4.9–8.1)	4.2 (3.0–5.4)	2.4 (1.6–3.2)	6.0 (5.1–6.9)
Cakes and muffins	5.0 (4.5–5.6)	2.5 (1.6–3.4)	3.3 (1.2–5.4)	5.2 (3.7–6.7)	5.4 (3.5–7.4)	4.3 (3.4–5.2)	4.6 (3.7–5.5)	6.4 (4.9–8.0)	5.0 (2.9–7.0)	4.7 (3.6–5.7)	6.4 (4.7–8.1)	6.0 (4.3–7.7)	5.4 (4.7–6.2)
Poultry	4.9 (4.4–5.5)	7.0 (4.8–9.2)	5.4 (3.4–7.4)	5.3 (4.0–6.6)	4.5 (2.6–6.4)	2.2 (1.4–2.9)	5.0 (4.1–5.8)	5.6 (3.8–7.4)	6.9 (4.8–8.9)	5.2 (4.0–6.5)	3.4 (2.3–4.5)	2.9 (2.0–3.8)	4.9 (4.2–5.6)
Fish and seafood	4.2 (3.6–4.7)	2.3 (1.0–3.6)	2.7 (0.9–4.5)	4.3 (3.0–5.7)	4.7 (2.8–6.5)	4.8 (3.6–6.0)	4.0 (3.2–4.8)	1.9 (0.8–2.9)	4.2 (2.3–6.0)	4.5 (3.2–5.8)	5.3 (3.6–6.9)	3.7 (2.6–4.7)	4.3 (3.6–5.1)
Non-alcoholic beverages	3.1 (2.6–3.5)	2.3 (1.4–3.1)	4.2 (2.4-6.1)	3.4 (2.2–4.6)	2.0 (0.9–3.1)	1.6 (1.1–2.1)	3.0 (2.3–3.6)	3.2 (2.2–4.2)	2.9 (2.0–3.8)	3.7 (2.6–4.8)	2.9 (1.9–3.9)	2.3 (1.7–3.0)	3.2 (2.6–3.7)
Grains and pasta	2.9	4.1	4.8	2.2	2.9	1.1	3.0	5.2	4.5	3.4	0.7	1.6	2.9
Pies and pasties	2.8	3.5	5.0	3.2	2.5	1.6	3.3	2.7	2.5	2.1	2.5	2.0	2.3
Biscuits	1.8	2.1	0.7	2.4	1.1	2.4	1.7	2.6	1.3	1.8	2.3	2.5	2.0
Potatoes, kumara and taro	1.7	2.6	1.1	1.4	2.0	2.4	1.7	2.4	2.1	2.3	0.9	1.0	1.8
Savoury sauces and condiments	1.5	2.2	1.2	1.1	1.8	0.9	1.4	1.4	1.8	2.1	1.4	1.1	1.7
Sugar and sweets	1.5	1.1	3.2	1.4	0.6	0.4	1.4	2.6	1.9	2.0	1.1	0.5	1.6
Puddings and desserts	1.5	1.2	0.7	1.3	1.7	3.3	1.4	1.3	1.6	1.2	1.7	2.1	1.5
Vegetables	1.3	1.2	0.7	1.5	0.8	1.0	1.1	1.7	1.9	1.2	1.9	1.3	1.6
Bread	1.0	1.8	1.9	1.5	0.3	0.5	1.2	1.1	0.7	1.0	0.5	0.4	0.8
Other meat	0.9	0.0	0.0	0.0	3.2	2.1	1.1	0.0	0.1	0.1	1.4	2.7	0.7
Beef and veal	0.8	1.7	0.6	0.9	0.7	0.8	0.8	0.7	0.3	0.7	1.3	0.7	0.8

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Sausages and processed meats	0.7	1.1	0.8	0.8	0.8	0.4	0.8	0.7	1.0	0.4	0.5	0.5	0.6
Lamb and mutton	0.6	0.4	0.6	0.4	0.8	0.4	0.6	0.4	1.1	0.6	0.8	0.4	0.7
Supplements providing energy	0.5	1.8	1.5	0.3	0.1	0.1	0.6	0.6	0.9	0.4	0.2	0.6	0.5
Soups and stocks	0.5	0.2	0.2	0.3	0.4	0.9	0.3	0.9	0.4	0.6	0.7	0.5	0.6
Snack bars	0.3	1.0	0.1	0.6	0.0	0.2	0.4	0.5	0.1	0.2	0.4	0.1	0.2
Breakfast cereals	0.2	0.1	0.1	0.0	0.3	0.9	0.2	0.2	0.2	0.3	0.0	0.3	0.2
Pork	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.0	0.1	0.1	0.1	0.2	0.1
Alcoholic beverages	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.5	0.2	0.0	0.0	0.2
Nuts and seeds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snack foods	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

4.3 Vitamin C

Vitamin C, or ascorbic acid, is a water-soluble vitamin which is easily oxidised in the body to dehydroascorbic acid, which just as readily converts back to ascorbic acid. Most of the functions of Vitamin C in the body relate to this ability to take part in oxidation–reduction reactions (Mann and Truswell 2007). Vitamin C has several functions, including:

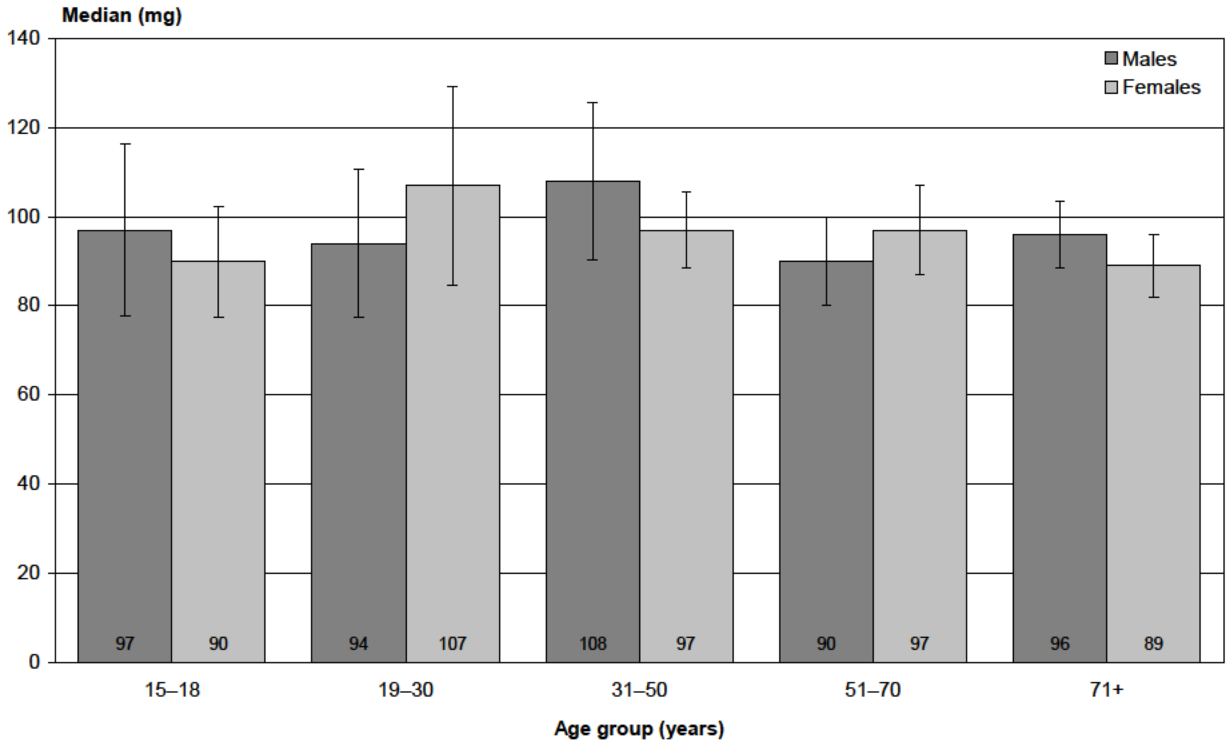
- collagen synthesis
- as an antioxidant
- thyroxine synthesis
- amino acid metabolism
- enhancing resistance to infection
- assisting iron absorption (Rolfes et al 2009).

Fruits and vegetables are good sources of vitamin C. Juices and fruit drinks also supply vitamin C because most of these have it replaced or added during manufacture (Mann and Truswell 2007; Rolfes et al 2009). Vitamin C is easily destroyed by heating and oxygen (Rolfes et al 2009).

Vitamin C intake

The median usual daily vitamin C intake for the New Zealand population was 99 mg for both males and females (Table 4.7). There was very little variability by age for both males and females (Figure 4.7).

Figure 4.7: Median vitamin C intake (mg), by age group and sex



There were no differences in intakes of vitamin C consumed across age and sex groups within ethnic groups.

For both males and females there were no differences in intakes of vitamin C consumed between NZDep2006 quintiles. Overall, vitamin C intake decreased with increasing neighbourhood deprivation, but this association did not remain after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of vitamin C was 2.4% (males 3.7%; females 1.3%).

Dietary sources of vitamin C

The *Vegetables* group was the largest single contributor of vitamin C to the diet (28%), followed by *Fruit* (22%), *Non-alcoholic beverages* (15%) and *Potatoes, kumara and taro* (13%) (Table 4.8).

Younger males (15–18 years) obtained less vitamin C from *Vegetables* than all older males, and females aged 15–18 years obtained less than females aged 31+ years. In contrast, older males and females (71+ years) obtained more vitamin C from *Fruit* than all younger males and females (15–50 years). *Non-alcoholic beverages* provided more vitamin C for younger males and females (15–18 years) than for males and females aged 31+ years (Figure 4.8). *Potatoes, kumara and taro* provided more vitamin C for males aged 71+ years than for males aged 19–50 years.

Figure 4.8: Percent vitamin C from non-alcoholic beverages, by age group and sex

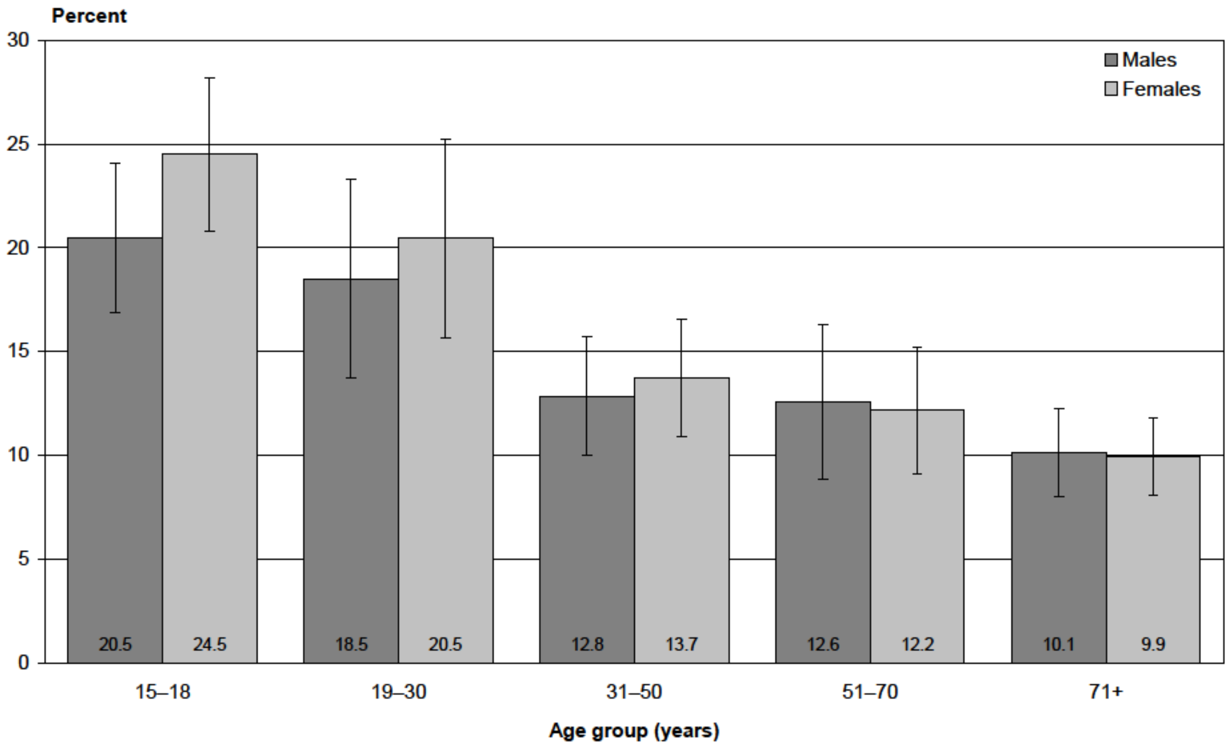


Table 4.7: Vitamin C intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin C (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%), (95% CI)[3]**
Total population		108	49	99 (95–103)	177	2.4
By age group (years)						
Males	15–18	114	39	97 (78–116)	208	4.4*
	19–30	103	48	94 (77–111)	170	2.1*
	31–50	115	49	108 (90–126)	191	2.5*
	51–70	102	36	90 (80–100)	181	6.8
	71+	103	49	96 (88–104)	166	2.2*
	Total	109	44	99 (93–105)	186	3.7
Females	15–18	94	57	90 (78–102)	135	0.1*
	19–30	116	59	107 (85–129)	185	0.3*
	31–50	101	60	97 (88–106)	146	0.0*
	51–70	108	46	97 (87–107)	180	3.0*
	71+	98	42	89 (82–96)	166	4.1
	Total	106	54	99 (93–105)	167	1.3
Māori						
Males	15–18	104	40	89 (49–129)	187	3.5*
	19–30	117	35	98 (68–128)	219	7.4*
	31–50	92	30	76 (57–95)	174	10.3
	51+	90	24	71 (43–99)	170	14.5*
	Total	102	52	95 (80–110)	161	9.5
Females	15–18	77	23	65 (33–97)	146	14.1
	19–30	88	35	79 (61–97)	153	6.7*
	31–50	96	37	83 (71–95)	169	2.8*
	51+	84	33	73 (59–87)	149	8.1*
	Total	89	38	80 (72–88)	150	6.3
Pacific						
Males	15–18	175	79	154 (82–226)	297	0.0*
	19–30	93	20	65 (39–91)	194	18.4*
	31–50	106	38	92 (70–114)	194	5.9*
	51+	95	30	79 (47–111)	181	9.9*
	Total	115	33	95 (78–112)	223	9.6
Females	15–18	61	27	56 (34–78)	102	11.1*
	19–30	114	30	93 (70–116)	225	10.0
	31–50	101	68	98 (78–118)	138	0.0
	51+	88	48	84 (58–110)	134	1.5*
	Total	99	71	97 (82–112)	131	5.1

		Vitamin C (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
NZEO						
Males	15–18	110	40	95 (77–113)	198	3.9*
	19–30	101	63	97 (74–120)	144	0.0*
	31–50	118	49	107 (93–121)	200	2.7*
	51+	103	42	94 (86–102)	175	4.1
	Total	110	46	100 (93–107)	186	2.8*
Females	15–18	97	55	92 (76–108)	146	0.3*
	19–30	120	55	108 (83–133)	199	0.9*
	31–50	101	69	99 (88–110)	136	0.0
	51+	107	44	97 (90–104)	181	3.7
	Total	108	53	100 (94–106)	171	1.6
By NZDep2006 quintile						
Males	1	117	48	109 (92–126)	193	[4]
	2	112	43	101 (87–115)	194	[4]
	3	109	57	103 (89–117)	168	[4]
	4	105	33	90 (72–108)	198	[4]
	5	103	42	93 (81–105)	178	[4]
Females	1	107	50	100 (86–114)	172	[4]
	2	108	54	102 (92–112)	170	[4]
	3	115	59	107 (94–120)	181	[4]
	4	108	54	100 (83–117)	173	[4]
	5	90	59	88 (76–100)	124	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.8: Vitamin C sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Vegetables	28.1 (26.8–29.4)	11.9 (9.6–14.3)	22.8 (18.0–27.6)	29.5 (26.1–33.0)	28.8 (25.2–32.3)	31.7 (28.9–34.5)	26.8 (24.9–28.7)	17.7 (14.6–20.8)	24.3 (19.8–28.9)	29.5 (26.3–32.6)	34.3 (31.0–37.6)	33.1 (30.1–36.1)	29.3 (27.5–31.1)
Fruit	22.4 (21.1–23.6)	17.6 (13.8–21.5)	15.8 (11.9–19.7)	18.2 (15.2–21.2)	20.7 (17.6–23.9)	27.8 (24.5–31.1)	19.2 (17.5–20.9)	21.3 (17.8–24.7)	20.5 (16.6–24.4)	24.7 (21.7–27.8)	27.7 (24.7–30.7)	32.7 (29.8–35.6)	25.3 (23.5–27)
Non-alcoholic beverages	14.6 (13.4–15.9)	20.5 (16.9–24.1)	18.5 (13.7–23.3)	12.8 (10.0–15.7)	12.6 (8.9–16.3)	10.1 (8.0–12.3)	14.3 (12.4–16.1)	24.5 (20.8–28.2)	20.5 (15.7–25.2)	13.7 (10.9–16.6)	12.2 (9.2–15.2)	9.9 (8.1–11.8)	15.0 (13.4–16.6)
Potatoes, kumara and taro	12.8 (11.9–13.7)	14.5 (11.8–17.2)	11.4 (8.0–14.8)	12.0 (9.8–14.3)	15.9 (12.9–18.9)	16.7 (14.8–18.6)	13.6 (12.2–14.9)	10.4 (8.5–12.3)	13.6 (10.2–17.0)	11.9 (10.0–13.9)	11.2 (9.1–13.3)	12.6 (11.0–14.2)	12.1 (10.9–13.2)
Bread-based dishes	3.5 (3.0–4.1)	9.3 (5.8–12.9)	9.0 (5.3–12.6)	3.1 (2.2–4.1)	2.8 (1.3–4.2)	0.9 (0.4–1.3)	4.5 (3.5–5.5)	6.7 (4.3–9.2)	3.3 (2.1–4.5)	3.1 (1.9–4.3)	1.2 (0.6–1.7)	0.5 (0.2–0.8)	2.6 (2.0–3.2)
Grains and pasta	2.9 (2.3–3.4)	3.2 (1.9–4.5)	4.2 (2.1–6.3)	3.6 (2.2–5.1)	1.9 (0.5–3.3)	0.5 (0.0–1.1)	3.0 (2.2–3.8)	3.3 (2.0–4.5)	4.3 (2.4–6.3)	3.3 (1.9–4.7)	1.5 (0.7–2.3)	0.5 (0.2–0.7)	2.7 (2.1–3.4)
Milk	2.0 (1.7–2.3)	3.0 (1.8–4.2)	1.6 (0.9–2.4)	2.8 (1.7–3.9)	2.6 (1.5–3.7)	1.5 (0.9–2.0)	2.4 (1.9–2.9)	1.3 (0.8–1.8)	1.4 (0.9–1.9)	2.1 (1.5–2.8)	1.1 (0.8–1.5)	1.2 (0.8–1.5)	1.6 (1.3–1.9)
Poultry	1.7 (1.3–2.2)	2.2 (0.9–3.6)	2.1 (0.7–3.6)	3.1 (1.2–5.1)	1.9 (0.5–3.2)	0.4 (0.1–0.7)	2.3 (1.4–3.1)	2.6 (1.1–4.1)	1.7 (0.9–2.4)	1.1 (0.6–1.6)	1.1 (0.3- 2.9)	0.5 (0.2–0.9)	1.2 (0.9–1.6)
Savoury sauces and condiments	1.7 (1.4–2.0)	2.9 (1.5–4.3)	3.0 (1.9–4.0)	2.5 (1.5–3.5)	1.6 (0.8–2.5)	0.7 (0.4–1.0)	2.2 (1.7–2.7)	2.5 (1.3–3.6)	1.5 (0.9–2.1)	1.3 (0.7–1.9)	0.9 (0.4–1.4)	0.6 (0.4–0.9)	1.2 (1.0–1.5)
Soups and stocks	1.6 (1.2–1.9)	0.7 (0.1–1.4)	1.4 (0.3–2.5)	1.4 (0.6–2.2)	1.1 (0.2–3.4)	2.7 (1.6–3.9)	1.4 (0.9–1.9)	1.2 (0.4–2.1)	2.0 (0.5–3.5)	1.6 (0.7–2.4)	2.0 (1.1–2.8)	1.8 (1.1–2.5)	1.8 (1.2–2.3)
Beef and veal	1.5	2.2	2.1	2.0	1.6	1.5	1.9	1.3	1.1	1.0	1.2	0.7	1.1
Pies and pasties	0.9	1.1	1.9	1.0	0.8	0.5	1.1	0.8	0.6	1.1	0.4	0.6	0.7
Fish and seafood	0.8	0.5	0.4	1.2	1.8	0.6	1.1	0.3	0.5	0.7	0.7	0.7	0.6
Breakfast cereals	0.7	2.0	1.1	0.6	1.0	0.7	0.9	0.9	0.4	0.7	0.4	0.5	0.6
Pork	0.7	1.6	1.1	1.0	0.8	0.5	1.0	0.2	0.4	0.5	0.4	0.5	0.4
Sugar and sweets	0.5	0.3	0.4	0.5	1.4	0.8	0.7	0.4	0.2	0.3	0.4	0.7	0.4
Dairy products	0.5	0.8	0.2	0.9	0.3	0.2	0.5	0.5	0.6	0.6	0.3	0.3	0.5
Sausages and processed meats	0.5	0.7	0.8	0.9	0.2	0.2	0.6	0.9	0.2	0.3	0.5	0.2	0.4
Cakes and muffins	0.4	0.1	0.1	0.5	0.5	0.3	0.4	0.7	0.6	0.3	0.3	1.1	0.5
Puddings and desserts	0.4	0.5	0.0	0.3	0.3	0.8	0.3	0.2	0.7	0.4	0.6	0.3	0.5
Snack bars	0.3	0.8	0.3	0.7	0.2	0.0	0.4	0.6	0.1	0.1	0.3	0.1	0.2
Supplements providing energy	0.3	1.4	0.8	0.2	0.1	0.0	0.4	0.2	0.1	0.2	0.0	0.3	0.2

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Alcoholic beverages	0.2	1.0	0.0	0.1	0.1	0.1	0.1	0.0	0.2	0.5	0.2	0.1	0.3
Other meat	0.2	0.0	0.0	0.0	0.4	0.4	0.1	0.1	0.2	0.0	0.4	0.4	0.2
Lamb and mutton	0.2	0.5	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.3	0.1	0.2
Nuts and seeds	0.1	0.2	0.3	0.1	0.1	0.0	0.1	0.2	0.1	0.2	0.1	0.0	0.1
Bread	0.1	0.2	0.2	0.2	0.1	0.0	0.2	0.1	0.0	0.2	0.0	0.0	0.1
Snack foods	0.1	0.1	0.3	0.2	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.1
Biscuits	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.6	0.0	0.1	0.1	0.0	0.1
Eggs and egg dishes	0.1	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Butter and margarine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

4.4 Vitamin E

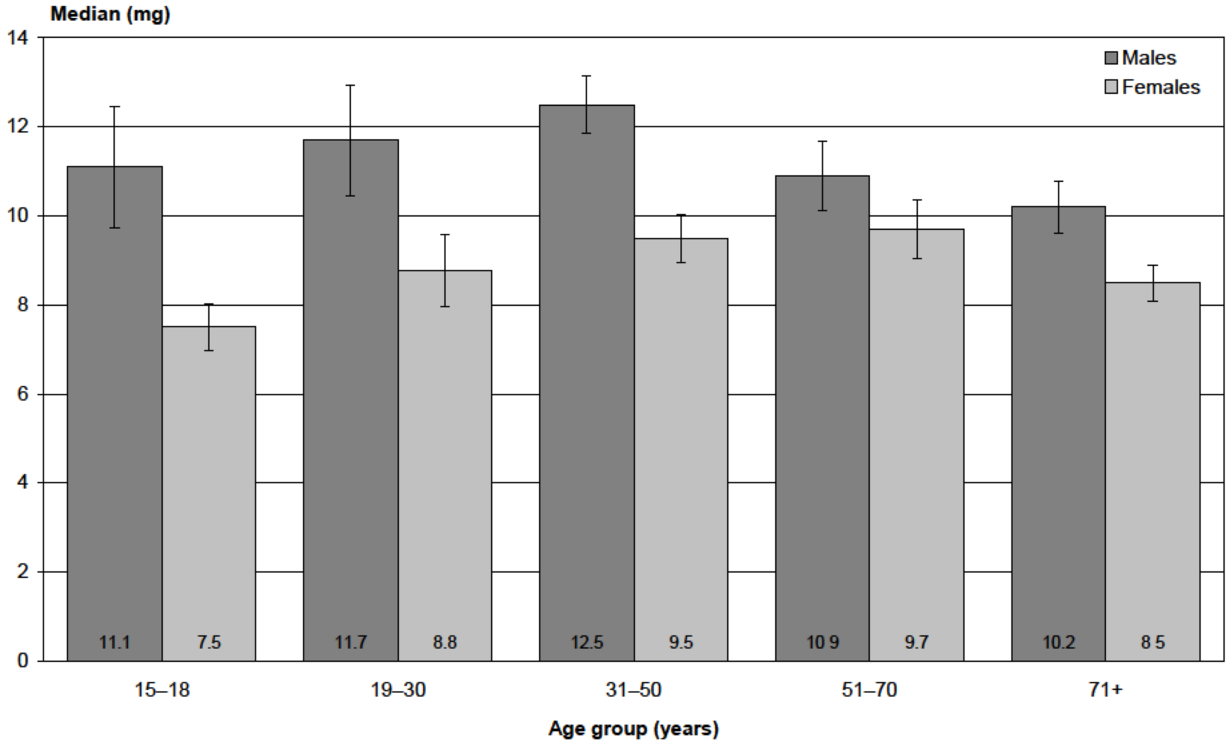
There are eight naturally occurring forms of vitamin E, including four tocopherols and four tocotrienols, whose abundance and biological activity vary considerably (Mann and Truswell 2007). Vitamin E is a powerful fat-soluble antioxidant, which helps stabilise cell membranes and protect plasma lipoproteins from oxidative damage by free radicals (Rolfes et al 2009).

Vitamin E is widespread in foods. The major sources are plant foods high in polyunsaturated fat, including oils and products made from oil, such as margarines (Mann and Truswell 2007; Rolfes et al 2009).

Vitamin E intake

The median usual daily vitamin E intake was 11.5 mg for males and 9.1 mg for females (Table 4.9). Males aged 71+ years had lower intakes than males aged 31–50 years, and females aged 15–18 years had intakes lower than those aged 31+ years (Figure 4.9).

Figure 4.9: Median vitamin E intake (mg), by age group and sex



There were no significant differences in intakes of vitamin E consumed within the Māori and Pacific ethnic groups across age groups.

For both males and females there were no differences in intakes of vitamin E between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of vitamin E, after adjusting for age, sex and ethnic group.

Dietary sources of vitamin E

The *Butter and margarine* group was the largest single contributor of vitamin E to the diet (13%), followed by *Vegetables* (11%), *Fruit* (7%), *Bread-based dishes* and *Potatoes, kumara and taro* (each 6%) (Table 4.10).

Older males (71+ years) obtained more vitamin E from *Butter and margarine* than those aged 15–50 years, and older females (71+ years) more than all younger females (Figure 4.10). In contrast, all younger males (15–70 years) and females (15–50 years) obtained more vitamin E from *Bread-based dishes* than those aged 71+ years.

The contribution of other food sources to vitamin E intake varied by age and sex. Males and females aged 51+ years obtained more vitamin E from *Vegetables* than males and females aged 15–30 years. Males and females aged 51+ years obtained more vitamin E from *Fruit* than males and females aged 15–50 years. Younger males (15–18 years) obtained more vitamin E from *Potatoes, kumara and taro* than males aged 31+ years; females aged 71+ years obtained less from *Potatoes, kumara and taro* than females aged 15–50 years.

Figure 4.10: Percent vitamin E from *Butter and margarine*, by age group and sex

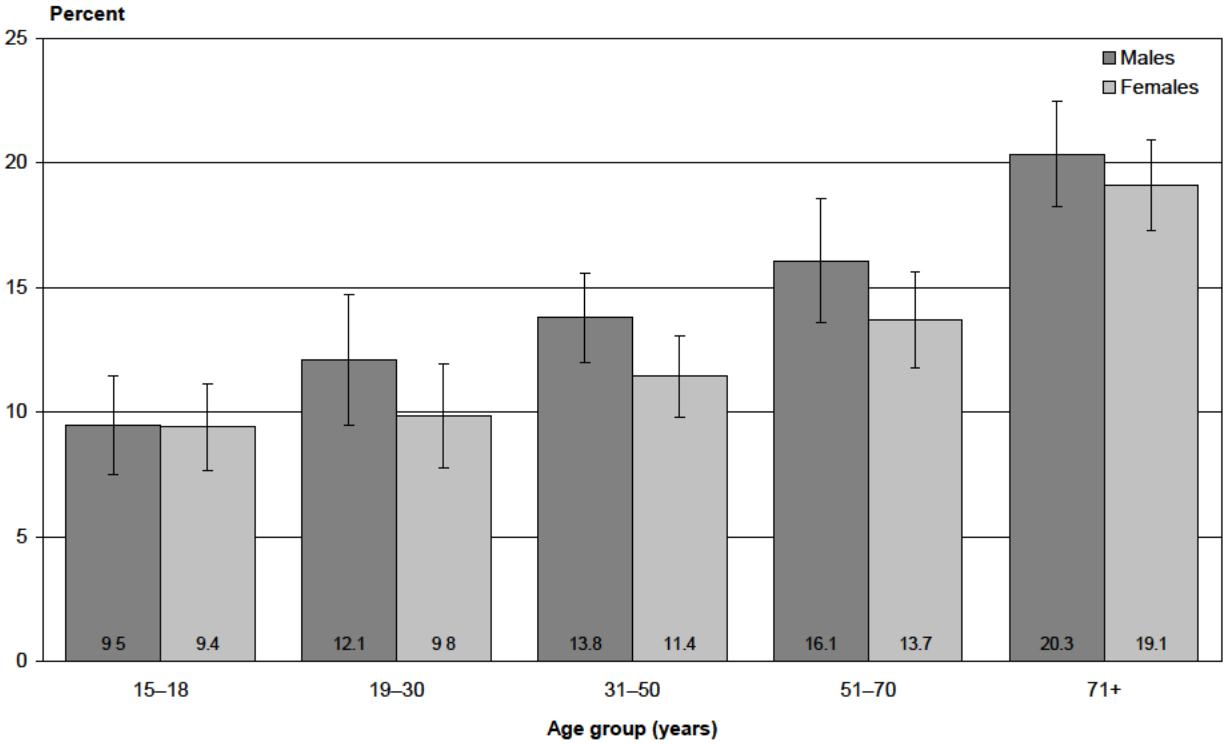


Table 4.9: Vitamin E intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin E (mg)[1]			
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**
Total population		10.6	6.9	10.2 (9.9–10.5)	14.9
By age group (years)					
Males	15–18	11.4	8.4	11.1 (9.7–12.5)	14.6
	19–30	12.0	8.9	11.7 (10.5–12.9)	15.3
	31–50	12.9	8.4	12.5 (11.8–13.2)	17.9
	51–70	11.3	6.9	10.9 (10.1–11.7)	16.2
	71+	10.5	7.0	10.2 (9.6–10.8)	14.3
	Total	11.9	7.8	11.5 (11.0–12.0)	16.5
Females	15–18	7.8	4.9	7.5 (7.0–8.0)	11.1
	19–30	8.9	7.1	8.8 (8.0–9.6)	10.7
	31–50	9.7	7.0	9.5 (9.0–10.0)	12.7
	51–70	10.2	6.5	9.7 (9.1–10.3)	14.6
	71+	8.7	6.1	8.5 (8.1–8.9)	11.4
	Total	9.4	6.4	9.1 (8.8–9.4)	12.8
Māori					
Males	15–18	13.5	7.5	12.5 (9.7–15.3)	20.8
	19–30	13.4	7.3	12.3 (9.9–14.7)	20.8
	31–50	13.0	7.3	12.4 (11.0–13.8)	19.4
	51+	11.9	8.4	11.7 (10.3–13.1)	15.5
	Total	13.1	9.0	12.7 (11.6–13.8)	17.7
Females	15–18	7.5	4.5	7.1 (5.5–8.7)	10.8
	19–30	9.1	5.2	8.8 (7.8–9.8)	13.5
	31–50	9.1	6.5	8.8 (7.5–10.1)	11.9
	51+	8.5	6.3	8.4 (7.7–9.1)	10.8
	Total	8.9	6.4	8.7 (8.1–9.3)	11.6
Pacific					
Males	15–18	13.0	8.8	12.3 (10.1–14.5)	18.0
	19–30	12.7	6.3	11.3 (7.2–15.4)	20.7
	31–50	12.2	7.3	11.7 (9.2–14.2)	17.9
	51+	11.3	6.2	10.7 (8.8–12.6)	17.2
	Total	12.8	7.7	12.2 (10.5–13.9)	18.7
Females	15–18	7.0	4.6	6.9 (5.3–8.5)	9.7
	19–30	10.1	6.1	9.7 (8.4–11.0)	14.5
	31–50	10.7	5.9	9.8 (8.5–11.1)	16.6
	51+	10.0	7.2	9.8 (8.4–11.2)	13.0
	Total	10.0	6.6	9.6 (8.9–10.3)	14.0

		Vitamin E (mg)[1]			
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]
NZEO					
Males	15–18	10.6	7.1	10.4 (9.2–11.6)	14.5
	19–30	11.6	6.4	10.8 (9.6–12.0)	17.6
	31–50	12.9	9.0	12.7 (12.0–13.4)	17.3
	51+	11.0	7.4	10.7 (10.1–11.3)	14.9
	Total	11.8	8.0	11.5 (11.0–12.0)	16.0
Females	15–18	7.8	5.3	7.6 (7.0–8.2)	10.6
	19–30	8.8	6.1	8.6 (7.6–9.6)	11.7
	31–50	9.6	6.9	9.4 (8.8–10.0)	12.7
	51+	9.8	6.4	9.4 (9.0–9.8)	13.7
	Total	9.4	6.4	9.1 (8.7–9.5)	12.9
By NZDep2006 quintile					
Males	1	12.3	7.9	11.9 (10.8–13.0)	17.4
	2	12.0	8.4	11.7 (10.8–12.6)	16.0
	3	11.5	7.0	11.2 (10.2–12.2)	16.4
	4	11.4	7.2	10.9 (9.9–11.9)	16.3
	5	12.3	6.9	11.6 (10.5–12.7)	18.6
Females	1	9.4	7.2	9.3 (8.5–10.1)	11.8
	2	9.4	5.8	9.1 (8.5–9.7)	13.5
	3	10.0	6.9	9.5 (8.6–10.4)	13.5
	4	9.2	6.2	8.9 (8.1–9.7)	12.5
	5	9.1	6.9	8.9 (8.3–9.5)	11.4

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

Table 4.10: Vitamin E sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Butter and margarine	13.3 (12.6–14.1)	9.5 (7.5–11.4)	12.1 (9.5–14.7)	13.8 (12.0–15.6)	16.1 (13.6–18.5)	20.3 (18.2–22.5)	14.3 (13.2–15.4)	9.4 (7.7–11.1)	9.8 (7.7–11.9)	11.4 (9.8–13.1)	13.7 (11.8–15.6)	19.1 (17.3–20.9)	12.4 (11.4–13.3)
Vegetables	11.3 (10.7–12.0)	5.1 (3.8–6.4)	7.1 (5.5–8.7)	10.6 (9.0–12.1)	11.7 (9.9–13.5)	14.0 (12.5–15.5)	10.0 (9.2–10.8)	7.4 (5.8–8.9)	9.9 (7.5–12.3)	11.5 (10.0–13.1)	16.5 (14.5–18.5)	14.0 (12.7–15.3)	12.5 (11.5–13.4)
Fruit	7.2 (6.7–7.6)	4.6 (3.5–5.6)	5.2 (3.6–6.9)	4.9 (3.9–5.9)	5.9 (4.7–7.0)	8.5 (6.9–10.0)	5.5 (4.9–6.2)	7.5 (6.2–8.8)	7.2 (5.8–8.6)	8.2 (7.1–9.3)	9.9 (8.5–11.3)	11.0 (9.9–12.0)	8.7 (8.0–9.3)
Bread-based dishes	5.9 (5.2–6.5)	11.3 (8.8–13.8)	10.9 (7.5–14.4)	6.0 (4.6–7.5)	6.2 (4.1–8.3)	2.1 (1.3–2.9)	7.1 (6.0–8.2)	10.1 (7.8–12.4)	6.0 (4.1–7.8)	5.1 (3.6–6.5)	2.9 (1.9–3.9)	1.7 (1.2–2.2)	4.7 (3.9–5.4)
Potatoes, kumara and taro	5.8 (5.3–6.3)	9.1 (7.4–10.8)	6.3 (4.6–8.1)	6.0 (4.8–7.1)	5.8 (4.5–7.1)	4.4 (3.6–5.3)	6.1 (5.4–6.8)	8.0 (6.5–9.5)	7.7 (5.2–10.2)	5.7 (4.6–6.8)	3.9 (3.1–4.7)	3.4 (2.6–4.1)	5.5 (4.8–6.2)
Non-alcoholic beverages	4.5 (4.2–4.8)	1.4 (1.0–1.9)	2.7 (1.7–3.8)	3.4 (2.8–3.9)	5.9 (4.9–6.9)	6.4 (5.7–7.1)	4.0 (3.6–4.4)	2.4 (1.8–3.0)	3.4 (2.2–4.5)	4.7 (3.9–5.5)	6.1 (5.2–7.0)	6.9 (6.3–7.6)	4.9 (4.4–5.3)
Bread	4.4 (4.1–4.6)	5.0 (3.7–6.3)	4.7 (3.5–5.8)	4.9 (4.2–5.7)	4.5 (3.8–5.1)	4.8 (4.3–5.3)	4.7 (4.3–5.2)	4.9 (4.1–5.7)	3.5 (2.7–4.2)	4.3 (3.5–5.0)	3.6 (3.1–4.0)	5.1 (4.4–5.7)	4.1 (3.7–4.4)
Poultry	4.3 (3.8–4.7)	6.2 (4.6–7.9)	4.9 (3.4–6.5)	5.5 (3.9–7.1)	3.3 (2.2–4.5)	1.9 (1.3–2.4)	4.5 (3.8–5.3)	5.7 (4.0–7.3)	5.9 (4.4–7.5)	4.2 (3.3–5.1)	2.6 (1.9–3.3)	2.3 (1.6–2.9)	4.0 (3.5–4.5)
Fish and seafood	4.1 (3.6–4.6)	2.8 (1.4–4.2)	2.5 (1.4–3.7)	5.2 (3.6–6.8)	4.3 (3.0–5.7)	4.4 (3.3–5.5)	4.2 (3.4–4.9)	1.8 (1.1–2.5)	3.7 (2.2–5.2)	4.4 (3.2–5.5)	4.5 (3.3–5.7)	3.9 (3.0–4.8)	4.0 (3.4–4.6)
Savoury sauces and condiments	4.0 (3.6–4.3)	5.6 (4.0–7.1)	5.1 (3.7–6.4)	4.4 (3.4–5.4)	2.9 (1.9–3.8)	1.8 (1.4–2.3)	4.0 (3.4–4.5)	5.0 (3.6–6.3)	4.7 (3.5–6.0)	4.3 (3.5–5.1)	3.4 (2.6–4.1)	2.2 (1.6–2.7)	4.0 (3.5–4.4)
Grains and pasta	3.8	5.2	5.7	3.8	3.5	2.4	4.1	5.4	5.3	4.0	1.9	1.9	3.6
Cakes and muffins	3.5	1.8	2.1	3.9	3.9	3.4	3.3	4.5	3.7	3.0	3.8	4.3	3.6
Eggs and egg dishes	3.4	4.0	2.8	3.7	3.9	3.4	3.6	2.2	4.3	2.8	3.2	3.5	3.2
Beef and veal	3.0	3.2	3.8	3.5	3.6	3.0	3.5	2.5	1.9	2.8	2.3	2.3	2.4
Breakfast cereals	2.9	2.3	2.2	2.6	3.8	2.6	2.8	1.7	2.3	3.2	3.4	3.3	3.0
Nuts and seeds	2.4	2.0	1.5	2.1	2.0	1.7	1.9	1.4	1.7	3.4	3.8	1.6	2.8
Biscuits	2.2	2.8	0.9	2.0	1.8	3.0	1.9	3.3	2.3	2.7	2.0	2.6	2.5
Pies and pasties	1.8	2.5	2.8	2.1	1.6	1.1	2.1	1.9	2.0	1.6	1.3	1.0	1.6
Sausages and processed meats	1.6	2.0	2.4	2.0	1.1	1.3	1.8	1.8	1.4	1.5	1.2	1.1	1.4
Milk	1.4	1.4	1.1	1.3	1.3	1.3	1.3	1.6	1.6	1.8	1.4	1.3	1.6
Soups and stocks	1.3	0.3	1.2	0.7	0.8	2.1	0.9	1.0	1.4	1.5	1.8	2.1	1.6
Sugar and sweets	1.2	1.1	2.4	1.1	0.3	0.6	1.1	1.7	1.4	1.4	0.9	0.6	1.2
Dairy products	1.0	1.4	0.7	0.9	1.1	0.9	1.0	1.4	1.6	0.9	0.8	0.8	1.0
Fats and oils	0.9	0.3	2.0	0.7	0.3	0.7	0.8	0.4	1.6	1.0	1.1	0.5	1.0

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Snack foods	0.9	1.6	1.7	0.6	0.3	0.1	0.8	2.4	1.8	1.1	0.4	0.0	1.0
Pork	0.9	1.3	1.6	0.8	1.2	0.9	1.1	0.6	0.8	0.5	0.7	0.7	0.7
Snack bars	0.8	2.6	0.6	1.1	0.5	0.2	0.8	1.4	0.5	0.9	0.7	0.3	0.7
Cheese	0.7	0.6	0.9	0.8	0.4	0.4	0.7	0.9	0.7	1.1	0.6	0.5	0.8
Puddings and desserts	0.7	0.8	0.2	0.6	1.0	1.5	0.7	0.8	1.0	0.5	0.6	0.9	0.7
Lamb and mutton	0.5	0.3	0.6	0.5	0.8	0.4	0.6	0.4	0.7	0.3	0.7	0.4	0.5
Supplements providing energy	0.4	1.9	1.2	0.3	0.1	0.1	0.5	0.6	0.3	0.2	0.1	0.6	0.3
Other meat	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Alcoholic beverages	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

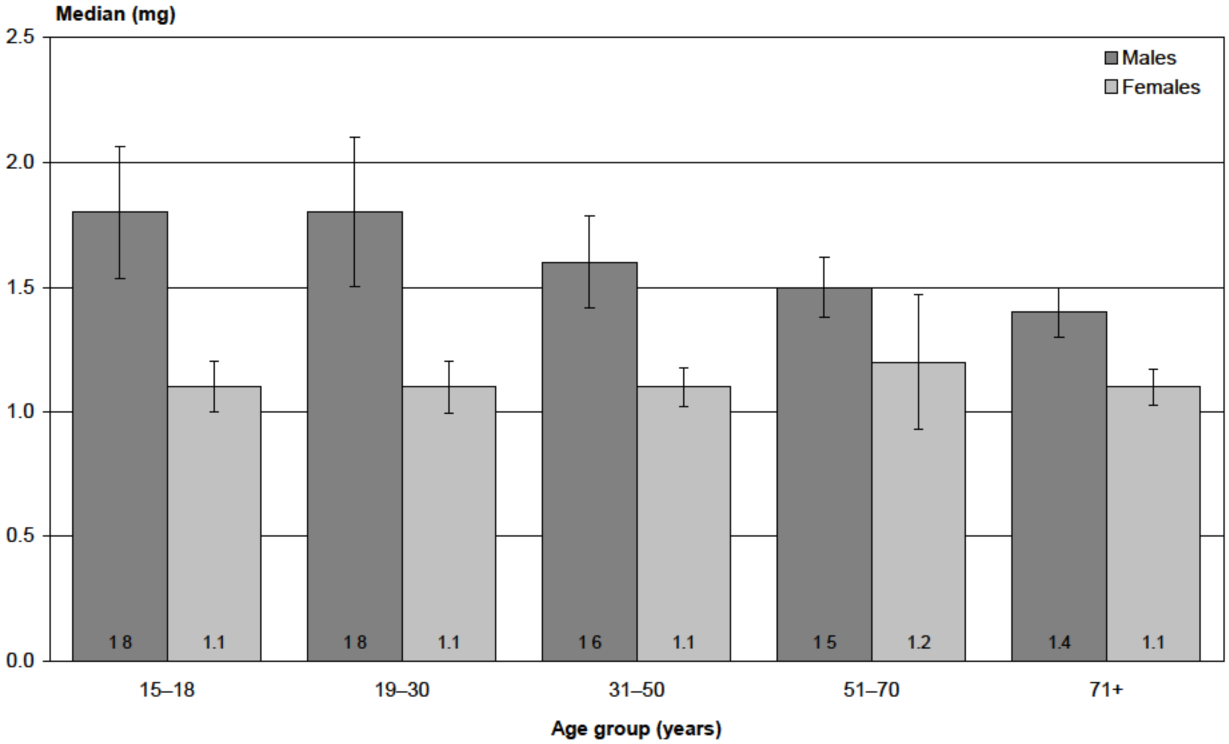
4.5 The B vitamins

Thiamin

Thiamin, also known as vitamin B_1, is one of the water-soluble vitamins. Thiamin is part of the coenzyme thiamine pyrophosphate, which is used in energy metabolism within body cells (Mann and Truswell 2007; Rolfes et al 2009). It also has a role in nerve processes and the responding muscle tissues (Rolfes et al 2009). Another coenzyme form is thiamine triphosphate, which is found in the brain (Mann and Truswell 2007). Thiamin is widely distributed in the food supply and there are no rich food sources (Mann and Truswell 2007).

The median usual daily thiamin intake was 1.6 mg for males and 1.1 mg for females (Table 4.11). Males aged 71+ years had lower intakes than males aged 15-30 years. There were no differences in intake across age groups for females (Figure 4.11), or within ethnic groups, or across quintiles of NZDep2006. Overall, there was no gradient across NZDep2006 quintiles in intakes of thiamin, after adjusting for age, sex and ethnic group.

Figure 4.11: Median thiamin intake (mg), by age group and sex



The estimated prevalence of inadequate intake of thiamin was 13.3% for males and 27.6% for females. Given the variability in absolute requirement (it is related to energy metabolism), a cautious approach is warranted when interpreting these data; this is especially so because there are no biochemical or clinical data to place alongside the nutrient intake data. Levels of intake of thiamin were similar to those in the 1997 National Nutrition Survey, at which time they were deemed satisfactory compared to the UK dietary references values (DRVs) (Department of Health [UK] 1991).

The *Bread* and *Breakfast cereals* groups were the main contributors of thiamin to the diet (17% and 14%, respectively) (Figure 4.12), followed by *Vegetables* (7%), *Bread-based dishes* and *Milk* (each 6%), and *Potatoes, kumara and taro*, *Grains and pasta* and *Savoury sauces and condiments* (each 5%) (Table 4.12).

Figure 4.12: Percent thiamin from *Breakfast cereals*, by age group and sex

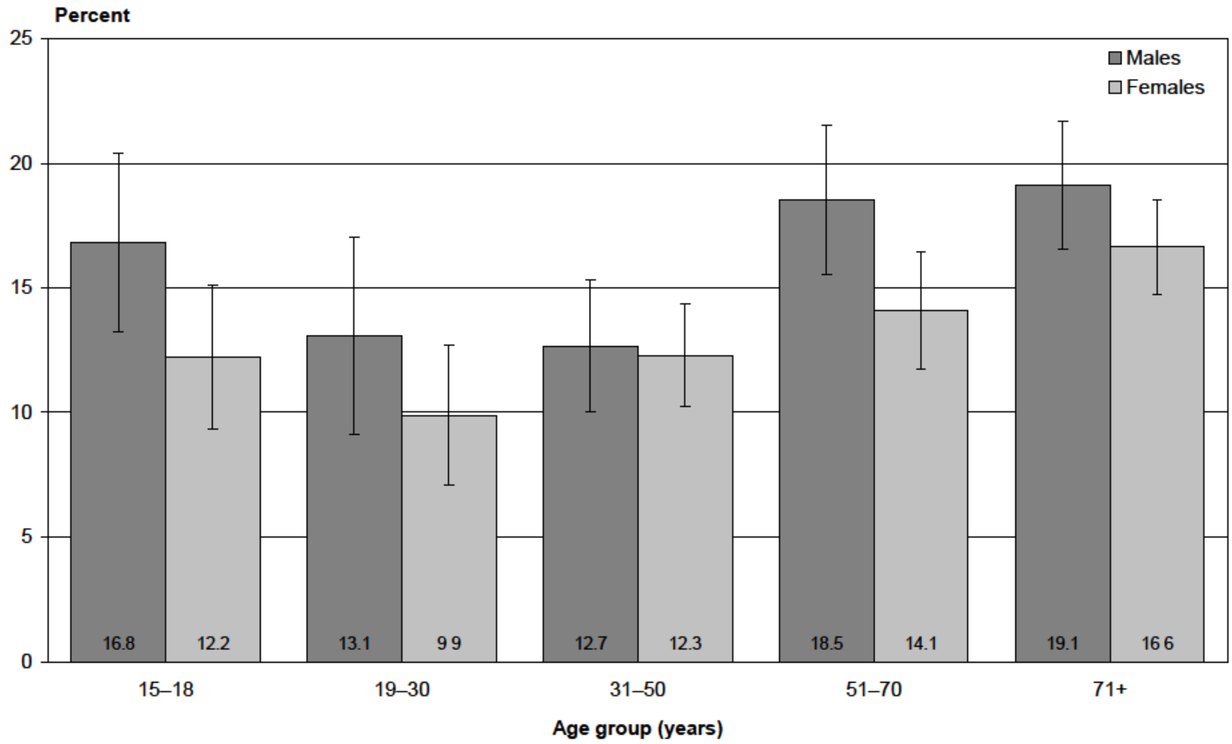


Table 4.11: Thiamin intake, by age group, ethnic group, NZDep2006 and sex

		Thiamin (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%), (95% CI)[3]**
Total population		1.5	0.8	1.3 (1.3–1.4)	2.3	20.7
By age group (years)						
Males	15–18	2.0	1.0	1.8 (1.5–2.0)	3.4	10.2*
	19–30	2.0	1.2	1.8 (1.5–2.1)	2.8	3.0*
	31–50	1.8	1.0	1.6 (1.5–1.8)	2.8	12.4
	51–70	1.6	0.8	1.5 (1.3–1.6)	2.7	20.5
	71+	1.6	0.8	1.4 (1.3–1.5)	2.5	21.3
	Total	1.8	0.9	1.6 (1.5–1.7)	2.8	13.3
Females	15–18	1.2	0.6	1.1 (0.9–1.2)	2.0	38.3
	19–30	1.1	0.8	1.1 (1.0–1.2)	1.5	30.1
	31–50	1.2	0.7	1.1 (1.1–1.2)	1.9	29.3
	51–70	1.2	0.8	1.2 (0.9–1.4)	1.7	20.5*
	71+	1.2	0.7	1.1 (1.0–1.2)	1.8	27.8
	Total	1.2	0.7	1.1 (1.0–1.2)	1.8	27.6
Māori						
Males	15–18	1.8	1.1	1.7 (1.0–2.3)	2.8	7.1*
	19–30	2.1	1.1	1.9 (1.5–2.2)	3.3	8.1*
	31–50	1.7	0.9	1.6 (1.3–1.8)	2.8	15.4
	51+	1.7	0.7	1.4 (1.1–1.8)	3.1	25.6
	Total	1.9	1.0	1.7 (1.5–1.9)	2.9	14.5
Females	15–18	1.1	0.4	0.9 (0.6–1.2)	1.9	49.9
	19–30	1.3	0.7	1.2 (1.1–1.3)	1.9	21.0
	31–50	1.2	0.6	1.1 (1.0–1.2)	1.9	30.0
	51+	1.1	0.5	1.0 (0.8–1.1)	1.8	44.6
	Total	1.2	0.6	1.1 (1.0–1.1)	1.9	32.9
Pacific						
Males	15–18	1.3	0.8	1.3 (0.9–1.6)	1.8	23.0*
	19–30	1.7	0.8	1.5 (0.9–2.1)	2.8	21.4*
	31–50	1.7	0.7	1.3 (1.0–1.5)	3.0	32.8
	51+	1.3	0.5	1.2 (0.9–1.5)	2.3	40.2
	Total	1.6	0.9	1.5 (1.2–1.7)	2.4	29.5*
Females	15–18	1.0	0.5	1.0 (0.7–1.3)	1.6	43.7
	19–30	1.3	0.8	1.2 (1.0–1.5)	1.8	35.2
	31–50	1.3	0.7	1.2 (1.0–1.4)	2.1	24.2
	51+	1.2	0.6	1.1 (0.9–1.3)	2.1	35.4
	Total	1.3	0.8	1.2 (1.1–1.4)	1.9	35.2

		Thiamin (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
NZEO						
Males	15–18	2.1	1.1	1.9 (1.5–2.2)	3.4	6.9*
	19–30	1.9	1.3	1.8 (1.5–2.1)	2.6	1.2*
	31–50	1.8	1.0	1.7 (1.5–1.8)	2.8	10.5
	51+	1.6	0.9	1.5 (1.4–1.6)	2.6	17.4
	Total	1.8	1.0	1.6 (1.5–1.7)	2.7	11.0
Females	15–18	1.2	0.6	1.1 (1.0–1.2)	2.0	34.7
	19–30	1.1	0.8	1.0 (0.9–1.1)	1.3	18.1*
	31–50	1.2	0.7	1.1 (1.1–1.2)	1.8	29.0
	51+	1.2	0.8	1.1 (1.0–1.2)	1.7	22.9
	Total	1.2	0.7	1.1 (1.0–1.2)	1.8	25.0
By NZDep2006 quintile						
Males	1	1.8	0.9	1.6 (1.4–1.8)	2.9	[4]
	2	1.9	1.1	1.7 (1.5–2.0)	2.9	[4]
	3	1.8	0.9	1.6 (1.4–1.7)	2.9	[4]
	4	1.7	0.9	1.5 (1.3–1.7)	2.7	[4]
	5	1.8	0.9	1.6 (1.4–1.8)	2.9	[4]
Females	1	1.2	0.7	1.1 (1.0–1.2)	1.7	[4]
	2	1.2	0.8	1.2 (1.1–1.3)	1.7	[4]
	3	1.2	0.7	1.1 (1.0–1.1)	1.8	[4]
	4	1.2	0.7	1.2 (1.1–1.2)	1.9	[4]
	5	1.2	0.7	1.1 (1.0–1.2)	1.8	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.12: Thiamin sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	16.6 (15.9–17.3)	14.0 (11.6–16.4)	15.5 (12.6–18.5)	17.8 (15.9–19.7)	16.7 (14.6–18.8)	19.6 (17.3–21.9)	16.9 (15.8–18.0)	14.7 (12.8–16.7)	14.0 (11.7–16.2)	16.6 (14.7–18.4)	16.5 (14.9–18.2)	19.9 (17.5–22.2)	16.3 (15.3–17.2)
Breakfast cereals	13.9 (13.0–14.9)	16.8 (13.2–20.4)	13.1 (9.1–17.1)	12.7 (10.0–15.3)	18.5 (15.6–21.5)	19.1 (16.6–21.7)	15.2 (13.7–16.7)	12.2 (9.3–15.1)	9.9 (7.1–12.7)	12.3 (10.2–14.3)	14.1 (11.7–16.5)	16.6 (14.7–18.6)	12.7 (11.6–13.9)
Vegetables	7.3 (6.8–7.8)	3.4 (2.5–4.3)	4.7 (3.5–5.9)	6.6 (5.6–7.6)	6.9 (5.5–8.3)	7.1 (6.3–7.8)	6.1 (5.5–6.7)	4.8 (3.8–5.7)	8.4 (6.2–10.6)	8.0 (6.9–9.1)	9.9 (8.6–11.2)	8.6 (7.8–9.5)	8.4 (7.7–9.1)
Bread-based dishes	5.8 (5.2–6.5)	11.4 (8.8–13.9)	10.2 (6.8–13.7)	6.3 (4.8–7.8)	5.6 (3.5–7.7)	2.0 (1.2–2.9)	6.9 (5.8–8.1)	10.2 (7.9–12.5)	6.9 (4.7–9.1)	5.0 (3.7–6.2)	2.9 (1.9–3.9)	1.8 (1.2–2.5)	4.8 (4.1–5.6)
Milk	5.6 (5.2–6.0)	4.8 (3.7–5.9)	4.0 (2.7–5.3)	5.5 (4.5–6.5)	5.4 (4.4–6.4)	6.0 (5.2–6.8)	5.2 (4.6–5.7)	4.1 (3.2–5.0)	5.0 (3.9–6.0)	6.7 (5.6–7.7)	6.2 (5.2–7.2)	6.7 (5.8–7.5)	6.0 (5.5–6.5)
Potatoes, kumara and taro	5.5 (5.1–5.8)	8.0 (6.3–9.7)	6.1 (4.5–7.7)	5.6 (4.7–6.5)	4.5 (3.7–5.3)	4.1 (3.5–4.7)	5.4 (4.9–6.0)	7.7 (6.4–9.1)	7.4 (5.6–9.3)	5.3 (4.3–6.2)	4.4 (3.6–5.2)	3.7 (3.2–4.2)	5.5 (4.9–6.0)
Grains and pasta	5.4 (4.8–5.9)	5.0 (3.5–6.6)	6.8 (4.5–9.0)	5.3 (4.0–6.6)	5.3 (3.6–7.0)	6.5 (4.7–8.3)	5.7 (4.8–6.6)	5.7 (4.4–7.0)	6.9 (4.6–9.3)	5.1 (4.0–6.2)	3.8 (2.8–4.7)	4.4 (3.5–5.4)	5.1 (4.4–5.8)
Savoury sauces and condiments	5.2 (4.6–5.8)	3.9 (2.5–5.3)	4.4 (2.3–6.6)	4.9 (3.4–6.4)	4.7 (3.0–6.5)	5.0 (3.7–6.3)	4.7 (3.8–5.6)	5.3 (3.6–7.0)	4.6 (2.9–6.2)	5.7 (4.1–7.2)	6.0 (4.3–7.6)	6.7 (5.4–8.0)	5.6 (4.8–6.5)
Pork	4.5 (4.0–5.0)	4.8 (2.9–6.7)	6.2 (4.0–8.4)	4.6 (3.3–5.9)	5.7 (3.7–7.8)	4.8 (3.8–5.8)	5.3 (4.4–6.1)	3.1 (2.1–4.2)	3.1 (1.8–4.5)	4.1 (3.0–5.2)	3.9 (2.9–4.9)	3.6 (2.8–4.4)	3.7 (3.2–4.3)
Fruit	3.9 (3.6–4.1)	3.0 (1.8–4.1)	2.8 (1.9–3.8)	3.0 (2.4–3.6)	3.1 (2.6–3.7)	4.4 (3.7–5.0)	3.1 (2.8–3.5)	3.3 (2.7–3.9)	3.9 (3.1–4.7)	4.7 (3.9–5.4)	5.2 (4.4–6.0)	4.9 (4.5–5.4)	4.6 (4.2–5.0)
Non-alcoholic beverages	3.0	3.1	2.9	2.6	2.3	2.0	2.6	4.6	4.4	3.4	2.8	2.8	3.5
Beef and veal	3.0	2.6	3.2	4.0	3.0	3.0	3.4	2.6	2.0	3.0	3.0	2.3	2.7
Poultry	2.8	3.3	3.0	3.5	2.2	1.1	2.8	3.5	3.4	3.1	2.0	1.4	2.7
Cakes and muffins	1.9	1.0	2.0	1.7	1.9	1.4	1.7	2.4	2.7	1.6	1.9	2.0	2.0
Fish and seafood	1.8	1.0	1.2	1.8	1.7	2.0	1.6	0.8	2.1	1.9	2.3	1.3	1.9
Dairy products	1.6	1.4	1.0	1.2	1.5	1.3	1.3	2.1	2.2	1.5	2.1	2.2	1.9
Pies and pasties	1.5	2.7	2.1	2.0	0.9	0.9	1.7	2.1	2.2	1.1	1.1	0.9	1.4
Biscuits	1.5	1.4	0.5	1.3	1.3	1.3	1.1	2.5	1.4	1.9	1.7	1.5	1.7
Eggs and egg dishes	1.1	1.0	0.9	1.2	1.2	1.2	1.1	0.7	1.6	1.0	1.2	1.2	1.1
Soups and stocks	1.0	0.4	0.9	0.5	0.5	1.7	0.7	0.7	1.1	1.0	1.6	2.5	1.3
Alcoholic beverages	1.0	0.8	1.0	0.9	1.3	1.1	1.0	0.2	0.6	1.4	1.1	0.5	1.0
Nuts and seeds	1.0	0.2	0.4	0.7	1.5	0.8	0.8	0.4	0.4	1.3	1.9	0.6	1.2

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Lamb and mutton	1.0	0.5	1.1	0.8	1.3	0.6	1.0	0.6	1.5	0.6	1.4	0.9	1.0
Sausages and processed meats	0.9	1.0	1.4	1.6	0.7	0.6	1.2	1.2	1.0	0.7	0.5	0.6	0.7
Snack bars	0.6	1.6	0.5	1.0	0.3	0.2	0.7	1.0	0.5	0.5	0.6	0.2	0.5
Sugar and sweets	0.6	0.4	1.1	0.5	0.3	0.3	0.5	1.0	0.8	0.7	0.4	0.2	0.6
Snack foods	0.5	0.8	1.0	0.3	0.4	0.1	0.5	1.2	0.7	0.6	0.4	0.1	0.6
Cheese	0.5	0.4	0.7	0.6	0.4	0.3	0.5	0.6	0.3	0.7	0.5	0.4	0.6
Puddings and desserts	0.4	0.3	0.1	0.4	0.4	0.8	0.4	0.3	0.5	0.3	0.4	0.5	0.4
Supplements providing energy	0.3	1.2	1.0	0.2	0.1	0.0	0.4	0.4	0.4	0.2	0.1	0.5	0.2
Other meat	0.3	0.1	0.2	0.4	0.3	0.5	0.3	0.1	0.3	0.2	0.2	0.3	0.2
Butter and margarine	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

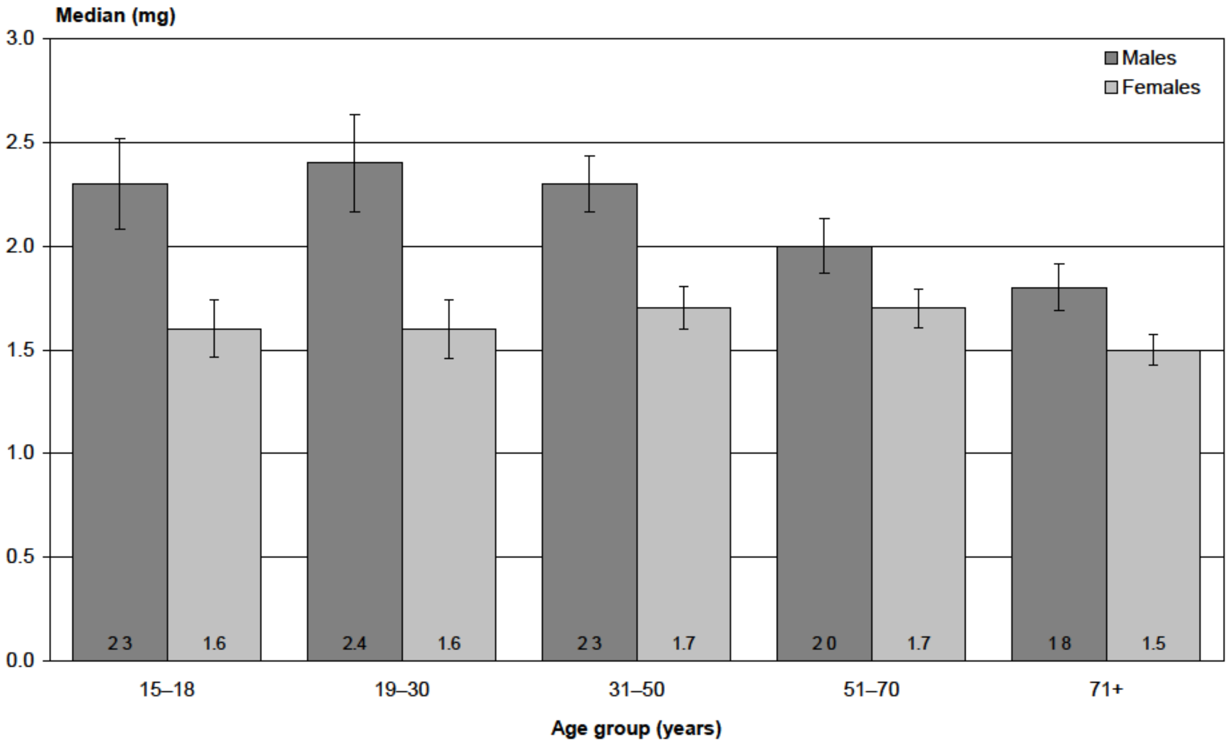
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Riboflavin

Riboflavin, or vitamin B_2, is a water-soluble vitamin which is part of the flavin co-enzymes involved in energy metabolism in all body cells. Most foods contain some riboflavin. The best sources are milk and milk products (Rolfes et al 2009).

The median usual daily intake of riboflavin for the New Zealand population was 2.2 mg for males and 1.7 mg for females (Table 4.13). There were no differences in riboflavin intake with age for females. Older males (71+ years) had lower intakes of riboflavin than males aged 15–50 years (Figure 4.13).

Figure 4.13: Median riboflavin intake (mg), by age group and sex



For both males and females there were no differences in intakes of riboflavin between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of riboflavin, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of riboflavin was 4.8% (males 4.2%; females 5.5%). The higher prevalence of inadequate intake for those aged 71+ years, among both males (18.7%) and females (15.4%), results from a higher EAR for this age group, set on the basis of one UK study of riboflavin status in free-living elderly. An estimated prevalence of inadequate intake above 10% was observed for Māori females aged 15–18 years and for Pacific males and females.

Milk was the largest single contributor of riboflavin to the diet (23%) (Figure 4.14), followed by *Non-alcoholic beverages* (8%), *Breakfast cereals* (6%), *Vegetables* and *Dairy products* (each 5%) (Table 4.14).

Figure 4.14: Percent riboflavin from *Milk*, by age group and sex

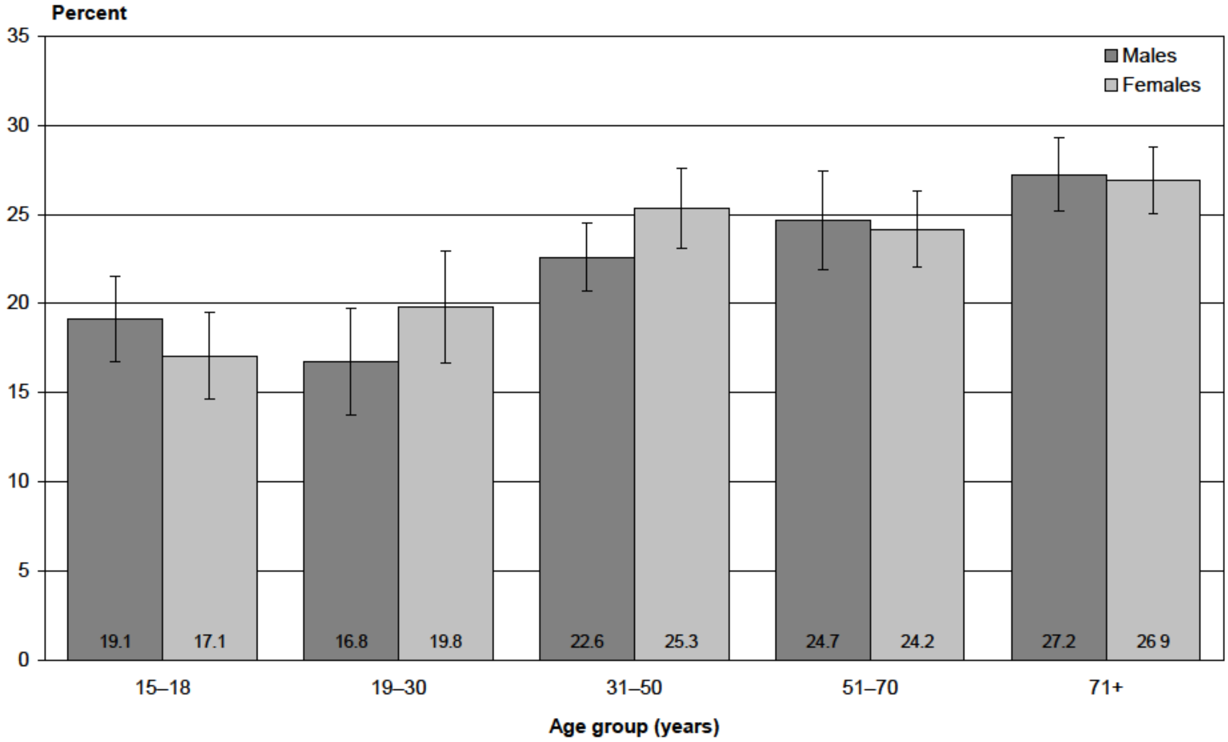


Table 4.13: Riboflavin intake, by age group, ethnic group, NZDep2006 and sex

		Riboflavin (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
Total population		2.0	1.2	1.9 (1.9–1.9)	2.9	4.8
By age group (years)						
Males	15–18	2.4	1.5	2.3 (2.1–2.5)	3.4	1.5*
	19–30	2.4	1.7	2.4 (2.1–2.6)	3.2	0.2*
	31–50	2.4	1.5	2.3 (2.2–2.4)	3.3	1.6*
	51–70	2.2	1.2	2.0 (1.9–2.1)	3.5	6.6
	71+	2.0	1.1	1.8 (1.7–1.9)	2.9	18.7
	Total	2.3	1.4	2.2 (2.1–2.3)	3.3	4.2
Females	15–18	1.6	1.0	1.6 (1.4–1.7)	2.2	4.3*
	19–30	1.7	0.9	1.6 (1.5–1.8)	2.6	8.5
	31–50	1.8	1.1	1.7 (1.6–1.8)	2.6	4.2
	51–70	1.7	1.2	1.7 (1.6–1.8)	2.2	1.3*
	71+	1.6	1.0	1.5 (1.5–1.6)	2.2	15.4
	Total	1.7	1.1	1.7 (1.6–1.7)	2.5	5.5
Māori						
Males	15–18	2.0	1.3	1.9 (1.6–2.1)	2.9	2.8*
	19–30	2.5	1.5	2.4 (2.0–2.8)	3.7	2.0*
	31–50	2.1	1.3	2.0 (1.7–2.3)	3.1	3.6*
	51+	2.0	1.2	2.0 (1.7–2.2)	2.9	7.1*
	Total	2.2	1.6	2.2 (2.0–2.3)	3.0	3.8

		Riboflavin (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
Females	15–18	1.4	0.8	1.3 (0.9–1.7)	2.1	15.1*
	19–30	1.9	1.2	1.8 (1.6–2.1)	2.6	1.8*
	31–50	1.8	1.1	1.7 (1.6–1.8)	2.6	4.9*
	51+	1.6	1.0	1.5 (1.3–1.6)	2.2	5.7*
	Total	1.8	1.1	1.7 (1.5–1.8)	2.5	5.4
Pacific						
Males	15–18	1.6	1.1	1.5 (1.1–2.0)	2.2	13.1*
	19–30	2.1	1.2	2.0 (1.4–2.5)	3.2	5.8*
	31–50	2.0	1.0	1.8 (1.5–2.0)	3.1	14.4*
	51+	1.5	0.7	1.4 (1.1–1.8)	2.3	28.4
	Total	1.9	1.0	1.8 (1.6–1.9)	3.0	14.4
Females	15–18	1.4	0.8	1.3 (1.0–1.7)	2.1	16.2*
	19–30	1.6	0.9	1.5 (1.3–1.8)	2.3	16.8
	31–50	1.6	0.9	1.6 (1.4–1.7)	2.5	8.6*
	51+	1.4	0.9	1.3 (1.1–1.5)	1.9	8.7*
	Total	1.6	0.9	1.5 (1.4–1.6)	2.4	13.1
NZEO						
Males	15–18	2.4	1.5	2.3 (2.1–2.6)	3.5	1.6*
	19–30	2.4	1.4	2.2 (2.0–2.5)	3.6	4.1
	31–50	2.4	1.7	2.4 (2.2–2.5)	3.2	0.2*
	51+	2.1	1.3	2.0 (1.9–2.1)	3.1	4.4
	Total	2.3	1.5	2.2 (2.1–2.4)	3.2	2.7
Females	15–18	1.6	1.2	1.6 (1.4–1.8)	2.2	1.7*
	19–30	1.7	1.0	1.6 (1.4–1.8)	2.5	7.2*
	31–50	1.8	1.2	1.7 (1.6–1.9)	2.5	2.3*
	51+	1.7	1.1	1.6 (1.6–1.7)	2.3	2.9*
	Total	1.7	1.1	1.7 (1.6–1.7)	2.4	3.4
By NZDep2006 quintile						
Males	1	2.3	1.3	2.2 (2.0–2.4)	3.5	[4]
	2	2.4	1.5	2.3 (2.1–2.5)	3.4	[4]
	3	2.2	1.5	2.2 (1.9–2.4)	3.0	[4]
	4	2.3	1.4	2.2 (2.0–2.4)	3.2	[4]
	5	2.3	1.4	2.1 (1.8–2.4)	3.5	[4]
Females	1	1.7	1.2	1.6 (1.5–1.8)	2.2	[4]
	2	1.8	1.2	1.7 (1.6–1.9)	2.5	[4]
	3	1.7	1.0	1.6 (1.5–1.7)	2.4	[4]
	4	1.7	1.1	1.6 (1.5–1.7)	2.4	[4]
	5	1.7	1.0	1.7 (1.6–1.8)	2.6	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.14: Riboflavin sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Milk	22.9 (22.0–23.7)	19.1 (16.7–21.5)	16.8 (13.8–19.7)	22.6 (20.7–24.5)	24.7 (21.9–27.4)	27.2 (25.2–29.3)	22.1 (20.9–23.3)	17.1 (14.7–19.5)	19.8 (16.7–22.9)	25.3 (23.1–27.6)	24.2 (22.0–26.3)	26.9 (25.1–28.8)	23.5 (22.3–24.8)
Non-alcoholic beverages	8.1 (7.4–8.7)	5.0 (3.4–6.7)	10.1 (7.0–13.3)	7.1 (5.8–8.5)	6.8 (5.1–8.5)	4.9 (4.3–5.5)	7.3 (6.4–8.2)	7.2 (5.3–9.2)	10.0 (7.4–12.6)	9.1 (7.3–10.9)	8.8 (7.4–10.2)	6.5 (5.7–7.3)	8.8 (7.9–9.7)
Breakfast cereals	6.0 (5.5–6.4)	8.4 (6.5–10.2)	5.5 (3.8–7.3)	5.3 (4.2–6.4)	8.3 (6.7–9.8)	8.5 (7.4–9.6)	6.7 (5.9–7.4)	5.4 (4.1–6.7)	4.5 (3.2–5.8)	5.1 (4.2–6.1)	5.6 (4.6–6.6)	6.6 (5.8–7.5)	5.3 (4.8–5.8)
Vegetables	5.1 (4.7–5.4)	2.5 (1.7–3.3)	3.0 (2.2–3.8)	4.8 (4.0–5.6)	4.3 (3.5–5.0)	5.4 (4.9–6.0)	4.2 (3.8–4.6)	3.2 (2.6–3.9)	5.3 (3.7–6.9)	5.5 (4.7–6.3)	7.3 (6.2–8.4)	6.4 (5.6–7.3)	5.9 (5.3–6.4)
Dairy products	4.8 (4.3–5.2)	4.5 (3.2–5.7)	3.6 (2.1–5.0)	4.1 (3.2–5.1)	4.1 (3.0–5.1)	4.0 (3.2–4.8)	4.0 (3.5–4.6)	6.2 (4.8–7.6)	6.3 (4.4–8.2)	4.1 (3.2–4.9)	6.1 (4.9–7.3)	6.4 (5.3–7.5)	5.4 (4.8–6.0)
Grains and pasta	4.2 (3.8–4.7)	5.5 (3.9–7.2)	6.6 (4.6–8.6)	3.7 (2.8–4.5)	3.9 (2.7–5.2)	2.7 (2.0–3.4)	4.4 (3.7–5.0)	6.8 (5.1–8.4)	6.3 (4.0–8.7)	4.1 (3.0–5.1)	2.3 (1.7–2.8)	2.4 (1.6–3.2)	4.1 (3.4–4.7)
Bread	4.2 (3.9–4.4)	4.0 (3.2–4.8)	3.9 (2.9–5.0)	4.7 (4.0–5.4)	4.2 (3.5–4.9)	5.4 (4.5–6.2)	4.4 (4.1–4.8)	4.2 (3.5–4.9)	3.4 (2.7–4.0)	3.9 (3.3–4.5)	3.9 (3.4–4.3)	5.3 (4.4–6.1)	4.0 (3.7–4.2)
Eggs and egg dishes	4.1 (3.7–4.6)	4.2 (2.6–5.8)	3.2 (2.0–4.5)	4.3 (3.3–5.3)	4.8 (3.7–6.0)	4.7 (3.6–5.8)	4.3 (3.6–4.9)	2.7 (1.8–3.5)	5.6 (3.7–7.5)	3.5 (2.7–4.3)	3.8 (3.0–4.6)	4.5 (3.0–6.0)	4.0 (3.5–4.6)
Savoury sauces and condiments	4.0 (3.5–4.4)	3.5 (1.9–5.2)	3.4 (1.6–5.1)	3.6 (2.5–4.7)	3.8 (2.5–5.1)	4.2 (3.1–5.2)	3.6 (3.0–4.3)	4.5 (3.1–5.9)	3.5 (2.2–4.8)	4.2 (3.1–5.4)	4.6 (3.2–6.0)	5.0 (4.0–6.0)	4.3 (3.6–4.9)
Bread-based dishes	3.9 (3.4–4.4)	8.9 (7.1–10.7)	7.8 (4.9–10.7)	4.0 (2.8–5.1)	3.0 (1.9–4.1)	1.0 (0.6–1.4)	4.6 (3.8–5.4)	8.5 (6.2–10.9)	4.4 (2.8–6.1)	3.2 (2.4–4.1)	1.6 (1.1–2.1)	0.9 (0.6–1.3)	3.2 (2.7–3.7)
Fruit	3.6	2.7	2.6	2.7	2.9	4.5	2.9	3.0	3.3	3.9	5.4	5.1	4.2
Poultry	3.5	4.8	3.7	4.4	3.1	1.8	3.7	4.4	4.5	3.7	2.5	1.9	3.4
Beef and veal	3.2	3.4	3.0	3.9	3.4	3.6	3.5	2.9	2.0	3.1	3.4	3.3	3.0
Cheese	2.9	2.5	3.5	3.2	2.3	2.1	2.9	3.0	2.0	3.7	2.8	2.5	3.0
Potatoes, kumara and taro	2.2	3.8	2.3	2.3	2.2	2.1	2.4	3.1	2.6	2.0	1.7	1.8	2.1
Alcoholic beverages	2.0	1.5	4.1	3.2	3.3	3.0	3.3	0.4	0.6	1.4	0.7	0.6	0.9
Pork	1.9	2.4	2.6	2.0	2.5	2.3	2.3	1.7	1.3	1.7	1.5	1.8	1.6
Cakes and muffins	1.7	0.9	1.3	1.8	1.8	1.3	1.6	2.9	2.1	1.5	1.8	2.1	1.9
Fish and seafood	1.7	1.1	1.4	1.7	1.9	1.7	1.7	0.8	1.6	1.7	2.1	1.3	1.7
Pies and pasties	1.6	2.4	3.0	2.1	1.2	1.0	2.0	2.0	1.8	1.1	1.2	1.1	1.3
Lamb and mutton	1.5	0.8	1.7	1.3	1.9	1.3	1.5	0.7	2.0	1.1	2.0	1.3	1.5
Sausages and processed meats	1.3	1.5	1.6	1.5	1.1	1.0	1.4	1.8	1.6	1.2	1.0	0.9	1.2
Sugar and sweets	1.2	0.8	1.5	1.3	0.7	0.5	1.1	2.3	1.4	1.6	0.8	0.5	1.3

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Puddings and desserts	0.7	0.6	0.2	0.8	0.6	1.9	0.7	0.6	0.8	0.7	0.9	1.0	0.8
Soups and stocks	0.6	0.3	0.6	0.3	0.5	1.2	0.5	0.7	0.5	0.9	0.9	1.0	0.8
Biscuits	0.6	0.8	0.3	0.5	0.5	0.7	0.5	1.3	0.6	0.8	0.7	0.6	0.7
Nuts and seeds	0.6	0.6	0.3	0.6	0.5	0.4	0.5	0.5	0.5	0.8	1.1	0.3	0.7
Other meat	0.6	0.1	0.1	0.4	1.2	1.4	0.6	0.1	0.4	0.3	0.7	1.0	0.5
Snack bars	0.4	1.4	0.3	0.8	0.2	0.1	0.5	0.8	0.4	0.3	0.4	0.2	0.4
Supplements providing energy	0.4	1.3	1.4	0.2	0.1	0.0	0.5	0.5	0.5	0.3	0.1	0.5	0.3
Snack foods	0.2	0.4	0.4	0.2	0.0	0.0	0.2	0.6	0.4	0.3	0.1	0.0	0.2
Butter and margarine	0.1	0.1	0.0	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

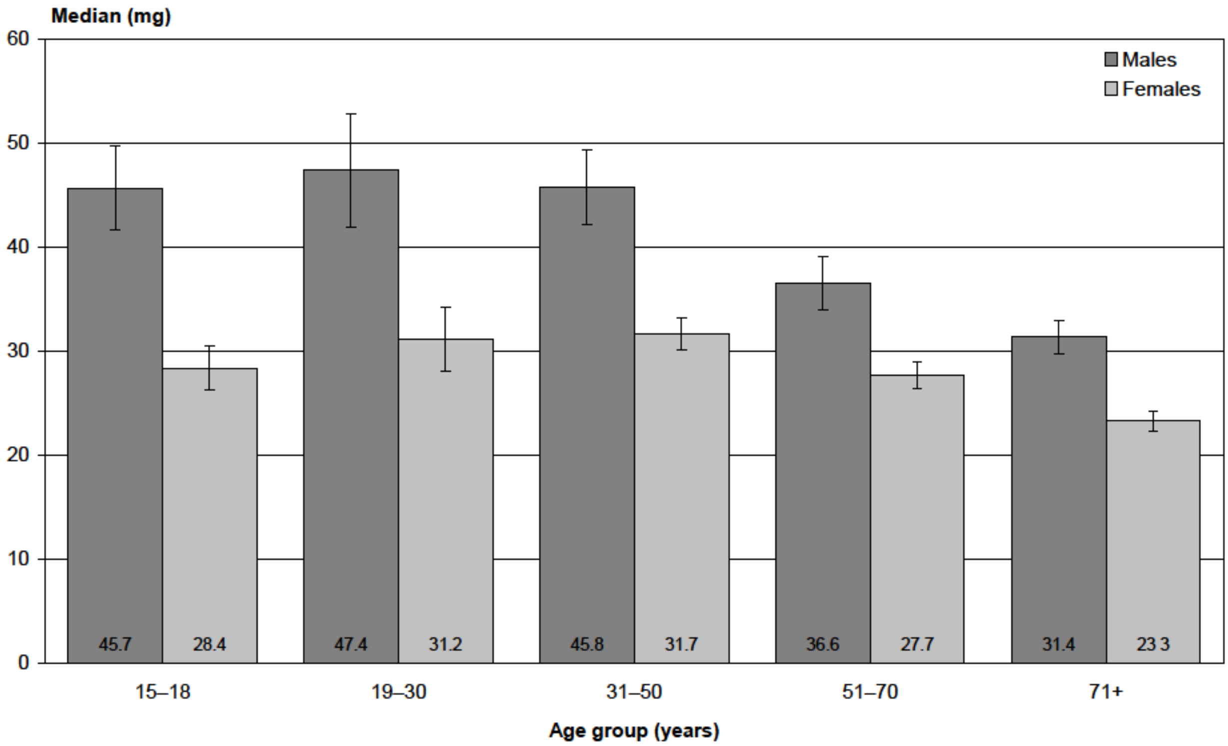
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Niacin equivalents

'Niacin equivalents' is a term used to describe compounds that act to prevent pellagra, a vitamin deficiency disease. The forms of niacin that are consumed from foods are nicotinamide and nicotinic acid. In addition, niacin can be synthesised in the liver from tryptophan. One niacin equivalent (mg) is equal to 60 mg tryptophan. Niacin has an essential role in energy metabolism as part of coenzymes. A good source of pre-formed niacin is meat. Foods that are rich in protein provide tryptophan (Mann and Truswell 2007).

The median usual daily intake of niacin was 42.2 mg niacin equivalents (NE) for males and 29.1 mg for females (Table 4.15). The higher level for males reflects their higher energy and protein intakes and therefore higher intake of tryptophan, a precursor of niacin. Males aged 15–30 years had higher intakes of niacin equivalents than males aged 51+ years. Females aged 71+ years had lower intakes than all other females (Figure 4.15).

Figure 4.15: Median niacin intake (mg), by age group and sex



Māori males and females aged 51+ years had lower intakes of niacin equivalents than Māori males aged 19–50 years and females aged 19–30 years. Pacific males aged 51+ years had intakes lower than Pacific males aged 31–50 years.

For both males and females there were no differences in intakes of niacin equivalents between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of niacin equivalents, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of niacin equivalents was zero for males and 0.1% for females. The prevalence of inadequate intake was less than 5% across all population subgroups.

The main contributors of niacin equivalents to the diet are *Poultry* (9%), *Bread* and *Non-alcoholic beverages* (each 8%), *Beef and veal* (7%), *Potatoes, kumara and taro*, *Fish and seafood*, *Bread-based dishes* and *Grains and pasta* (each 6%), *Vegetables* and *Milk* (each 5%) (Table 4.16).

Figure 4.16: Percent niacin from bread, by age group and sex

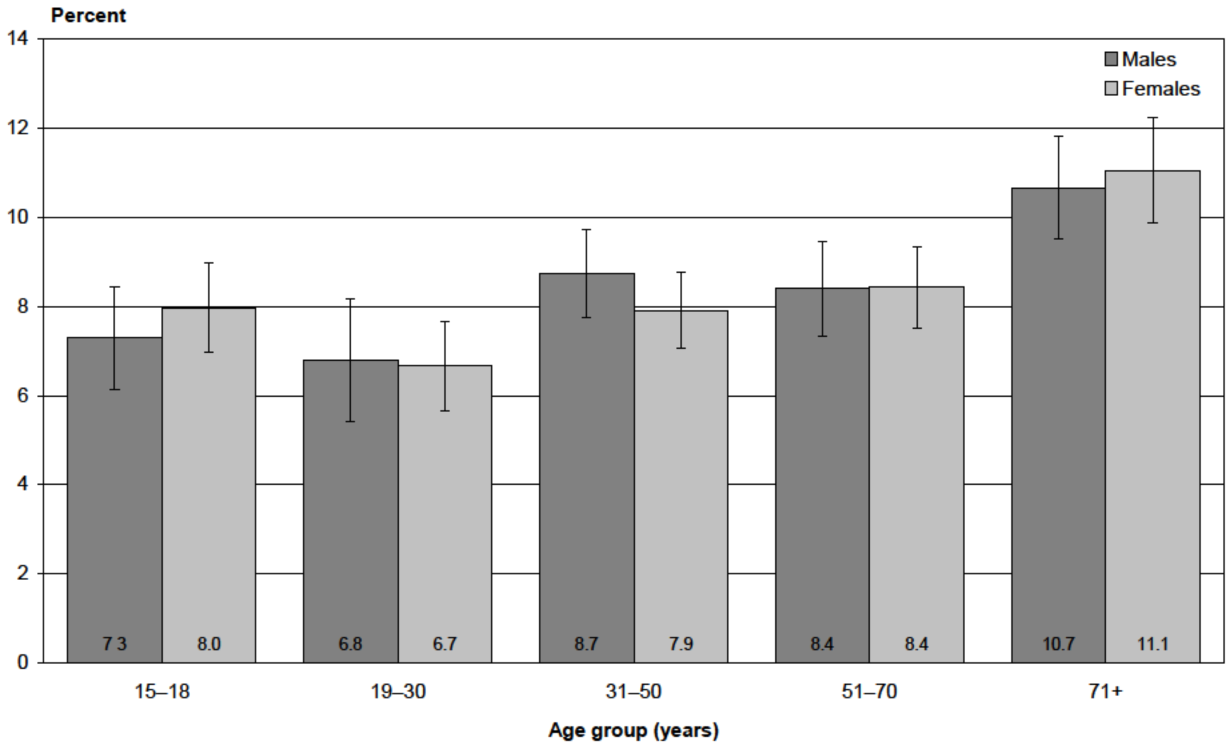


Table 4.15: Niacin equivalents intake, by age group, ethnic group, NZDep2006 and sex

		Niacin equivalents (mg)[1]				
		Mean	**10th[2]**	**Median (50th)[2] (95% CI)**	**90th[2]**	**Inadequate intake (%, 95% CI)[3]**
Total population		36.9	23.1	34.7 (33.5–35.9)	53.3	0.0
By age group (years)						
Males	15–18	46.1	38.3	45.7 (41.7–49.7)	54.6	0.0
	19–30	50.6	31.2	47.4 (41.9–52.9)	74.0	0.0
	31–50	46.7	36.1	45.8 (42.2–49.4)	58.4	0.0
	51–70	39.0	24.6	36.6 (34.0–39.2)	56.1	0.1
	71+	32.0	24.1	31.4 (29.8–33.0)	40.6	0.0
	Total	43.9	30.0	42.2 (40.4–44.0)	60.0	0.0
Females	15–18	30.1	19.1	28.4 (26.3–30.5)	43.1	0.2
	19–30	32.0	24.1	31.2 (28.1–34.3)	40.9	0.0
	31–50	32.6	22.7	31.7 (30.1–33.3)	43.7	0.0
	51–70	28.3	20.0	27.7 (26.4–29.0)	37.4	0.0
	71+	24.2	16.8	23.3 (22.3–24.3)	32.7	0.4
	Total	30.3	20.7	29.1 (28.1–30.1)	41.3	0.1
Māori						
Male	15–18	44.1	25.1	38.3 (17.1–59.5)	73.2	0.5*
	19–30	56.0	29.0	51.0 (44.5–57.5)	87.0	0.6
	31–50	49.1	36.6	47.8 (43.2–52.4)	63.0	0.0
	51+	39.4	21.7	37.4 (32.6–42.2)	59.3	1.4*
	Total	48.9	33.9	47.3 (44.7–49.9)	65.7	0.5
Female	15–18	29.8	13.8	24.4 (11.9–36.9)	50.6	4.2*
	19–30	34.7	25.9	33.8 (28.9–38.7)	44.6	0.0
	31–50	31.8	19.3	30.1 (27.5–32.7)	46.4	0.1
	51+	26.2	18.9	25.7 (23.4–28.0)	34.0	0.0
	Total	31.8	20.2	30.1 (28.3–31.9)	45.3	0.5
Pacific						
Males	15–18	52.4	28.0	50.0 (37.2–62.8)	81.0	0.3*
	19–30	52.2	20.0	48.0 (36.3–59.7)	89.0	3.1*
	31–50	48.2	38.2	47.6 (40.3–54.9)	59.0	0.0
	51+	35.2	17.2	33.9 (28.5–39.3)	54.8	3.7
	Total	47.2	25.0	45.0 (40.8–49.2)	72.0	1.7
Females	15–18	30.8	14.1	28.1 (22.8–33.4)	51.0	4.8*
	19–30	32.7	19.1	30.9 (27.2–34.6)	48.6	0.5
	31–50	35.7	23.1	34.5 (30.4–38.6)	49.9	0.0*
	51+	31.6	16.6	28.0 (24.4–31.6)	50.4	1.6*
	Total	33.4	19.8	31.8 (29.4–34.2)	49.1	1.2

		Niacin equivalents (mg)[1]				
		Mean	10th[2]	Median (50th)[2] (95% CI)	90th[2]	Inadequate intake (%, 95% CI)[3]
NZEO						
Males	15–18	44.9	37.7	44.3 (38.5–50.1)	52.9	0.0
	19–30	49.4	33.1	47.2 (41.0–53.4)	68.3	0.0
	31–50	46.9	37.2	46.3 (42.5–50.1)	57.4	0.0
	51+	36.8	26.3	35.6 (31.0–40.2)	48.8	0.0
	Total	43.4	31.7	42.3 (40.3–44.3)	56.3	0.0
Females	15–18	29.9	20.0	28.4 (26.3–30.5)	41.5	0.0
	19–30	30.8	22.9	30.1 (26.9–33.3)	39.7	0.0
	31–50	32.5	23.9	31.8 (29.9–33.7)	42.1	0.0
	51+	27.1	19.3	26.4 (25.5–27.3)	35.6	0.0
	Total	29.9	21.0	29.0 (28.1–29.9)	40.0	0.0
By NZDep2006 quintile						
Males	1	43.5	29.2	41.8 (37.5–46.1)	59.9	[4]
	2	45.6	35.5	44.9 (41.4–48.4)	56.7	[4]
	3	42.9	34.1	41.9 (37.6–46.2)	52.9	[4]
	4	42.3	27.7	41.0 (36.8–45.2)	58.7	[4]
	5	45.4	28.5	43.1 (39.0–47.2)	65.2	[4]
Females	1	29.6	22.4	29.1 (27.4–30.8)	37.5	[4]
	2	30.0	23.2	29.5 (27.6–31.4)	37.3	[4]
	3	30.9	19.9	29.5 (27.3–31.7)	44.1	[4]
	4	30.6	20.5	29.3 (27.5–31.1)	42.3	[4]
	5	30.2	18.9	28.6 (26.6–30.6)	43.4	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.16: Niacin equivalent sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Poultry	9.3 (8.5–10.1)	10.9 (8.2–13.7)	9.0 (6.4–11.5)	10.7 (8.4–13.1)	8.2 (6.0–10.5)	5.2 (3.9–6.4)	9.2 (8.0–10.4)	10.2 (7.8–12.5)	11.9 (9.6–14.3)	9.9 (8.0–11.7)	7.6 (5.7–9.6)	6.4 (4.6–8.1)	9.3 (8.4–10.3)
Bread	8.2 (7.9–8.6)	7.3 (6.1–8.4)	6.8 (5.4–8.2)	8.7 (7.8–9.7)	8.4 (7.3–9.5)	10.7 (9.5–11.8)	8.3 (7.8–8.8)	8.0 (7.0–9.0)	6.7 (5.7–7.7)	7.9 (7.1–8.8)	8.4 (7.5–9.3)	11.1 (9.9–12.2)	8.1 (7.7–8.6)
Non-alcoholic beverages	7.6 (7.0–8.1)	4.8 (3.4–6.2)	9.6 (6.8–12.4)	7.0 (5.8–8.2)	7.0 (5.8–8.2)	5.2 (4.6–5.7)	7.2 (6.4–8.0)	7.5 (5.6–9.4)	8.8 (6.7–10.9)	8.7 (7.3–10.1)	6.9 (6.1–7.8)	6.2 (5.6–6.7)	7.9 (7.2–8.6)
Beef and veal	7.2 (6.5–7.8)	6.5 (4.4–8.5)	5.8 (3.7–7.9)	8.1 (6.2–10.1)	8.0 (5.9–10.2)	9.3 (7.6–11.1)	7.6 (6.6–8.6)	5.5 (3.9–7.2)	4.5 (2.6–6.3)	7.1 (5.7–8.5)	7.8 (6.0–9.6)	8.4 (6.6–10.2)	6.8 (6.0–7.6)
Potatoes, kumara and taro	6.2 (5.9–6.6)	8.3 (6.6–10.0)	5.6 (4.3–6.9)	5.7 (4.8–6.6)	6.2 (5.3–7.1)	7.3 (6.5–8.0)	6.1 (5.6–6.6)	7.8 (6.6–9.0)	7.8 (5.9–9.7)	5.6 (4.7–6.5)	5.7 (4.9–6.6)	6.5 (5.7–7.2)	6.3 (5.7–6.9)
Fish and seafood	5.8 (5.2–6.3)	3.1 (1.9–4.4)	3.3 (1.8–4.8)	6.0 (4.5–7.5)	5.5 (4.0–7.1)	6.6 (5.1–8.1)	5.1 (4.4–5.9)	2.9 (1.8–4.0)	5.1 (3.0–7.1)	6.6 (5.0–8.1)	8.0 (6.2–9.7)	5.9 (4.5–7.2)	6.3 (5.5–7.2)
Bread-based dishes	5.7 (5.1–6.3)	12.0 (9.7–14.3)	10.9 (7.6–14.3)	5.8 (4.4–7.2)	4.7 (3.1–6.3)	1.9 (1.2–2.6)	6.7 (5.7–7.7)	10.6 (8.3–13.0)	6.6 (4.5–8.6)	5.3 (4.0–6.6)	2.4 (1.7–3.1)	1.7 (1.1–2.3)	4.8 (4.1–5.5)
Grains and pasta	5.7 (5.1–6.2)	5.7 (3.9–7.5)	8.0 (5.8–10.2)	6.0 (4.7–7.3)	4.8 (3.5–6.0)	3.7 (2.7–4.7)	5.8 (5.1–6.6)	7.4 (5.8–8.9)	8.3 (5.8–10.8)	5.6 (4.5–6.8)	3.5 (2.8–4.3)	3.5 (2.6–4.3)	5.5 (4.8–6.2)
Vegetables	5.2 (4.8–5.6)	2.5 (1.7–3.3)	3.4 (2.4–4.4)	4.6 (3.9–5.3)	4.5 (3.8–5.3)	6.0 (5.4–6.6)	4.3 (3.9–4.7)	3.5 (2.8–4.2)	5.4 (3.9–6.8)	5.6 (4.8–6.3)	7.6 (6.6–8.5)	6.9 (6.3–7.5)	6.1 (5.5–6.6)
Milk	5.0 (4.8–5.3)	4.1 (3.5–4.8)	3.4 (2.7–4.1)	4.4 (3.8–4.9)	5.5 (4.7–6.2)	6.2 (5.4–7.0)	4.6 (4.3–4.9)	4.1 (3.4–4.9)	4.5 (3.7–5.4)	5.8 (5.0–6.6)	5.5 (4.9–6.1)	6.7 (6.1–7.3)	5.4 (5.0–5.8)
Breakfast cereals	4.9	5.9	4.0	4.1	7.1	6.5	5.2	4.4	3.5	4.3	5.5	5.9	4.6
Pork	4.1	4.7	5.0	3.8	5.5	5.4	4.7	3.1	2.9	3.6	4.0	4.1	3.6
Fruit	2.8	1.9	1.7	1.8	2.7	3.7	2.2	2.3	2.7	2.8	4.4	4.6	3.4
Pies and pasties	2.6	4.4	5.2	3.1	2.0	1.8	3.2	2.9	2.8	2.0	1.4	1.3	2.0
Sausages and processed meats	2.3	2.5	2.8	2.7	2.1	2.3	2.5	3.3	2.1	2.1	2.2	2.0	2.2
Eggs and egg dishes	2.0	1.8	1.4	1.9	2.2	2.7	1.9	1.3	2.8	1.6	2.1	2.7	2.1
Lamb and mutton	1.9	1.1	1.6	1.6	2.7	1.8	1.9	1.0	2.3	1.3	2.8	2.4	2.0
Savoury sauces and condiments	1.8	1.7	1.7	1.7	1.8	1.9	1.7	2.2	1.5	1.9	2.1	2.2	1.9
Cheese	1.8	1.5	1.8	1.8	1.4	1.3	1.6	1.8	1.1	2.4	1.9	1.9	1.9
Nuts and seeds	1.6	1.7	1.0	1.6	1.8	1.5	1.5	0.9	0.9	2.1	1.9	1.0	1.6
Cakes and muffins	1.3	0.7	1.0	1.1	1.3	1.2	1.1	1.7	1.6	1.1	1.6	1.9	1.4
Alcoholic beverages	1.2	0.7	2.2	2.3	1.9	1.9	2.0	0.2	0.3	0.8	0.2	0.2	0.4
Dairy products	1.2	1.0	0.8	0.9	1.0	1.0	0.9	1.5	1.5	1.0	1.7	1.7	1.4

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Biscuits	1.0	1.0	0.4	0.8	0.9	1.1	0.8	1.7	0.9	1.2	1.2	1.3	1.2
Soups and stocks	0.9	0.3	0.8	0.5	0.7	1.5	0.7	0.7	0.7	1.1	1.6	1.6	1.2
Sugar and sweets	0.6	0.5	0.9	0.6	0.2	0.2	0.5	0.9	0.7	0.8	0.4	0.3	0.6
Snack bars	0.6	1.8	0.4	0.8	0.3	0.2	0.6	1.0	0.4	0.5	0.5	0.2	0.5
Other meat	0.5	0.2	0.2	0.6	1.0	1.0	0.6	0.2	0.2	0.3	0.5	0.6	0.4
Supplements providing energy	0.4	0.7	0.7	0.5	0.1	0.0	0.4	0.2	0.7	0.4	0.1	0.3	0.4
Puddings and desserts	0.4	0.3	0.1	0.3	0.4	1.0	0.3	0.3	0.4	0.3	0.4	0.6	0.4
Snack foods	0.3	0.4	0.4	0.2	0.1	0.0	0.2	0.6	0.6	0.3	0.2	0.0	0.3
Butter and margarine	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

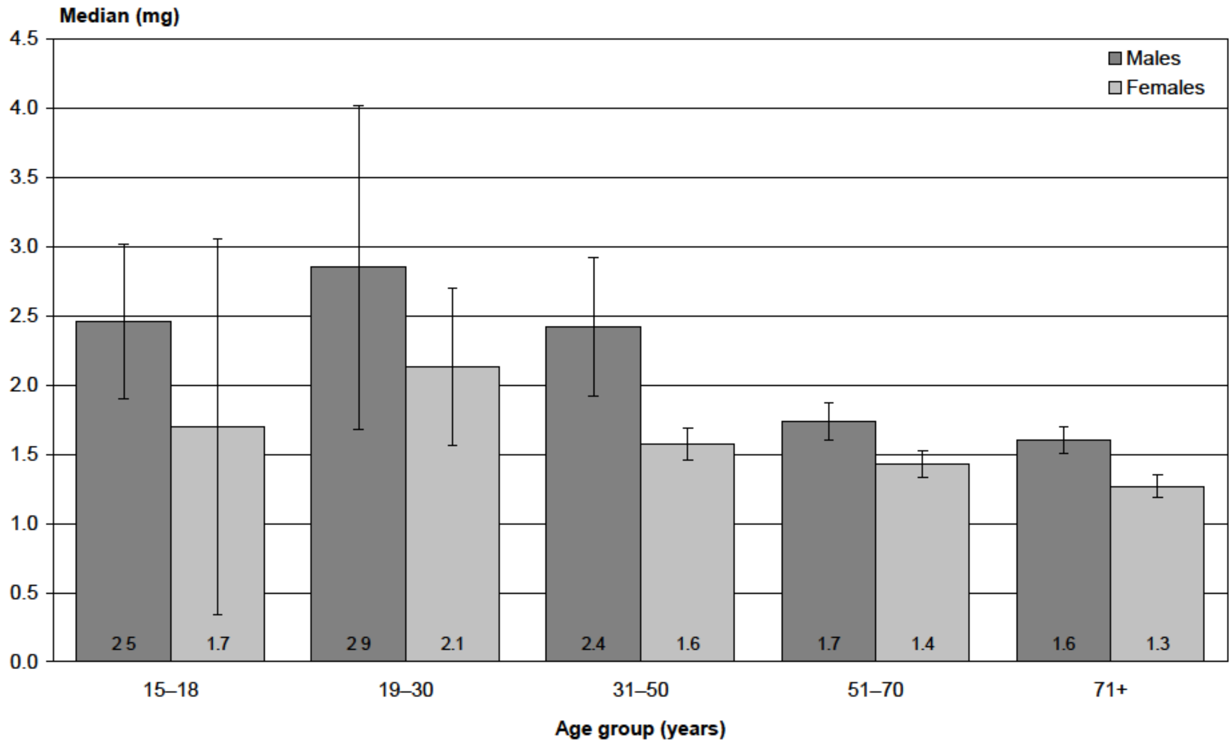
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Vitamin B_6

In nature vitamin B_6 has three forms, all of which can be converted in the body to the coenzyme pyridoxal phosphate, which is active in amino acid metabolism (Mann and Truswell 1997). Vitamin B_6 is found in a wide range of foods. Heat processing destroys vitamin B_6, so unprocessed or lightly processed foods contain more than their cooked form.

The median usual daily intake of vitamin B_6 was 2.2 mg for males and 1.6 mg for females (Table 4.17). Males aged 71+ years had lower intakes of vitamin B_6 than males aged 15–18 years and 31–50 years. Females aged 71+ years had lower intakes than females aged 19–50 years (Figure 4.17).

Figure 4.17: Median vitamin B_6 intake (mg), by age group and sex



Among Māori and Pacific males and females there were no differences in vitamin B_6 intake by age group.

For both males and females there were no differences in intakes of vitamin B_6 between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of vitamin B_6, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake was 16.9% (males 10.4%; females 22.9%), partly because the EAR for both males and females is higher for those aged 51+ years compared to younger age groups. However, vitamin B_6 is key to protein metabolism, and absolute protein intake is lower in these older age groups, so some caution should be exercised when interpreting the higher level of inadequacy among those aged 50+ years.

Vitamin B_6 intakes are above those in the 1997 National Nutrition Survey, when they were deemed to be satisfactory in comparison to the UK DRVs (Department of Health [UK] 1991). There are no biochemical or clinical data to place alongside the nutrient intake data to assess nutritional status.

The *Fruit* group was the largest single contributor of vitamin B_6 to the diet (13%) (Figure 4.18), followed by *Vegetables*, *Potatoes, kumara and taro* (each 10%), *Poultry* (7%), *Breakfast cereals* (6%), and *Bread, Non-alcoholic beverages*, *Grains and pasta* and *Beef and veal* (each 5%) (Table 4.18).

Figure 4.18: Percent vitamin B_6 from *Fruit*, by age group and sex

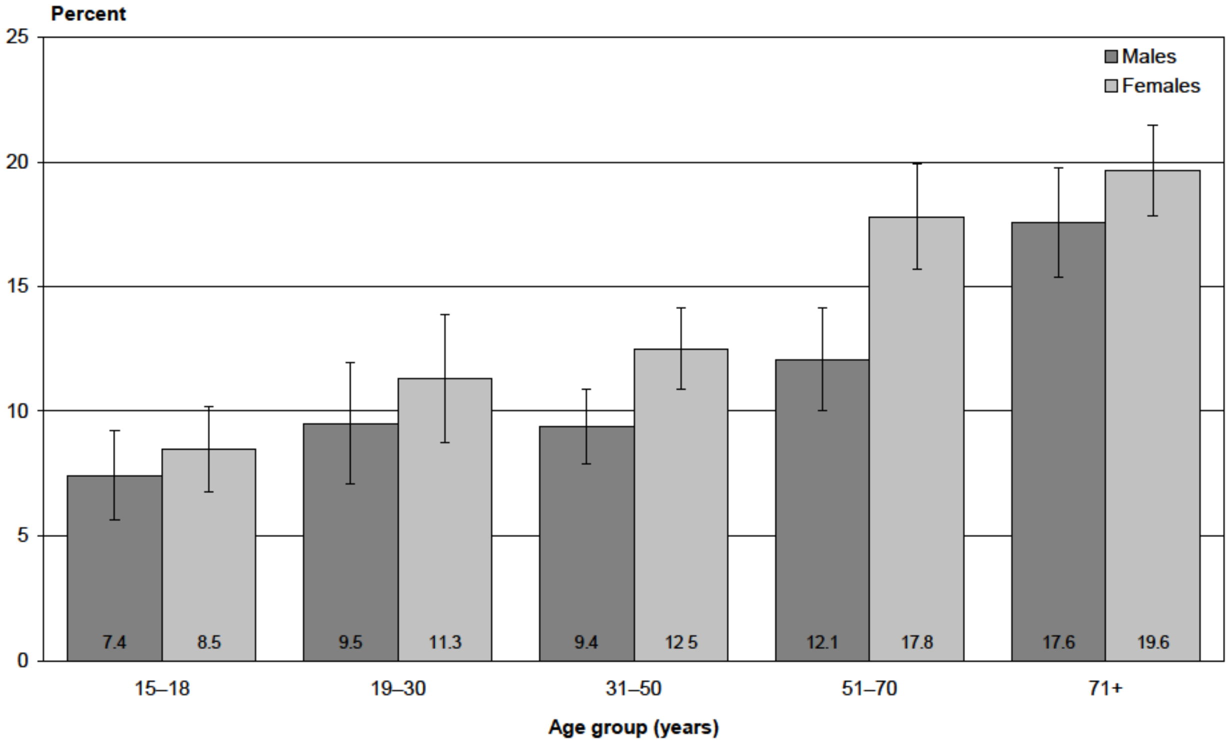


Table 4.17: Vitamin B_6 intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin B_6 (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%, 95% CI)[2]**
Total population		2.1	1.1	1.9 (1.7–2.0)	3.5	16.9
By age group (years)						
Males	15–18	2.7	1.7	2.5 (1.9–3.0)	3.9	0.0*
	19–30	3.3	1.6	2.9 (1.7–4.0)	5.5	1.5*
	31–50	2.6	1.7	2.4 (1.9–2.9)	3.6	0.2*
	51–70	1.9	1.1	1.7 (1.6–1.9)	2.9	27.5
	71+	1.6	1.2	1.6 (1.5–1.7)	2.1	28.8
	Total	2.5	1.4	2.2 (2.0–2.5)	3.9	10.4
Females	15–18	2.2	0.8	1.7 (0.3–3.1)	4.0	19.0
	19–30	2.3	1.4	2.1 (1.6–2.7)	3.3	0.8*
	31–50	1.8	1.0	1.6 (1.5–1.7)	2.8	17.0
	51–70	1.5	1.0	1.4 (1.3–1.5)	2.0	36.6
	71+	1.3	0.8	1.3 (1.2–1.4)	1.9	53.0
	Total	1.8	1.0	1.6 (1.4–1.7)	2.9	22.9
Māori						
Males	15–18	2.4	1.1	2.0 (1.4–2.6)	4.0	9.9*
	19–30	3.0	1.1	2.4 (1.6–3.1)	5.6	9.8
	31–50	2.3	1.2	2.0 (1.5–2.4)	3.8	7.1*
	51+	1.6	0.9	1.5 (1.3–1.7)	2.4	42.2
	Total	2.4	1.3	2.1 (1.8–2.5)	3.9	15.7
Females	15–18	1.9	0.5	1.1 (0.6–1.5)	3.6	47.1
	19–30	2.2	0.8	1.6 (1.3–2.0)	3.9	22.4
	31–50	1.7	0.8	1.4 (1.2–1.6)	2.8	25.7
	51+	1.3	0.9	1.2 (1.1–1.4)	1.7	57.2
	Total	1.9	0.8	1.5 (1.1–1.9)	3.5	34.0
Pacific						
Males	15–18	2.4	1.2	2.2 (1.4–2.9)	4.0	6.1*
	19–30	2.4	1.0	2.0 (1.1–2.9)	4.4	13.2*
	31–50	3.3	1.1	2.1 (1.7–2.6)	5.8	9.1
	51+	1.7	0.8	1.6 (1.3–1.9)	2.6	38.6
	Total	2.7	1.4	2.3 (1.6–3.0)	4.3	15.7*
Females	15–18	1.4	0.7	1.1 (0.8–1.5)	2.3	39.3
	19–30	1.7	0.8	1.5 (1.3–1.7)	2.7	24.7
	31–50	1.8	1.3	1.7 (1.4–2.0)	2.3	2.0*
	51+	1.5	0.9	1.4 (1.1–1.6)	2.1	42.1
	Total	1.7	1.1	1.6 (1.5–1.7)	2.4	23.6

		Vitamin B_6 (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%, 95% CI)[2]**
NZEO						
Males	15–18	2.7	1.8	2.5 (1.7–3.3)	3.8	0.0
	19–30	3.1	1.6	2.7 (1.7–3.6)	5.1	1.3*
	31–50	2.5	1.3	2.2 (2.0–2.4)	4.2	5.8
	51+	1.8	1.2	1.7 (1.6–1.9)	2.6	7.5
	Total	2.5	1.5	2.4 (2.1–2.7)	3.7	5.2
Females	15–18	2.2	0.9	1.7 (1.1–2.3)	3.9	14.8*
	19–30	2.2	1.2	1.9 (1.2–2.6)	3.4	7.0*
	31–50	1.8	1.0	1.6 (1.4–1.7)	2.7	17.4
	51+	1.4	0.9	1.4 (1.3–1.5)	2.0	42.0
	Total	1.7	1.0	1.5 (1.4–1.7)	2.8	24.7
By NZDep2006 quintile						
Males	1	2.6	1.6	2.4 (1.8–2.9)	4.0	[4]
	2	2.7	1.5	2.4 (2.0–2.8)	4.1	[4]
	3	2.4	1.3	2.1 (1.7–2.5)	3.9	[4]
	4	2.5	1.6	2.4 (1.9–2.9)	3.5	[4]
	5	2.3	1.3	2.2 (1.6–2.7)	3.7	[4]
Females	1	1.7	1.3	1.7 (1.4–1.9)	2.2	[4]
	2	1.7	1.0	1.5 (1.4–1.6)	2.6	[4]
	3	1.7	1.1	1.6 (1.4–1.9)	2.5	[4]
	4	2.0	0.8	1.5 (1.3–1.7)	3.5	[4]
	5	1.8	1.0	1.5 (1.3–1.7)	2.8	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.18: Vitamin B_6 sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Fruit	12.5 (11.8–13.2)	7.4 (5.6–9.2)	9.5 (7.1–11.9)	9.4 (7.9–10.9)	12.1 (10.0–14.1)	17.6 (15.4–19.8)	10.7 (9.7–11.7)	8.5 (6.8–10.2)	11.3 (8.7–13.8)	12.5 (10.9–14.1)	17.8 (15.7–19.9)	19.6 (17.8–21.4)	14.1 (13.1–15.1)
Vegetables	10.1 (9.5–10.7)	4.4 (3.4–5.5)	6.8 (5.1–8.4)	9.6 (8.2–10.9)	9.0 (7.5–10.4)	11.8 (10.7–12.8)	8.6 (7.9–9.4)	6.6 (5.4–7.8)	10.0 (7.8–12.2)	11.1 (9.8–12.4)	13.8 (12.3–15.4)	12.7 (11.6–13.7)	11.5 (10.6–12.3)
Potatoes, kumara and taro	10.0 (9.3–10.6)	11.3 (9.3–13.2)	7.8 (5.7–9.9)	9.4 (7.8–11.0)	11.7 (9.6–13.7)	13.0 (11.6–14.4)	10.2 (9.2–11.1)	10.8 (9.1–12.5)	11.7 (8.9–14.4)	9.1 (7.7–10.5)	8.6 (7.1–10.0)	11.1 (9.7–12.4)	9.8 (8.9–10.6)
Poultry	7.2 (6.6–7.9)	9.8 (6.8–12.9)	7.2 (4.9–9.4)	8.9 (6.7–11.1)	6.2 (4.4–8.1)	3.4 (2.6–4.3)	7.4 (6.3–8.5)	8.5 (6.4–10.6)	8.6 (6.8–10.5)	7.8 (6.2–9.3)	5.8 (4.2–7.5)	4.1 (3.0–5.3)	7.1 (6.3–7.9)
Breakfast cereals	6.4 (5.9–6.9)	8.8 (6.5–11.1)	5.5 (3.7–7.3)	5.6 (4.4–6.8)	8.8 (7.0–10.6)	8.5 (7.3–9.7)	7.0 (6.2–7.7)	6.1 (4.6–7.6)	4.2 (3.0–5.3)	6.0 (4.8–7.1)	6.6 (5.4–7.7)	7.3 (6.2–8.3)	5.9 (5.3–6.5)
Bread	5.4 (5.2–5.7)	5.4 (4.5–6.3)	4.8 (3.8–5.8)	5.8 (5.0–6.7)	5.8 (4.9–6.7)	6.7 (6.0–7.5)	5.6 (5.2–6.1)	5.9 (5.0–6.8)	3.9 (3.2–4.6)	5.1 (4.5–5.8)	5.5 (4.8–6.2)	7.0 (6.1–7.8)	5.2 (4.9–5.6)
Non-alcoholic beverages	5.1 (4.4–5.9)	6.4 (4.2–8.6)	11.9 (7.7–16.1)	5.2 (3.1–7.3)	2.9 (1.1–4.8)	0.9 (0.6–1.2)	5.7 (4.4–7.0)	8.6 (6.2–11.1)	9.1 (5.8–12.3)	3.9 (2.6–5.3)	2.4 (1.7–3.2)	1.8 (1.2–2.4)	4.6 (3.8–5.5)
Grains and pasta	5.1 (4.6–5.6)	5.0 (3.4–6.6)	7.3 (5.2–9.5)	5.5 (4.2–6.8)	4.6 (3.2–6.0)	2.9 (2.0–3.7)	5.3 (4.6–6.1)	7.0 (5.5–8.6)	7.2 (4.9–9.6)	5.2 (4.1–6.4)	3.0 (2.2–3.7)	2.6 (1.9–3.4)	4.9 (4.2–5.6)
Beef and veal	4.9 (4.4–5.4)	5.4 (3.6–7.3)	4.3 (2.6–6.0)	5.9 (4.4–7.4)	5.4 (3.8–7.1)	5.4 (4.3–6.4)	5.3 (4.5–6.2)	3.9 (2.6–5.1)	3.0 (1.6–4.4)	5.1 (4.0–6.2)	4.7 (3.6–5.8)	4.3 (3.4–5.3)	4.4 (3.9–5.0)
Milk	4.3 (4.1–4.6)	3.7 (3.1–4.4)	3.1 (2.3–3.8)	3.9 (3.3–4.4)	4.6 (3.9–5.2)	4.9 (4.3–5.5)	4.0 (3.7–4.3)	3.7 (3.0–4.4)	3.7 (3.0–4.4)	5.3 (4.6–6.0)	4.6 (4.1–5.2)	5.2 (4.7–5.7)	4.7 (4.3–5.0)
Bread-based dishes	4.2	8.8	8.2	4.6	3.7	1.5	5.2	7.9	4.4	3.8	1.4	0.9	3.3
Fish and seafood	4.0	2.5	2.5	4.2	3.5	3.4	3.5	2.3	3.8	4.8	5.1	4.0	4.4
Alcoholic beverages	2.7	1.2	2.6	3.8	3.4	3.4	3.2	0.3	1.5	2.8	2.4	1.8	2.2
Pork	2.7	3.5	3.3	2.6	3.6	3.0	3.1	2.0	1.8	2.3	2.5	2.5	2.2
Dairy products	1.8	2.1	1.7	1.7	1.6	1.5	1.7	2.3	2.9	1.4	2.0	2.3	2.0
Savoury sauces and condiments	1.8	2.1	1.8	2.0	1.9	1.3	1.9	2.1	1.6	2.0	1.7	1.5	1.8
Pies and pasties	1.6	2.0	2.3	1.9	1.7	1.2	1.9	1.9	1.4	1.3	1.2	0.9	1.3
Lamb and mutton	1.2	0.9	0.9	1.0	2.3	1.0	1.3	0.7	1.4	0.7	1.5	1.1	1.1
Sausages and processed meats	1.1	1.2	1.2	1.5	0.9	1.0	1.2	1.8	1.0	1.0	0.9	0.8	1.0
Soups and stocks	1.1	0.3	0.9	0.6	0.6	1.8	0.7	0.7	0.8	1.4	1.6	2.1	1.3
Cakes and muffins	1.0	0.4	0.7	0.7	1.2	1.0	0.8	1.3	1.1	0.9	1.2	1.4	1.1
Cheese	0.9	0.8	1.1	1.0	0.7	0.6	0.9	1.1	0.6	1.3	0.9	0.9	1.0
Sugar and sweets	0.9	0.4	1.0	1.3	0.4	0.3	0.8	1.3	1.5	1.1	0.5	0.5	1.0

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Biscuits	0.8	0.7	0.4	0.8	0.7	0.8	0.7	0.9	0.6	1.2	0.8	0.8	0.9
Nuts and seeds	0.6	0.3	0.5	0.5	0.8	0.5	0.6	0.4	0.4	0.7	1.0	0.4	0.7
Eggs and egg dishes	0.6	0.6	0.4	0.6	0.6	0.8	0.6	0.4	0.7	0.5	0.7	0.7	0.6
Snack foods	0.5	1.0	0.7	0.5	0.2	0.1	0.5	1.2	0.8	0.6	0.3	0.0	0.5
Snack bars	0.5	1.5	0.5	0.8	0.3	0.2	0.6	0.8	0.4	0.3	0.4	0.2	0.4
Puddings and desserts	0.3	0.3	0.1	0.2	0.3	0.9	0.3	0.3	0.4	0.4	0.4	0.5	0.4
Supplements providing energy	0.3	1.4	0.9	0.2	0.1	0.0	0.4	0.5	0.2	0.3	0.1	0.4	0.2
Other meat	0.3	0.1	0.1	0.3	0.5	0.6	0.3	0.1	0.1	0.2	0.3	0.4	0.2
Butter and margarine	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

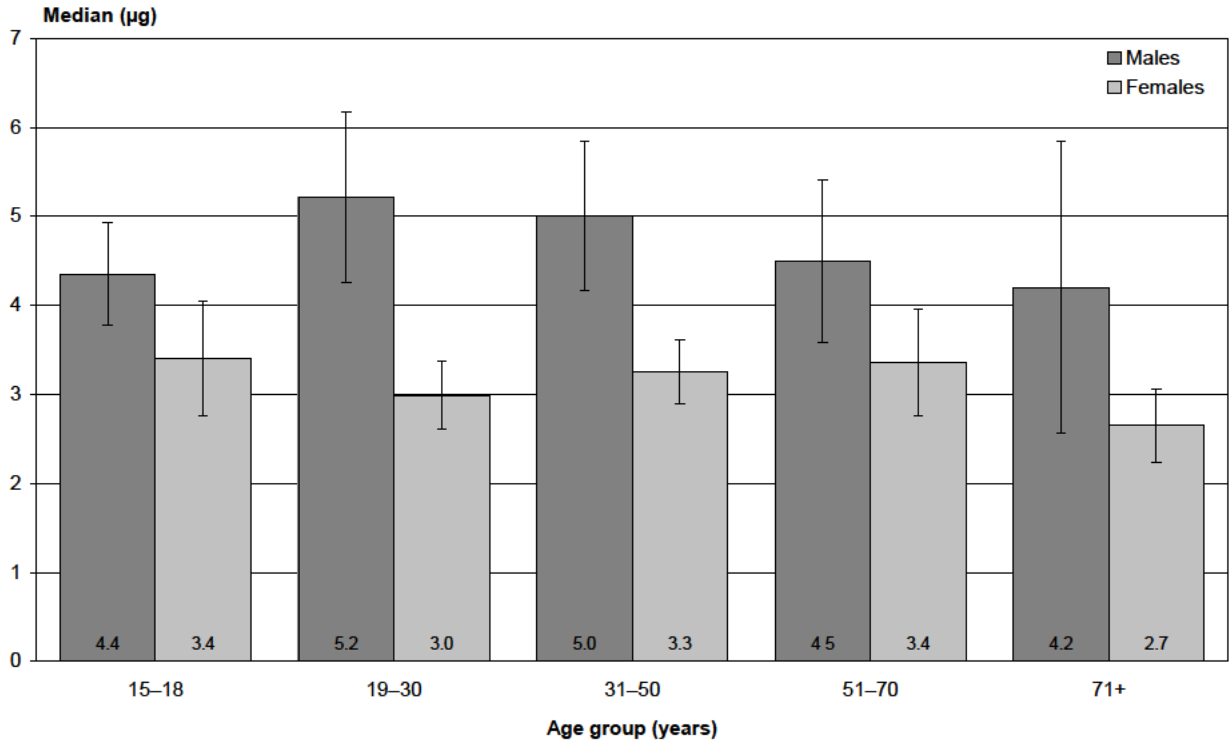
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

Vitamin B_{12}

Vitamin B_{12} is found almost exclusively in foods derived from animals. It is part of the coenzymes involved in DNA synthesis and regulation. It also helps maintain nerve cells, reforms folate coenzyme, and is involved in fatty acid and amino acid metabolism (Rolfes et al 2009).

The median usual daily intake of vitamin B_{12} was 4.7 µg for males and 3.3 µg for females (Table 4.19). There was little variation across age groups for both males and females (Figure 4.19).

Figure 4.19: Median vitamin B_{12} intake (µg), by age group and sex



Among Māori and Pacific males and females there were no differences in vitamin B_{12} intake by age group.

For both males and females there were no differences in intakes of vitamin B_{12} between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of vitamin B_{12}, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake for vitamin B_{12} was 7.9% (males 1.3%; females 14.1%). There was a higher prevalence of inadequate intake among females, particularly those aged 19–30 (22.8%), and 71+ years (27.0%), compared to those aged 51–70 years (1.1%).

The *Milk* group was the largest single contributor of vitamin B_{12} to the diet (21%), followed by *Beef and veal* (11%) (Figure 4.20), *Fish and seafood* (10%), *Eggs and egg dishes, Bread-based dishes* and *Poultry* (each 6%), *Non-alcoholic beverages* and *Cheese* (each 5%) (Table 4.20).

Figure 4.20: Percent vitamin B_{12} from *Beef and veal*, by age group and sex

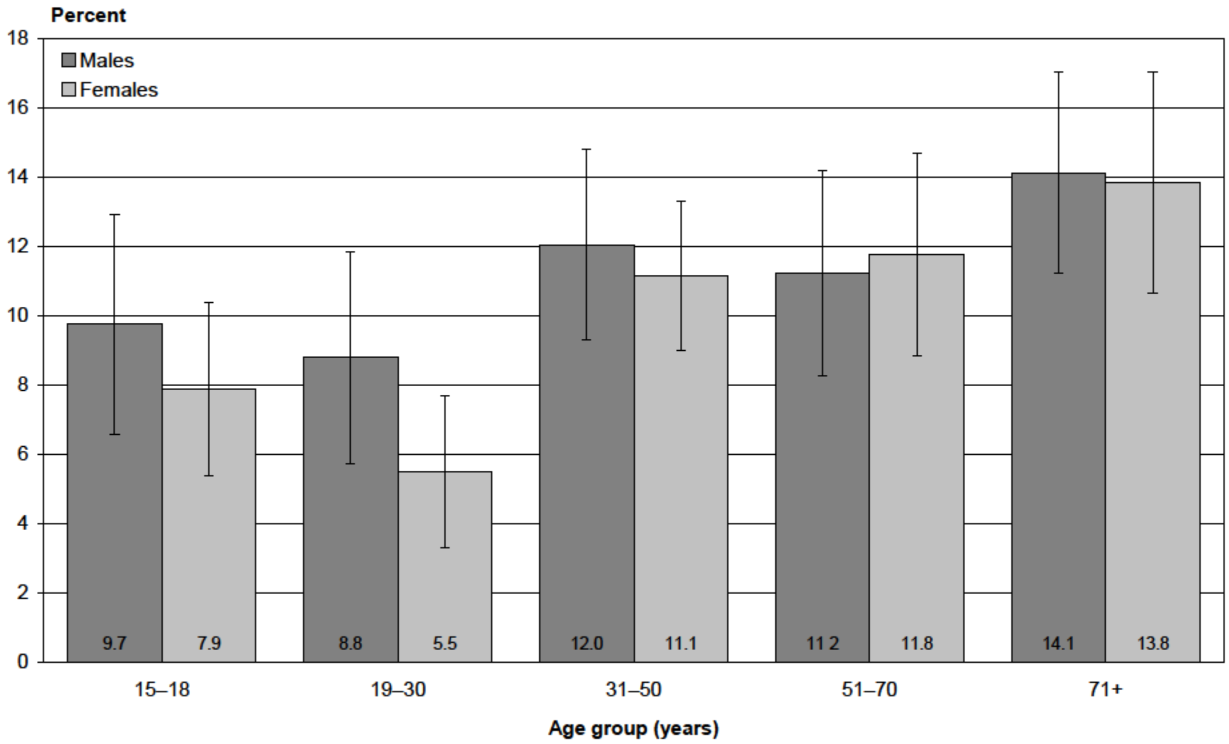


Table 4.19: Vitamin B_{12} intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin B_{12} (µg)[1]				
		Mean	**10th**[2]	**Median (50th),[2] (95% CI)**	**90th**[2]	**Inadequate intake (%), (95% CI)[3]**
Total population		4.4	2.3	3.9 (3.7–4.1)	7.2	7.9
By age group (years)						
Males	15–18	4.6	2.9	4.4 (3.8–4.9)	6.5	1.1*
	19–30	5.3	4.1	5.2 (4.2–6.2)	6.6	0.0
	31–50	5.2	3.4	5.0 (4.2–5.9)	7.3	0.2*
	51–70	5.2	2.6	4.5 (3.6–5.4)	8.7	2.8*
	71+	5.7	2.4	4.2 (2.6–5.8)	10.2	3.8*
	Total	5.3	3.0	4.7 (4.3–5.1)	8.2	1.3*
Females	15–18	3.7	2.1	3.4 (2.8–4.0)	5.5	7.9*
	19–30	3.6	1.5	3.0 (2.6–3.4)	6.3	22.8
	31–50	3.7	1.8	3.3 (2.9–3.6)	6.2	16.1
	51–70	3.5	2.5	3.4 (2.8–4.0)	4.6	1.1*
	71+	3.2	1.5	2.7 (2.2–3.1)	5.4	27.0
	Total	3.6	2.0	3.3 (3.0–3.5)	5.7	14.1
Māori						
Males	15–18	3.8	2.0	3.6 (2.8–4.3)	6.0	9.3*
	19–30	6.0	3.5	5.5 (3.3–7.7)	9.1	0.2*
	31–50	5.8	2.5	4.6 (3.1–6.1)	10.0	4.9*
	51+	6.6	2.1	5.6 (3.7–7.5)	12.5	9.0
	Total	5.9	3.7	5.5 (4.6–6.4)	8.5	5.1
Females	15–18	3.7	1.5	3.1 (1.2–5.0)	6.7	23.4*
	19–30	4.0	1.9	3.3 (2.8–3.9)	6.7	13.2
	31–50	4.0	1.9	3.4 (2.8–4.0)	6.8	12.0*
	51+	4.2	2.2	3.8 (2.6–4.9)	6.8	5.9*
	Total	4.3	2.3	3.8 (3.3–4.4)	6.8	12.4
Pacific						
Males	15–18	4.9	2.5	4.4 (0.1-8.7)	7.7	4.5*
	19–30	6.0	2.7	5.3 (3.2–7.4)	10.3	3.6*
	31–50	5.6	1.9	4.5 (3.2–5.8)	10.5	11.4
	51+	4.3	1.7	3.7 (2.5–4.9)	7.7	15.6*
	Total	5.6	2.8	5.1 (4.1–6.1)	9.1	8.9
Females	15–18	3.5	1.5	3.2 (2.1–4.3)	5.9	19.6*
	19–30	3.9	1.4	3.4 (2.8–4.0)	6.9	20.0
	31–50	4.4	1.7	3.7 (2.9–4.5)	7.8	15.1
	51+	3.4	1.6	3.1 (2.2–3.9)	5.8	20.9*
	Total	4.1	2.2	3.8 (3.3–4.3)	6.5	20.0

		Vitamin B_{12} (µg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%), (95% CI)[3]**
NZEO						
Males	15–18	4.5	2.5	4.2 (3.6–4.8)	7.0	4.0*
	19–30	4.9	2.2	4.3 (3.4–5.2)	8.4	7.1
	31–50	5.1	3.9	5.0 (4.2–5.9)	6.5	0.0
	51+	5.3	2.8	4.6 (3.6–5.6)	8.4	1.4*
	Total	5.2	3.1	4.7 (4.0–5.4)	7.7	2.2
Females	15–18	3.4	2.2	3.2 (2.7–3.8)	4.8	6.1*
	19–30	3.3	1.8	3.0 (2.6–3.5)	5.2	15.9*
	31–50	3.6	1.9	3.2 (2.8–3.6)	5.8	14.4
	51+	3.4	2.0	3.1 (2.8–3.5)	5.1	10.1*
	Total	3.5	1.9	3.2 (2.9–3.4)	5.4	12.5
By NZDep2006 quintile						
Males	1	5.1	2.2	4.2 (3.3–5.1)	8.8	[4]
	2	5.8	2.8	5.0 (4.1–5.9)	9.8	[4]
	3	5.3	2.8	4.7 (3.4–6.0)	8.6	[4]
	4	5.0	2.2	4.3 (3.8–4.8)	8.5	[4]
	5	5.2	3.2	4.9 (3.9–5.9)	7.6	[4]
Females	1	3.4	2.6	3.3 (2.2–4.4)	4.2	[4]
	2	3.6	2.0	3.3 (2.9–3.7)	5.6	[4]
	3	3.3	1.5	2.9 (2.5–3.3)	5.5	[4]
	4	3.7	1.8	3.2 (2.6–3.7)	6.1	[4]
	5	4.3	2.5	3.9 (2.9–5.0)	6.6	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.20: Vitamin B_{12} sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Milk	20.6 (19.6–21.6)	16.2 (13.8–18.5)	15.1 (11.6–18.7)	19.4 (17.2–21.7)	22.7 (19.6–25.8)	26.1 (23.4–28.9)	19.8 (18.3–21.2)	15.5 (12.8–18.3)	17.8 (14.2–21.4)	22.1 (19.6–24.5)	22.9 (20.1–25.8)	25.5 (23.4–27.6)	21.4 (20.0–22.7)
Beef and veal	10.7 (9.7–11.7)	9.7 (6.6–12.9)	8.8 (5.7–11.8)	12.0 (9.3–14.8)	11.2 (8.3–14.2)	14.1 (11.2–17.0)	11.2 (9.7–12.6)	7.9 (5.4–10.4)	5.5 (3.3–7.7)	11.1 (9.0–13.3)	11.8 (8.9–14.7)	13.8 (10.6–17.0)	10.3 (9.0–11.5)
Fish and seafood	9.6 (8.6–10.5)	5.2 (3.2–7.3)	5.0 (3.0–7.0)	9.5 (7.3–11.7)	10.5 (7.4–13.6)	10.1 (7.9–12.4)	8.6 (7.3–9.8)	5.3 (3.2–7.4)	7.6 (4.8–10.5)	11.4 (8.9–13.9)	13.2 (10.3–16.1)	9.4 (7.2–11.6)	10.5 (9.2–11.8)
Eggs and egg dishes	6.4 (5.7–7.0)	5.9 (3.5–8.4)	4.4 (2.7–6.2)	6.0 (4.5–7.6)	7.0 (5.1–8.9)	8.0 (6.1–9.9)	6.1 (5.2–7.0)	3.9 (2.5–5.3)	9.7 (6.3–13.0)	5.2 (3.9–6.4)	6.4 (4.9–7.9)	8.1 (5.9–10.3)	6.6 (5.6–7.6)
Bread-based dishes	6.2 (5.4–7.0)	13.5 (10.6–16.4)	12.5 (8.4–16.6)	6.6 (4.7–8.6)	4.4 (2.7–6.1)	2.2 (1.3–3.1)	7.4 (6.1–8.6)	11.9 (9.0–14.9)	6.9 (4.1–9.7)	5.7 (4.1–7.3)	2.5 (1.8–3.3)	1.3 (0.8–1.9)	5.1 (4.2–6.0)
Poultry	5.9 (5.3–6.6)	7.5 (5.3–9.6)	5.6 (3.4–7.7)	6.7 (5.1–8.4)	6.2 (4.0–8.4)	3.7 (2.5–4.8)	6.1 (5.2–7.1)	7.1 (5.1–9.1)	7.9 (5.6–10.2)	5.3 (3.8–6.7)	5.1 (3.7–6.4)	4.5 (3.2–5.7)	5.8 (5.0–6.6)
Non-alcoholic beverages	5.4 (4.7–6.1)	5.3 (3.4–7.3)	10.1 (6.6–13.7)	5.2 (3.4–6.9)	3.4 (1.6–5.2)	1.2 (0.7–1.6)	5.4 (4.3–6.4)	7.1 (4.8–9.3)	8.4 (5.5–11.4)	5.6 (3.8–7.3)	4.0 (2.9–5.0)	2.3 (1.5–3.0)	5.5 (4.5–6.4)
Cheese	4.7 (4.2–5.3)	3.5 (2.4–4.6)	5.3 (3.3–7.3)	4.7 (3.3–6.0)	3.5 (2.2–4.7)	3.4 (2.6–4.3)	4.3 (3.6–5.0)	4.9 (3.4–6.4)	3.2 (2.1–4.4)	6.9 (5.2–8.6)	4.3 (3.0–5.5)	4.5 (3.5–5.4)	5.1 (4.4–5.8)
Dairy products	4.2 (3.7–4.6)	4.7 (2.8–6.5)	2.6 (1.4–3.8)	3.3 (2.4–4.1)	4.1 (2.9–5.4)	3.8 (3.0–4.6)	3.5 (3.0–4.1)	6.0 (4.5–7.5)	5.5 (3.8–7.2)	3.5 (2.6–4.3)	5.3 (4.1–6.6)	5.7 (4.7–6.6)	4.7 (4.2–5.3)
Grains and pasta	4.1 (3.4–4.8)	4.8 (2.8–6.9)	6.9 (4.0–9.8)	3.8 (2.5–5.2)	3.4 (1.8–5.0)	1.5 (0.5–2.5)	4.2 (3.3–5.2)	6.6 (4.6–8.7)	6.6 (3.7–9.6)	4.2 (2.9–5.5)	1.7 (0.9–2.5)	2.3 (1.3–3.4)	4.0 (3.2–4.8)
Sausages and processed meats	3.3	3.6	3.7	3.8	3.6	3.2	3.7	4.2	3.4	2.6	3.0	2.8	3.0
Lamb and mutton	3.1	2.1	2.8	2.7	3.7	3.0	3.0	1.3	3.4	2.4	4.4	3.6	3.2
Pork	2.9	3.5	3.2	2.4	3.7	5.1	3.3	2.8	1.7	2.8	2.6	3.1	2.6
Pies and pasties	2.8	3.7	5.4	3.6	2.7	2.3	3.6	3.0	2.9	1.9	1.8	1.7	2.1
Savoury sauces and condiments	2.3	2.6	1.4	2.5	1.6	2.4	2.1	3.1	1.7	2.5	3.3	2.4	2.6
Cakes and muffins	1.7	0.9	1.0	1.7	1.7	1.6	1.5	2.9	2.0	1.4	1.8	2.4	1.8
Other meat	1.1	0.4	0.3	0.8	2.9	2.4	1.4	0.2	1.0	0.5	1.3	1.9	0.9
Soups and stocks	0.8	0.3	1.6	0.3	0.9	1.1	0.8	0.6	0.5	1.0	0.9	0.5	0.8
Butter and margarine	0.8	0.4	0.3	1.0	0.8	1.1	0.8	0.5	0.7	0.8	0.8	1.0	0.8
Puddings and desserts	0.7	0.5	0.2	0.7	0.6	1.8	0.7	0.6	0.6	0.4	0.8	1.1	0.6
Vegetables	0.6	1.0	0.8	0.6	0.2	0.4	0.5	0.8	0.8	0.7	0.5	0.5	0.7

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Potatoes, kumara and taro	0.4	0.5	0.2	0.5	0.5	0.4	0.4	0.7	0.4	0.6	0.2	0.2	0.4
Supplements providing energy	0.4	1.6	1.0	0.3	0.1	0.1	0.5	0.5	0.4	0.4	0.1	0.6	0.4
Sugar and sweets	0.3	0.2	0.5	0.4	0.1	0.1	0.3	0.5	0.3	0.4	0.3	0.1	0.3
Bread	0.3	0.5	1.1	0.2	0.1	0.2	0.4	0.4	0.2	0.2	0.2	0.1	0.2
Biscuits	0.3	0.5	0.0	0.3	0.1	0.3	0.2	0.5	0.3	0.3	0.3	0.5	0.3
Snack bars	0.2	0.7	0.0	0.3	0.0	0.0	0.2	0.5	0.1	0.0	0.3	0.0	0.1
Breakfast cereals	0.1	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.1	0.2	0.1
Snack foods	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1
Alcoholic beverages	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuts and seeds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

4.6 Calcium

Calcium, the most abundant mineral in the body, is found mainly in bones and teeth. Calcium provides strength to the skeleton, which, in turn, provides protection for the vital organs. The skeleton provides a 'bank' of calcium and phosphorus for the body to draw on or deposit according to physiological need (Mann and Truswell 2007).

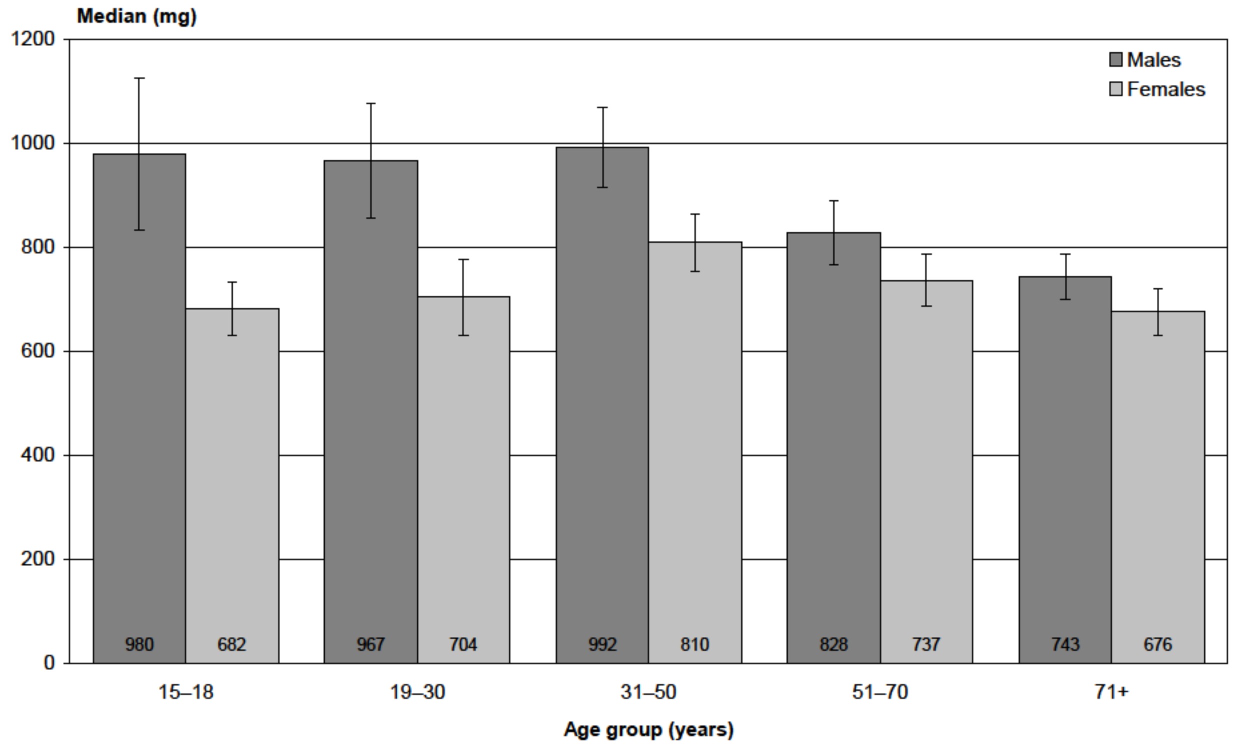
Peak bone mass is developed during young adulthood, then bone density decreases in later life due to falling sex steroids, and falls sharply following menopause in women (Mann and Truswell 2007). Other functions of calcium include involvement in muscle contraction and relaxation, nerve functioning, blood clotting and blood pressure (Rolfes et al 2009).

Calcium is not widely distributed across food groups. Milk and some milk products (eg, yoghurt and cheese) are good sources of calcium. Non-dairy sources of calcium include tinned fish (with bones), green leafy vegetables, nuts and seeds, and fortified soy and rice milk.

Calcium intake

The median usual daily intake of calcium was 919 mg for males and 745 mg for females (Table 4.21). Males aged 71+ years had lower intakes of calcium than males aged
15–50 years, and males aged 51–70 years had lower intakes of calcium than males aged 31–50 years. Females aged 31–50 years had higher intakes than females aged 71+ years and younger females aged 15–18 years (Figure 4.21).

Figure 4.21: Median calcium intake (mg), by age group and sex



Calcium intakes were lower for Māori females aged 15–18 years than for those aged 19–50 years. Pacific females aged 51+ years had lower usual daily median calcium intakes than Pacific females aged 19–50 years.

For both males and females there were no differences in intakes of calcium between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of calcium, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of calcium was 59% (males 45%; females 73%). The prevalence for Māori and Pacific females aged 51+ years was over 90%, and for those aged 15–18 years it was over 95%.

Interpretation of these data requires a cautionary approach because the EAR values have been augmented by 320 mg to take into account 'unspecified low absorption that occurs at about 500 mg/day' (NHMRC 2006). Also, the addition of 260 mg/day to the EAR for adults aged 71+ years, to account for further decreases in absorption with age, is high and is reflected in the higher prevalence of inadequate intake for older age groups in all ethnic groups. While calcium is of major importance for attaining and maintaining bone health, other factors such as vitamin D intakes, exercise levels and habitual levels of intake all influence bone health.

Dietary sources of calcium

Milk was the largest single contributor of calcium to the diet (27%), followed by *Bread* and *Non-alcoholic beverages* (each 10%), *Cheese* (8%), *Vegetables* and *Dairy products* (each 6%) and *Bread-based dishes* (5%) (Table 4.22).

Males aged 51+ years and females aged 31+ years obtained more calcium from *Milk* than younger males and females aged 15–30 years (Figure 4.22). Older males and females (71+ years) consumed more calcium from *Bread* (both 12%) than those aged 19–30 years (9% males, 8% females). *Non-alcoholic beverages* contributed less calcium for males and females aged 71+ years than for all younger adults. *Vegetables* contributed more calcium for males aged 31+ years and females aged 51+ years than for those aged 15–18 years.

Figure 4.22: Percent calcium intake from *Milk*, by age group and sex

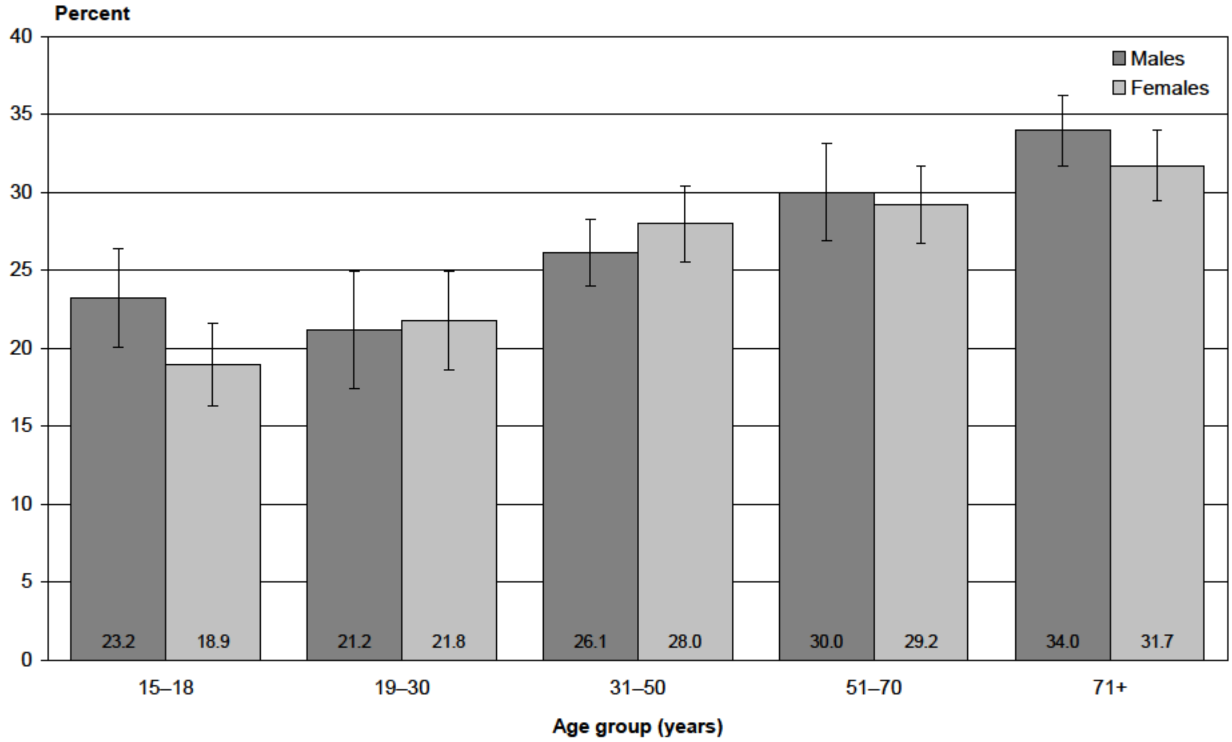


Table 4.21: Calcium intake, by age group, ethnic group, NZDep2006 and sex

		Calcium (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
Total population		871	496	824 (800–848)	1304	59.1
Age group (years)						
Males	15–18	1035	611	980 (834–1126)	1529	57.7
	19–30	1006	622	967 (857–1077)	1440	33.6
	31–50	1044	620	992 (915–1069)	1527	31.9
	51–70	868	493	828 (767–889)	1295	51.6
	71+	785	445	743 (699–787)	1180	86.0
	Total	968	564	919 (878–960)	1431	44.5
Females	15–18	724	410	682 (630–734)	1093	87.8
	19–30	742	389	704 (630–778)	1145	68.4
	31–50	847	507	810 (755–865)	1234	55.5
	51–70	775	467	737 (687–787)	1135	88.2
	71+	710	423	676 (632–720)	1039	92.8
	Total	784	451	745 (719–771)	1170	72.7
Māori						
Males	15–18	885	510	786 (654–918)	1371	76.1
	19–30	996	583	929 (800–1058)	1513	39.5
	31–50	901	551	852 (747–957)	1320	48.3
	51+	749	355	703 (560–846)	1204	65.4
	Total	899	587	863 (769–957)	1258	53.3
Females	15–18	571	306	527 (397–657)	892	95.5
	19–30	849	479	804 (672–936)	1278	55.4
	31–50	766	439	733 (680–786)	1133	63.7
	51+	681	393	637 (544–730)	1023	93.1
	Total	750	427	711 (662–760)	1123	71.4
Pacific						
Males	15–18	730	424	680 (404–956)	1097	87.8
	19–30	829	480	782 (629–935)	1227	58.9
	31–50	747	374	675 (561–789)	1207	68.5
	51+	604	307	574 (475–673)	941	83.2
	Total	772	358	693 (621–765)	1286	71.2
Females	15–18	586	419	571 (437–705)	772	99.4
	19–30	673	442	650 (562–738)	933	78.4
	31–50	701	381	658 (592–724)	1077	75.7
	51+	506	320	489 (423–555)	712	99.8
	Total	653	343	604 (565–643)	1024	92.3

		Calcium (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
NZEO						
Males	15–18	1062	648	1015 (864–1166)	1534	54.2
	19–30	1019	770	1004 (872–1136)	1288	19.2*
	31–50	1078	676	1035 (949–1121)	1529	25.9
	51+	862	516	825 (776–874)	1254	52.2
	Total	990	620	951 (901–1001)	1406	36.5
Females	15–18	749	412	706 (646–766)	1141	85.2
	19–30	743	360	696 (606–786)	1191	67.3
	31–50	865	590	842 (773–911)	1169	51.6
	51+	771	472	736 (698–774)	1117	89.1
	Total	798	469	762 (733–791)	1172	71.1
By NZDep2006 quintile						
Males	1	1034	571	966 (863–1069)	1582	[4]
	2	1011	598	965 (890–1040)	1483	[4]
	3	992	624	957 (753–1161)	1398	[4]
	4	905	574	880 (795–965)	1268	[4]
	5	895	487	832 (722–942)	1382	[4]
Females	1	790	421	750 (683–817)	1211	[4]
	2	852	511	815 (751–879)	1241	[4]
	3	765	424	715 (655–775)	1169	[4]
	4	770	470	739 (687–791)	1111	[4]
	5	744	439	715 (668–762)	1084	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.22: Calcium sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Milk	26.8 (25.8–27.8)	23.2 (20.0–26.4)	21.2 (17.4–25.0)	26.1 (24.0–28.3)	30.0 (26.9–33.1)	34.0 (31.7–36.2)	26.7 (25.3–28.1)	18.9 (16.3–21.6)	21.8 (18.7–24.9)	28.0 (25.6–30.4)	29.2 (26.7–31.7)	31.7 (29.5–34).0	26.9 (25.5–28.2)
Bread	9.9 (9.4–10.3)	10.1 (8.3–11.9)	8.8 (7.1–10.4)	10.9 (9.7–12.0)	11.1 (9.5–12.7)	12.4 (11.1–13.7)	10.6 (9.9–11.3)	10.0 (8.5–11.4)	8.3 (6.8–9.8)	8.6 (7.6–9.6)	9.4 (8.3–10.4)	11.8 (10.3–13.3)	9.2 (8.6–9.8)
Non-alcoholic beverages	9.6 (9.1–10.2)	8.3 (7.1–9.5)	11.2 (9.1–13.2)	9.2 (7.8–10.5)	7.5 (6.1–8.9)	5.0 (4.3–5.7)	8.7 (7.9–9.4)	9.8 (8.4–11.2)	11.5 (9.6–13.4)	11.2 (9.6–12.8)	10.5 (9.1–11.9)	6.5 (5.7–7.4)	10.5 (9.7–11.3)
Cheese	7.7 (7.0–8.4)	6.6 (4.6–8.6)	9.2 (6.6–11.9)	8.8 (6.8–10.7)	6.4 (4.7–8.1)	6.2 (4.9–7.5)	7.8 (6.8–8.9)	7.2 (5.5–8.9)	4.9 (3.4–6.5)	9.5 (7.7–11.3)	7.4 (5.7–9.0)	6.7 (5.4–8.0)	7.6 (6.7–8.5)
Vegetables	5.8 (5.5–6.2)	3.0 (2.1–3.9)	3.7 (2.9–4.6)	5.2 (4.4–6.0)	5.7 (4.9–6.6)	7.0 (6.3–7.8)	5.0 (4.6–5.4)	4.2 (3.2–5.2)	6.3 (4.8–7.7)	5.7 (4.9–6.5)	8.3 (7.2–9.4)	7.4 (6.6–8.2)	6.5 (6.0–7.1)
Dairy products	5.8 (5.2–6.3)	5.2 (3.7–6.6)	4.3 (2.6–5.9)	5.1 (3.9–6.3)	5.0 (3.7–6.3)	4.8 (3.8–5.8)	4.9 (4.2–5.5)	7.2 (5.5–8.8)	7.4 (5.1–9.7)	5.0 (3.9–6.1)	7.5 (6.1–9.0)	7.8 (6.5–9.0)	6.6 (5.8–7.3)
Bread-based dishes	5.0 (4.4–5.6)	12.6 (10.0–15.1)	9.6 (6.2–13.0)	5.5 (4.0–7.0)	4.4 (2.7–6.0)	1.3 (0.8–1.8)	6.2 (5.1–7.2)	10.3 (7.8–12.8)	5.3 (3.6–7.0)	4.2 (3.1–5.3)	2.0 (1.3–2.6)	1.4 (0.7–2.0)	4.0 (3.4–4.6)
Grains and pasta	3.6 (3.1–4.0)	4.6 (2.6–6.7)	6.0 (3.9–8.2)	2.9 (2.2–3.6)	3.4 (2.3–4.6)	2.5 (1.7–3.3)	3.8 (3.1–4.4)	5.7 (4.2–7.2)	5.4 (3.4–7.3)	3.4 (2.4–4.4)	1.6 (1.2–2.0)	2.4 (1.5–3.3)	3.4 (2.8–3.9)
Fruit	2.5 (2.3–2.6)	2.3 (1.4–3.2)	1.6 (1.1–2.1)	1.8 (1.4–2.2)	2.1 (1.7–2.5)	3.4 (2.9–3.9)	2.0 (1.8–2.3)	2.5 (1.9–3.1)	2.6 (1.9–3.2)	2.6 (2.2–3.0)	3.3 (2.9–3.7)	3.7 (3.3–4.1)	2.9 (2.6–3.1)
Cakes and muffins	2.2 (1.9–2.5)	1.1 (0.6–1.5)	1.7 (0.6–2.8)	2.4 (1.7–3.1)	2.7 (1.7–3.7)	2.0 (1.6–2.4)	2.2 (1.7–2.7)	3.1 (2.3–3.8)	2.5 (1.5–3.6)	1.9 (1.3–2.5)	2.2 (1.5–2.8)	2.8 (2.0–3.6)	2.3 (1.9–2.6)
Fish and seafood	1.9	1.2	1.2	2.0	2.8	2.5	2.0	0.7	1.5	1.6	2.6	1.8	1.8
Breakfast cereals	1.9	1.5	1.5	1.6	2.8	2.0	1.9	1.2	1.6	1.9	1.9	2.6	1.9
Sugar and sweets	1.9	1.4	2.4	1.9	1.3	1.2	1.7	3.2	2.5	2.3	1.2	1.0	2.0
Potatoes, kumara and taro	1.8	2.6	1.5	2.0	2.0	1.7	1.9	2.1	2.2	1.7	1.2	1.3	1.7
Pies and pasties	1.7	2.8	3.0	2.2	1.2	1.0	2.0	1.8	1.9	1.2	1.1	1.2	1.3
Eggs and egg dishes	1.6	2.0	1.1	1.6	1.9	1.9	1.6	0.9	2.3	1.2	1.4	1.7	1.5
Alcoholic beverages	1.5	1.0	2.0	1.8	1.9	1.6	1.8	0.9	1.9	1.2	1.0	0.6	1.2
Savoury sauces and condiments	1.2	1.1	1.1	1.1	1.4	1.2	1.2	1.3	1.7	1.3	1.1	1.0	1.3
Poultry	1.2	1.7	1.7	1.5	1.0	0.6	1.3	1.5	1.4	1.2	0.7	0.6	1.1
Soups and stocks	0.9	0.2	0.8	0.5	0.6	1.7	0.7	0.9	0.7	1.1	1.3	1.4	1.1
Puddings and desserts	0.8	0.6	0.2	0.9	0.6	2.3	0.8	0.7	1.1	0.7	0.9	1.1	0.9

Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Biscuits	0.8	1.0	0.4	0.9	0.7	1.0	0.7	1.3	0.8	0.9	0.8	0.8	0.8
Beef and veal	0.7	0.9	0.8	1.0	0.8	0.7	0.8	0.8	0.4	0.6	0.6	0.6	0.6
Sausages and processed meats	0.6	0.9	0.9	0.7	0.5	0.4	0.7	0.8	0.9	0.6	0.6	0.4	0.6
Supplements providing energy	0.6	1.7	1.9	0.5	0.1	0.0	0.7	0.7	0.8	0.6	0.1	0.5	0.5
Nuts and seeds	0.5	0.4	0.3	0.5	0.6	0.3	0.5	0.4	0.5	0.6	0.7	0.3	0.6
Pork	0.5	0.6	0.7	0.4	0.7	0.6	0.6	0.3	0.4	0.4	0.3	0.3	0.4
Snack bars	0.4	0.8	0.3	0.6	0.2	0.1	0.4	0.7	0.3	0.2	0.5	0.1	0.3
Snack foods	0.3	0.4	0.4	0.2	0.1	0.0	0.2	0.7	0.6	0.4	0.1	0.0	0.4
Lamb and mutton	0.3	0.1	0.4	0.2	0.4	0.2	0.3	0.2	0.4	0.2	0.4	0.2	0.3
Butter and margarine	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1
Other meat	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

4.7 Iron

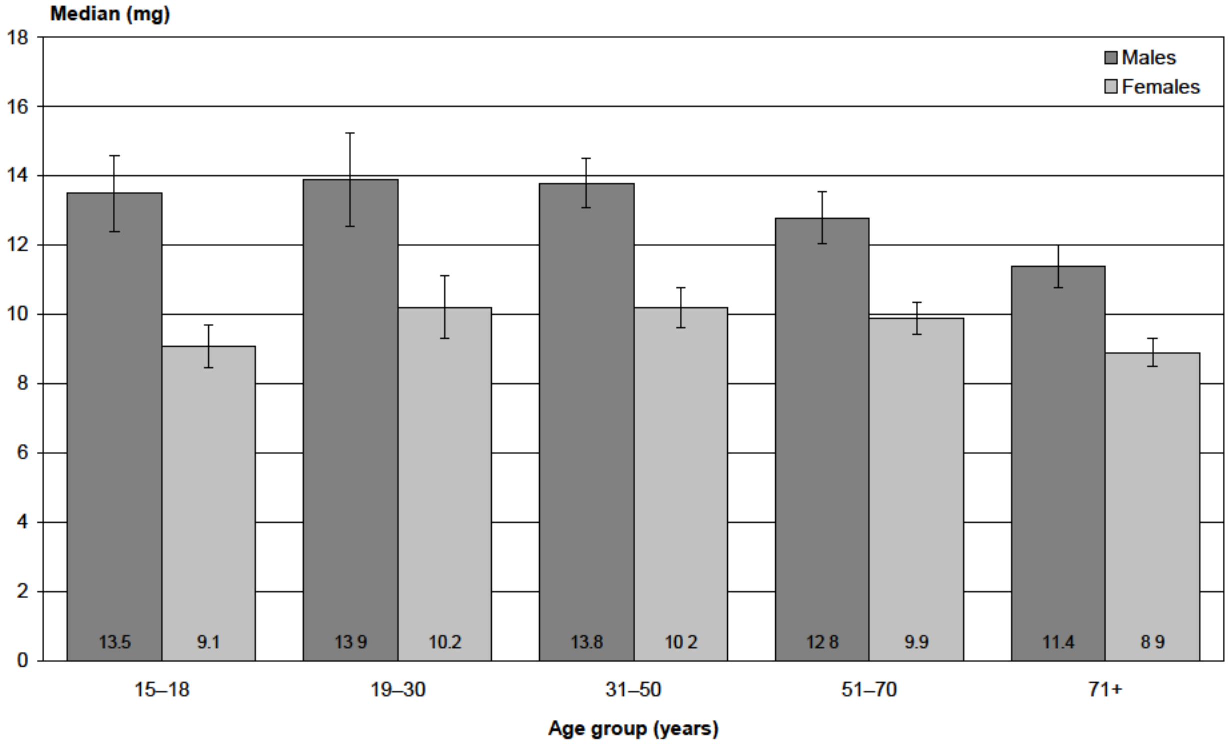
Iron is part of the proteins haemoglobin and myoglobin, which are responsible for the transport of oxygen in blood and for making oxygen available for muscle contraction, respectively (Rolfes et al 2009).

In foods, haem iron is found in meat, fish and poultry and is better absorbed by the body than non-haem iron. Non-haem iron comes from most foods and its absorption is improved by consuming foods containing a Meat, Fish and Poultry factor and vitamin C during the same meal (Mann and Truswell 2007; Rolfes et al 2009). Foods containing phytate and polyphenols, such as whole-grain cereals, nuts, legumes, tea, coffee and some vegetables, reduce the absorption of iron.

Iron intake

The median usual daily intake of iron was 13.2 mg for males and 9.9 mg for females (Table 4.23). Older males and females (71+ years) had lower intakes than males aged 15–50 years and females aged 31–70 years (Figure 4.23).

Figure 4.23: Median iron intake (mg), by age group and sex



There were no differences in intakes of iron consumed within ethnic groups across age groups for both sexes.

For both males and females there were no differences in intakes of iron between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of iron, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake was 5.6% (males 1.2%; females 9.7%). Females aged 15–18 years had a prevalence of inadequate intake of 34.2%; those aged 31–50 years had a prevalence of 15.4%.

Dietary sources of iron

The *Bread* group provided 12% of dietary iron, followed by *Breakfast cereals* (10%), *Vegetables* (8%), *Grains and pasta* and *Beef and veal* (each 7%), *Potatoes, kumara and taro* (6%), and *Bread-based dishes* and *Non-alcoholic beverages* (each 5%) (Table 4.24).

Older males and females (71+ years) obtained more iron from *Bread* than males aged 15–18 years and all younger females. Males aged 51+ years obtained more iron from *Breakfast cereals* than those aged 19–50 years, and females aged 71+ years more from *Breakfast cereals* than those aged 15–30 years (Figure 4.24). Males and females aged 15–18 years obtained less iron from *Vegetables* than males aged 31+ years and all older females.

Figure 4.24: Percent iron from breakfast cereals, by age group and sex

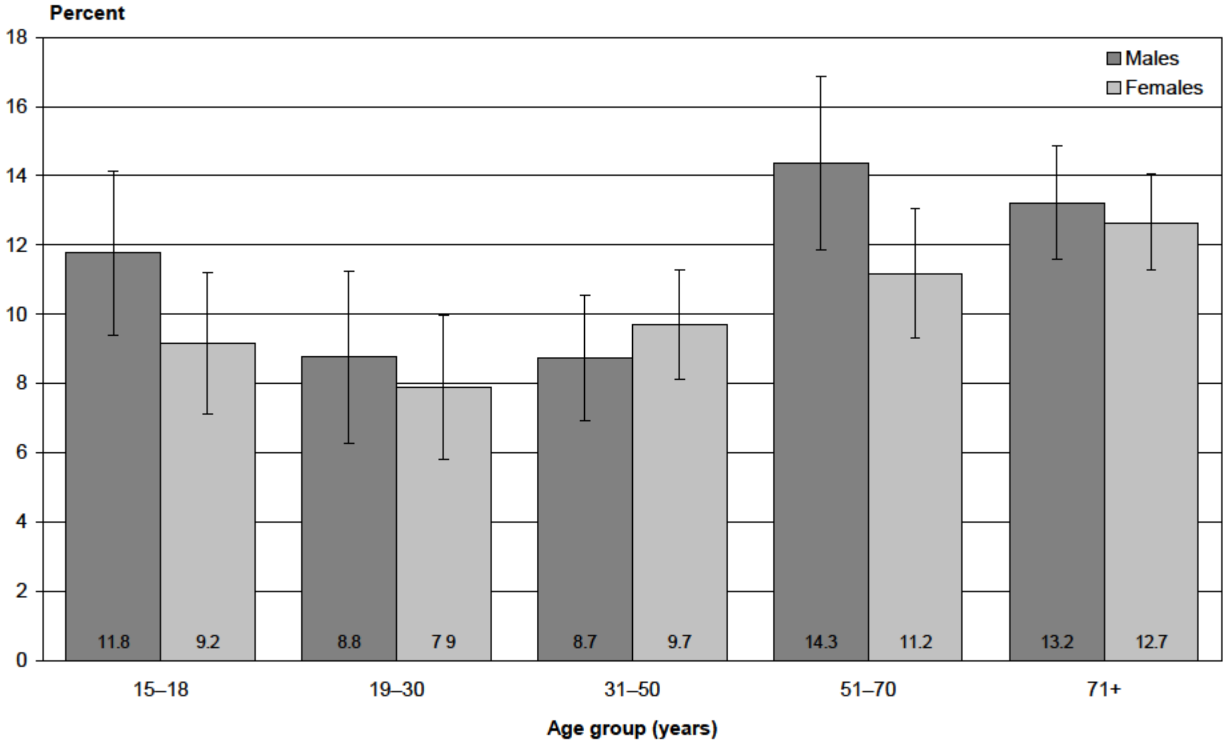


Table 4.23: Iron intake, by age group, ethnic group, NZDep2006 and sex

		Iron (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%), (95% CI)[3]**
Total population		11.9	7.5	11.4 (11.1–11.7)	16.9	5.6
By age group (years)						
Males	15–18	13.9	9.1	13.5 (12.4–14.6)	19.2	5.0*
	19–30	14.4	9.8	13.9 (12.5–15.3)	19.7	0.1*
	31–50	14.2	9.3	13.8 (13.1–14.5)	19.6	0.8
	51–70	13.4	8.4	12.8 (12.0–13.6)	19.2	1.3
	71+	11.8	8.0	11.4 (10.8–12.0)	16.0	1.3*
	Total	13.8	8.9	13.2 (12.8–13.6)	19.3	1.2
Females	15–18	9.4	6.1	9.1 (8.5–9.7)	13.1	34.2
	19–30	10.3	8.7	10.2 (9.3–11.1)	12.0	6.0*
	31–50	10.4	7.6	10.2 (9.6–10.8)	13.5	15.4
	51–70	10.2	7.1	9.9 (9.4–10.4)	13.6	0.7
	71+	9.3	6.2	8.9 (8.5–9.3)	12.7	2.3*
	Total	10.1	7.1	9.9 (9.6–10.2)	13.5	9.7
Māori						
Males	15–18	13.4	9.4	13.0 (11.4–14.6)	18.0	2.9*
	19–30	15.4	9.7	14.5 (12.9–16.1)	21.8	0.6
	31–50	14.5	9.5	14.1 (12.9–15.3)	20.0	0.9*
	51+	13.2	8.3	12.8 (10.8–14.8)	18.6	2.3*
	Total	14.5	9.9	14.0 (12.9–15.1)	19.9	1.4
Females	15–18	8.6	5.1	8.1 (6.1–10.1)	12.8	48.8
	19–30	10.8	8.2	10.7 (9.2–12.2)	13.6	7.3*
	31–50	9.9	6.3	9.5 (8.6–10.4)	13.9	26.8
	51+	9.4	6.7	9.2 (8.3–10.1)	12.5	0.8*
	Total	10.0	6.8	9.7 (9.1–10.3)	13.6	18.4
Pacific						
Males	15–18	14.4	9.8	14.5 (12.1–16.9)	18.9	4.0*
	19–30	13.5	7.9	12.9 (9.4–16.4)	19.8	3.3*
	31–50	13.8	8.7	13.3 (10.9–15.7)	19.7	0.9*
	51+	12.1	6.0	11.7 (9.8–13.6)	18.8	10.1*
	Total	14.0	7.7	13.3 (12.1–14.5)	21.3	3.8
Females	15–18	8.9	6.0	8.6 (6.8–10.4)	12.2	39.9
	19–30	10.9	6.5	10.5 (9.4–11.6)	15.9	25.8
	31–50	11.5	7.5	11.1 (9.9–12.3)	16.1	14.5*
	51+	9.5	7.0	9.2 (8.1–10.3)	12.5	0.3*
	Total	10.8	7.3	10.4 (9.7–11.1)	14.7	19.9

		Iron (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
NZEO						
Males	15–18	13.8	8.5	13.3 (12.0–14.6)	19.7	7.4*
	19–30	14.1	10.2	13.7 (12.1–15.3)	18.4	0.0
	31–50	14.2	9.2	13.8 (13.0–14.6)	19.8	0.8*
	51+	13.0	8.7	12.5 (11.9–13.1)	18.0	0.6
	Total	13.7	9.1	13.2 (12.7–13.7)	18.9	1.0
Females	15–18	9.5	6.2	9.2 (8.5–9.9)	13.3	32.4
	19–30	10.2	7.1	9.9 (9.0–10.8)	13.8	22.1
	31–50	10.4	8.2	10.3 (9.6–11.0)	12.8	7.1*
	51+	10.0	6.7	9.7 (9.3–10.1)	13.5	1.3
	Total	10.1	7.1	9.9 (9.6–10.2)	13.5	9.3
By NZDep2006 quintile						
Males	1	14.1	9.1	13.4 (12.0–14.8)	20.1	[4]
	2	14.2	10.6	14.0 (12.9–15.1)	18.2	[4]
	3	13.1	8.5	12.7 (11.6–13.8)	18.2	[4]
	4	13.0	8.2	12.6 (11.4–13.8)	18.3	[4]
	5	14.4	8.8	13.4 (12.1–14.7)	21.4	[4]
Females	1	10.3	7.9	10.2 (9.6–10.8)	13.0	[4]
	2	10.1	7.6	9.9 (9.2–10.6)	12.8	[4]
	3	10.4	7.7	10.2 (9.6–10.8)	13.4	[4]
	4	10.1	6.5	9.7 (9.1–10.3)	14.0	[4]
	5	9.8	6.8	9.6 (9.0–10.2)	13.2	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.24: Iron sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	11.5 (11.0–12.0)	10.1 (8.5–11.6)	10.6 (8.6–12.7)	12.7 (11.3–14.2)	11.9 (10.3–13.5)	14.0 (12.3–15.8)	12.0 (11.2–12.8)	10.8 (9.4–12.3)	9.2 (7.6–10.7)	11.2 (10.0–12.5)	11.2 (10.0–12.4)	14.4 (12.9–15.9)	11.1 (10.5–11.8)
Breakfast cereals	10.4 (9.8–11.1)	11.8 (9.4–14.1)	8.8 (6.3–11.3)	8.7 (6.9–10.6)	14.3 (11.8–16.9)	13.2 (11.6–14.8)	10.9 (9.8–12.0)	9.2 (7.1–11.2)	7.9 (5.8–10.0)	9.7 (8.1–11.3)	11.2 (9.3–13.0)	12.7 (11.3–14.0)	10.0 (9.1–10.9)
Vegetables	7.7 (7.1–8.2)	3.8 (2.7–4.9)	5.3 (3.7–6.9)	7.0 (5.9–8.2)	6.6 (5.4–7.8)	8.6 (7.7–9.6)	6.5 (5.8–7.1)	4.8 (3.8–5.8)	7.6 (5.8–9.5)	8.6 (7.3–9.9)	10.6 (9.2–11.9)	9.4 (8.6–10.3)	8.8 (8.0–9.5)
Grains and pasta	7.0 (6.3–7.6)	6.5 (4.4–8.6)	9.3 (6.6–12.0)	7.3 (5.7–8.8)	6.6 (4.8–8.3)	7.1 (5.1–9.1)	7.4 (6.4–8.4)	7.9 (6.2–9.6)	8.6 (6.5–10.8)	6.6 (5.3–7.8)	4.9 (3.8–5.9)	5.6 (4.5–6.7)	6.5 (5.8–7.2)
Beef and veal	6.8 (6.2–7.5)	6.5 (4.6–8.4)	6.5 (4.3–8.6)	8.0 (6.1–9.9)	7.3 (5.2–9.5)	7.9 (6.4–9.4)	7.4 (6.4–8.4)	5.2 (3.6–6.7)	4.1 (2.4–5.8)	7.0 (5.6–8.4)	7.0 (5.4–8.7)	7.1 (5.7–8.6)	6.3 (5.6–7.1)
Potatoes, kumara and taro	6.0 (5.6–6.3)	8.4 (6.7–10.2)	6.0 (4.5–7.5)	6.0 (5.0–7.0)	5.7 (4.7–6.6)	5.8 (5.0–6.5)	6.1 (5.6–6.6)	7.5 (6.2–8.7)	7.2 (5.8–8.6)	5.7 (4.8–6.6)	4.9 (4.0–5.7)	5.0 (4.4–5.6)	5.8 (5.3–6.3)
Bread-based dishes	5.3 (4.7–5.9)	11.6 (9.2–14.0)	10.6 (7.2–14.1)	5.7 (4.3–7.1)	4.6 (2.9–6.3)	1.7 (1.1–2.3)	6.5 (5.5–7.5)	9.5 (7.4–11.5)	5.8 (4.1–7.5)	4.5 (3.3–5.6)	2.1 (1.5–2.8)	1.4 (0.9–1.9)	4.1 (3.5–4.7)
Non-alcoholic beverages	5.2 (4.9–5.6)	4.0 (3.1–5.0)	4.7 (3.5–5.8)	4.3 (3.6–5.1)	4.8 (3.9–5.7)	4.0 (3.5–4.5)	4.5 (4.0–4.9)	5.4 (4.4–6.4)	6.3 (5.0–7.6)	6.4 (5.3–7.5)	5.3 (4.5–6.0)	5.2 (4.6–5.7)	5.9 (5.4–6.4)
Fruit	4.4 (4.1–4.7)	2.8 (2.0–3.6)	3.1 (2.2–4.1)	3.0 (2.4–3.5)	3.7 (3.1–4.3)	5.3 (4.7–6.0)	3.4 (3.0–3.7)	3.6 (3.0–4.1)	4.1 (3.3–4.9)	5.1 (4.3–5.8)	6.4 (5.6–7.2)	6.9 (6.3–7.5)	5.3 (4.9–5.7)
Poultry	4.0 (3.6–4.4)	5.1 (3.4–6.9)	4.7 (3.1–6.3)	4.9 (3.6–6.1)	3.4 (2.4–4.4)	1.9 (1.4–2.4)	4.2 (3.5–4.8)	5.1 (3.7–6.5)	4.9 (3.7–6.0)	4.0 (3.2–4.8)	2.8 (2.1–3.5)	2.2 (1.6–2.8)	3.8 (3.3–4.2)
Fish and seafood	3.3	2.0	1.9	3.7	4.4	3.5	3.4	1.8	3.3	3.3	3.8	3.2	3.3
Savoury sauces and condiments	3.0	2.9	2.8	3.2	2.3	2.8	2.8	3.5	3.5	3.1	3.2	2.8	3.2
Eggs and egg dishes	2.9	2.6	2.1	3.1	3.2	3.3	2.9	1.9	3.9	2.4	2.9	3.6	2.9
Cakes and muffins	2.5	1.2	1.9	2.4	2.5	2.3	2.2	3.2	3.1	2.3	3.1	3.4	2.8
Pork	2.5	3.1	3.4	2.3	3.5	3.0	3.0	1.8	2.0	2.3	2.2	2.1	2.1
Pies and pasties	2.4	3.8	4.5	2.9	1.8	1.4	2.9	2.5	2.7	1.9	1.6	1.1	1.9
Sausages and processed meats	2.3	2.7	3.2	2.7	1.9	2.0	2.5	3.1	2.0	2.3	1.9	1.8	2.1
Sugar and sweets	2.1	1.8	2.6	1.9	1.4	1.4	1.9	2.8	2.6	2.5	1.7	1.3	2.2
Biscuits	1.6	1.7	0.8	1.5	1.5	1.8	1.4	2.5	1.5	1.8	1.7	1.9	1.7
Soups and stocks	1.5	0.3	1.2	1.0	0.9	2.4	1.1	1.3	1.4	1.7	2.5	2.5	1.9
Lamb and mutton	1.5	0.9	1.5	1.4	2.1	1.3	1.6	0.9	1.4	1.0	2.1	1.5	1.4
Nuts and seeds	1.2	0.8	0.6	1.0	1.3	0.7	0.9	0.5	0.8	1.7	1.9	0.7	1.4
Alcoholic beverages	1.1	0.4	0.5	1.0	0.8	0.8	0.8	0.6	2.1	1.3	1.4	0.8	1.4

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Snack bars	0.8	1.8	0.6	1.5	0.4	0.2	0.9	1.5	0.6	0.7	0.9	0.3	0.7
Other meat	0.7	0.2	0.7	0.5	1.4	1.6	0.9	0.2	0.3	0.3	0.7	0.8	0.5
Milk	0.7	0.6	0.5	0.6	0.5	0.5	0.5	0.7	0.9	0.8	0.7	0.6	0.8
Puddings and desserts	0.5	0.4	0.1	0.4	0.6	0.8	0.4	0.3	0.5	0.5	0.5	0.6	0.5
Snack foods	0.4	0.7	0.5	0.3	0.1	0.1	0.3	0.8	0.6	0.5	0.3	0.0	0.4
Supplements providing energy	0.3	0.9	0.4	0.2	0.1	0.0	0.2	0.4	0.4	0.3	0.1	0.5	0.3
Dairy products	0.3	0.6	0.1	0.2	0.2	0.2	0.2	0.5	0.5	0.2	0.2	0.2	0.3
Cheese	0.2	0.1	0.2	0.3	0.1	0.2	0.2	0.3	0.1	0.4	0.2	0.2	0.3
Butter and margarine	0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

4.8 Zinc

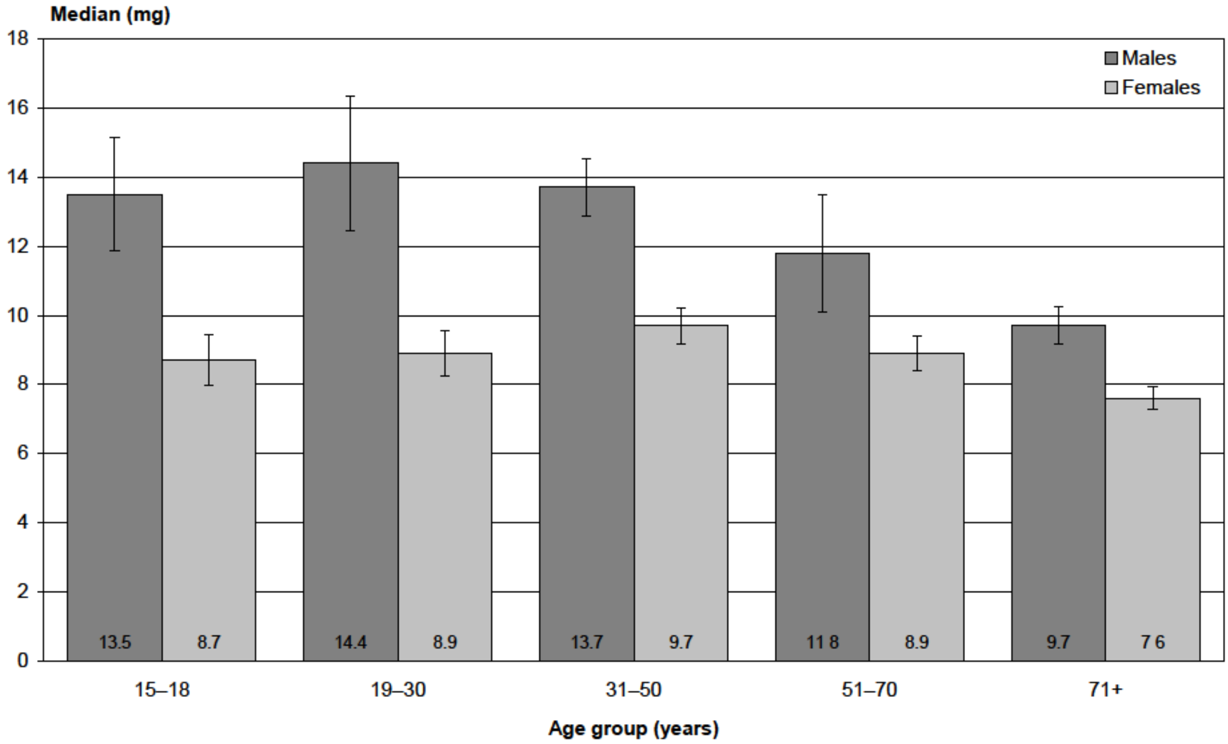
The trace element zinc acts as a cofactor for more than 100 enzymes in the body (Rolfes et al 2009). Zinc is important in major metabolic pathways, including protein and nucleic acid synthesis. It is also involved in the synthesis and action of insulin (Mann and Truswell 2007). Other functions include roles in growth, immune function, the transport of vitamin A, taste perception, appetite, wound healing, sperm generation and normal foetal development (Rolfes et al 2009).

Zinc is widely available in the food supply, but it is more bioavailable from animal products than from plant foods. Rich sources include oysters, red meat, lamb's liver and cheese (Mann and Truswell 2007). Cereal grains, legumes and nuts are also rich sources of zinc, but they are high in phytates, which reduce zinc absorption (Mann and Truswell 2007).

Zinc intake

The median usual daily intake of zinc was 12.9 mg for males and 9.0 mg for females (Table 4.25). Older males and females (71+ years) had lower intakes of zinc than males aged 15–50 years and all younger females (Figure 4.25).

Figure 4.25: Median zinc intake (mg), by age group and sex



Zinc intakes were lower for Māori females aged 51+ years than for those aged 19–30 years (7.8 mg versus 9.8 mg). There were no differences in zinc sources across age groups for Pacific males or females.

For both males and females there were no differences in intakes of zinc between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of zinc, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of zinc was 24.7% (males 39.1%; females 11.2%). The highest prevalence was among males aged 71+ years (89.7%). However, these data should be interpreted with caution given the EAR for those aged 71+ years may be set too high, as it is based on experimental data for younger age groups.

Dietary sources of zinc

Beef and veal (10%), *Bread* (10%) and *Grains and pasta* (9%) were the largest contributors of zinc to the diet, followed by *Milk* and *Bread-based dishes* (each 7%), *Vegetables* (6%), *Poultry* and *Pork* (each 5%) (Table 4.26).

Older females (71+ years) obtained proportionately more zinc from *Beef and veal* than females aged 15–30 years (Figure 4.26). Males and females aged 71+ years obtained more zinc from *Bread* than all younger males and females, but less from *Grains and pasta* than 15–50-year-old males and females. In contrast, *Bread-based dishes* provided more zinc for males and females aged 15–18 years than for males aged 31+ years and all older females. *Milk* provided more zinc for older males and females (71+ years) than for males aged 15–50 years and females aged 15–30 years.

Figure 4.26: Percent zinc from *Beef and veal*, by age group and sex

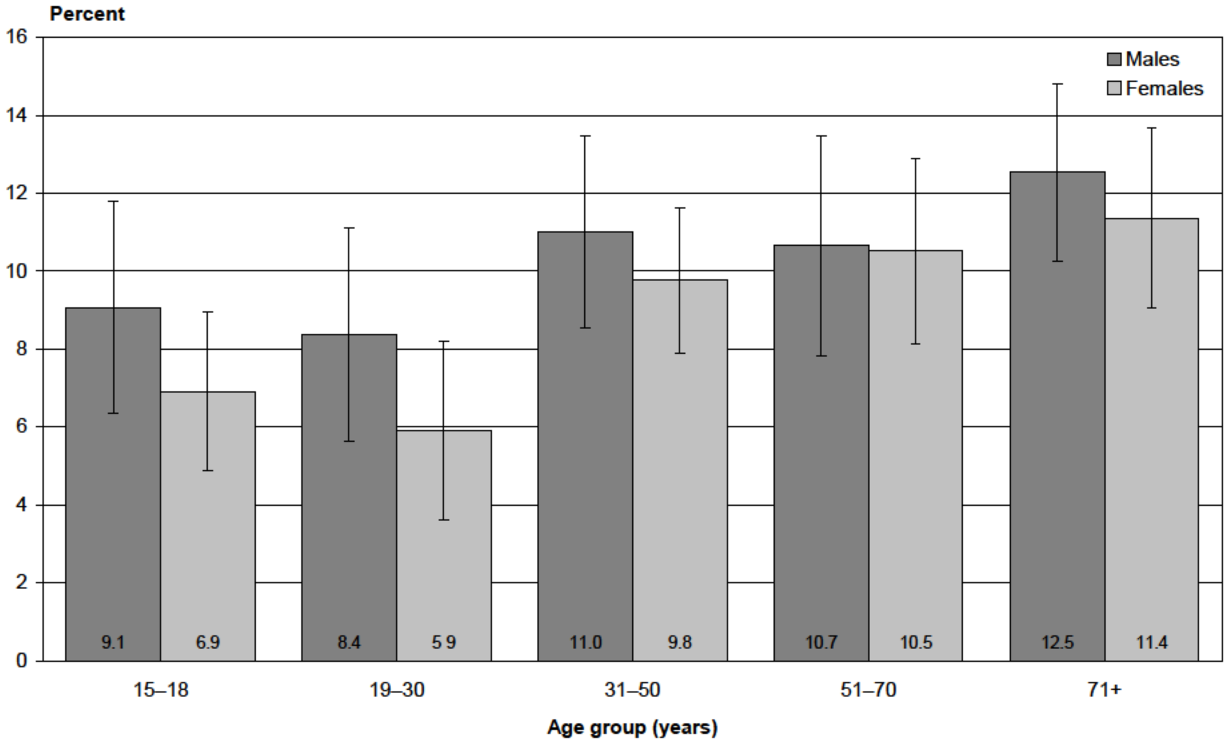


Table 4.25: Zinc intake, by age group, ethnic group, NZDep2006 and sex

		Zinc (mg)[1]				
		Mean	**10th**[2]	**Median (50th),[2] (95% CI)**	**90th**[2]	**Inadequate intake (%), (95% CI)**[3]
Total population		11.3	7.1	10.7 (10.4–11.0)	16.0	24.7
By age group (years)						
Males	15–18	13.7	10.3	13.5 (11.9–15.1)	17.5	16.8*
	19–30	15.0	10.4	14.4 (12.5–16.3)	20.5	24.2*
	31–50	14.0	9.8	13.7 (12.9–14.5)	18.6	30.1
	51–70	12.3	8.5	11.8 (10.1–13.5)	16.6	52.0
	71+	9.8	7.8	9.7 (9.2–10.2)	12.0	89.7
	Total	13.4	9.2	12.9 (12.4–13.4)	18.2	39.1
Females	15–18	9.1	6.4	8.7 (8.0–9.4)	12.1	6.5*
	19–30	9.2	5.8	8.9 (8.3–9.5)	13.0	18.8
	31–50	10.0	7.2	9.7 (9.2–10.2)	13.1	4.7*
	51–70	9.1	6.6	8.9 (8.4–9.4)	11.9	9.2*
	71+	7.9	5.4	7.6 (7.3–7.9)	10.8	28.3
	Total	9.3	6.4	9.0 (8.7–9.3)	12.6	11.2
Māori						
Males	15–18	12.9	9.0	12.3 (10.6–14.0)	17.7	32.5
	19–30	15.4	12.4	15.1 (11.7–18.5)	18.6	7.1*
	31–50	14.2	8.6	13.3 (11.7–14.9)	20.8	37.4
	51+	11.1	7.0	10.6 (8.6–12.6)	15.8	65.3
	Total	13.9	8.9	13.3 (12.4–14.2)	19.5	34.3
Females	15–18	8.8	4.8	7.9 (5.9–9.9)	14.0	25.4
	19–30	9.9	7.5	9.8 (8.8–10.8)	12.4	3.7*
	31–50	9.6	5.6	8.8 (8.1–9.5)	14.4	19.2
	51+	8.0	6.2	7.8 (7.0–8.7)	9.8	14.7*
	Total	9.3	6.5	9.1 (8.6–9.6)	12.5	14.7
Pacific						
Males	15–18	14.5	9.0	14.3 (9.1–19.5)	20.3	22.0*
	19–30	13.7	7.6	13.0 (9.3–16.7)	20.5	41.4
	31–50	17.1	9.1	15.1 (9.6–20.6)	26.8	28.1
	51+	12.4	6.4	11.6 (9.1–14.1)	19.4	52.9
	Total	14.9	9.4	14.3 (12.9–15.7)	21.1	36.1
Females	15–18	9.3	5.4	8.9 (6.3–11.5)	13.7	15.2*
	19–30	11.2	6.3	10.6 (9.0–12.2)	16.8	17.4
	31–50	12.3	7.8	11.7 (9.5-13.9)	17.6	3.4*
	51+	10.6	7.0	10.2 (8.7–11.7)	14.7	6.1*
	Total	11.5	6.5	10.6 (9.3–11.9)	17.6	10.5

		Zinc (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
NZEO						
Males	15–18	13.6	9.7	13.2 (11.3–15.1)	17.8	21.8*
	19–30	14.8	10.2	14.2 (12.0–16.4)	20.3	26.3*
	31–50	13.9	10.6	13.7 (12.7–14.7)	17.6	25.1
	51+	11.7	9.5	11.6 (10.8–12.4)	14.1	59.3
	Total	13.2	9.8	12.9 (12.3–13.5)	17.1	38.0
Females	15–18	8.8	6.4	8.5 (7.8–9.2)	11.5	6.5*
	19–30	9.0	5.6	8.7 (8.0–9.4)	12.7	19.0
	31–50	9.9	7.7	9.7 (9.1–10.3)	12.3	2.0*
	51+	8.7	6.1	8.5 (8.1–8.9)	11.6	14.9
	Total	9.2	6.4	8.9 (8.6–9.2)	12.3	10.4
By NZDep2006 quintile						
Males	1	13.3	9.5	12.8 (11.6–14.0)	17.6	[4]
	2	13.6	8.5	13.0 (12.0–14.0)	19.4	[4]
	3	12.8	9.7	12.6 (10.9–14.3)	16.0	[4]
	4	12.9	9.0	12.5 (11.0–14.0)	17.3	[4]
	5	14.2	8.4	13.2 (11.9–14.5)	21.2	[4]
Females	1	9.2	6.3	8.9 (8.3–9.5)	12.4	[4]
	2	9.1	7.2	9.0 (8.6–9.4)	11.2	[4]
	3	9.5	7.0	9.3 (8.7–9.9)	12.2	[4]
	4	9.4	5.9	9.0 (8.4–9.6)	13.3	[4]
	5	9.4	6.1	8.9 (8.3–9.5)	13.3	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.26: Zinc sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Beef and veal	9.8 (8.9–10.6)	9.1 (6.4–11.8)	8.4 (5.7–11.1)	11.0 (8.5–13.5)	10.7 (7.8–13.5)	12.5 (10.3–14.8)	10.4 (9.0–11.7)	6.9 (4.9–9.0)	5.9 (3.6–8.2)	9.8 (7.9–11.6)	10.5 (8.1–12.9)	11.4 (9.1–13.7)	9.2 (8.1–10.2)
Bread	9.5 (9.1–9.9)	8.2 (7.0–9.5)	8.0 (6.4–9.6)	10.1 (8.9–11.3)	10.1 (8.8–11.3)	12.8 (11.4–14.2)	9.8 (9.2–10.4)	8.8 (7.7–10.0)	7.6 (6.4–8.9)	9.0 (8.0–10.0)	9.6 (8.6–10.7)	12.8 (11.3–14.3)	9.3 (8.7–9.8)
Grains and pasta	9.3 (8.6–10.0)	9.6 (7.1–12.0)	13.0 (9.9–16.2)	9.5 (7.9–11.2)	8.6 (6.4–10.8)	5.3 (4.0–6.7)	9.6 (8.5–10.7)	12.1 (9.8–14.4)	12.9 (10.1–15.7)	9.2 (7.6–10.8)	6.5 (5.0–8.0)	5.1 (3.9–6.3)	9.0 (8.1–9.9)
Milk	7.4 (7.1–7.8)	6.1 (5.2–7.1)	5.1 (4.0–6.2)	6.7 (5.8–7.5)	8.1 (6.9–9.2)	9.3 (8.1–10.5)	6.9 (6.4–7.4)	5.3 (4.4–6.3)	6.6 (5.3–7.9)	8.1 (7.2–9.0)	8.5 (7.4–9.5)	9.7 (8.9–10.6)	7.9 (7.4–8.4)
Bread-based dishes	6.6 (5.8–7.3)	14.3 (11.5–17.1)	13.0 (9.0–17.0)	7.2 (5.4–9.0)	5.3 (3.5–7.1)	2.1 (1.4–2.8)	8.0 (6.8–9.2)	12.6 (9.8–15.3)	7.4 (5.1–9.7)	5.5 (4.2–6.8)	2.7 (1.9–3.5)	1.8 (1.1–2.5)	5.2 (4.5–6.0)
Vegetables	5.6 (5.2–6.0)	2.8 (2.0–3.6)	3.5 (2.3–4.8)	5.2 (4.3–6.1)	4.8 (4.0–5.6)	6.9 (6.1–7.6)	4.7 (4.3–5.2)	3.3 (2.6–4.1)	5.3 (4.1–6.5)	6.0 (5.0–7.0)	8.2 (7.0–9.4)	7.2 (6.5–7.9)	6.4 (5.8–7.0)
Poultry	5.4 (4.9–5.9)	6.5 (4.8–8.3)	5.2 (3.5–6.8)	6.4 (4.9–7.8)	4.8 (3.5–6.2)	3.2 (2.4–4.1)	5.4 (4.7–6.2)	6.0 (4.4–7.7)	6.9 (5.5–8.4)	5.4 (4.3–6.4)	4.3 (3.2–5.5)	3.9 (2.9–4.9)	5.3 (4.7–5.9)
Pork	4.5 (4.0–5.0)	4.7 (3.1–6.3)	5.6 (3.6–7.6)	4.2 (3.0–5.4)	6.2 (4.0–8.3)	6.4 (4.8–8.0)	5.3 (4.4–6.1)	3.2 (2.1–4.3)	3.6 (1.8–5.3)	3.8 (2.8–4.8)	4.1 (3.0–5.3)	4.3 (3.1–5.4)	3.9 (3.3–4.4)
Potatoes, kumara and taro	4.3 (4.0–4.6)	5.7 (4.5–6.9)	4.0 (3.0–4.9)	4.3 (3.6–5.0)	4.4 (3.6–5.2)	4.4 (3.9–4.9)	4.4 (4.0–4.8)	5.3 (4.2–6.5)	5.3 (3.8–6.8)	4.0 (3.3–4.7)	3.4 (2.9–3.9)	3.8 (3.3–4.3)	4.2 (3.7–4.6)
Non-alcoholic beverages	3.7 (3.4–4.0)	2.9 (2.2–3.6)	3.4 (2.6–4.2)	3.0 (2.4–3.6)	3.3 (2.5–4.1)	2.9 (2.6–3.3)	3.2 (2.8–3.5)	3.8 (3.1–4.6)	4.3 (3.4–5.2)	4.4 (3.5–5.4)	4.2 (3.4–4.9)	4.0 (3.4–4.5)	4.2 (3.8–4.7)
Breakfast cereals	3.5	3.1	1.9	2.8	5.1	4.2	3.4	2.5	2.6	3.9	4.0	4.2	3.6
Cheese	3.3	2.6	3.6	3.4	2.5	2.4	3.0	3.4	2.1	4.5	3.1	3.0	3.5
Sausages and processed meats	3.2	3.6	4.0	3.8	2.8	3.2	3.5	4.1	3.1	2.9	2.7	2.8	3.0
Pies and pasties	2.8	4.1	5.5	3.5	2.1	1.9	3.5	2.9	3.3	2.0	1.8	1.3	2.2
Fish and seafood	2.5	1.3	1.5	2.5	2.9	2.9	2.4	1.4	2.3	2.6	3.3	2.6	2.6
Lamb and mutton	2.4	1.5	2.1	2.2	2.9	2.3	2.3	1.3	2.7	1.7	3.5	2.9	2.4
Fruit	2.2	1.4	1.4	1.4	2.0	2.9	1.7	1.7	2.0	2.5	3.4	3.5	2.7
Eggs and egg dishes	2.1	1.9	1.4	1.9	2.3	2.8	2.0	1.3	2.8	1.7	2.2	3.0	2.1
Dairy products	1.7	1.7	1.1	1.3	1.4	1.4	1.3	2.2	2.4	1.5	2.5	2.3	2.1
Cakes and muffins	1.7	0.8	1.3	1.5	1.6	1.5	1.4	2.2	2.3	1.5	1.9	2.3	1.9
Nuts and seeds	1.4	0.8	0.7	1.3	2.0	1.2	1.3	0.6	0.7	2.0	2.0	0.8	1.5
Biscuits	1.2	1.3	0.5	1.0	1.1	1.4	1.0	2.0	1.1	1.6	1.4	1.4	1.4
Sugar and sweets	1.2	1.0	1.4	1.1	0.8	0.5	1.0	1.9	1.6	1.6	0.9	0.7	1.4

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Savoury sauces and condiments	1.0	1.0	1.0	0.9	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
Soups and stocks	1.0	0.3	1.0	0.5	0.7	1.6	0.8	0.8	0.8	1.1	1.6	1.7	1.2
Snack bars	0.6	1.6	0.5	1.0	0.3	0.2	0.7	1.2	0.4	0.5	0.6	0.2	0.5
Other meat	0.5	0.3	0.2	0.6	1.0	0.9	0.6	0.2	0.2	0.4	0.6	0.7	0.4
Alcoholic beverages	0.5	0.2	0.4	0.4	0.3	0.4	0.4	0.4	0.9	0.5	0.5	0.3	0.5
Puddings and desserts	0.4	0.3	0.1	0.4	0.4	1.1	0.4	0.3	0.5	0.4	0.5	0.7	0.5
Snack foods	0.4	0.7	0.6	0.4	0.2	0.0	0.4	0.9	0.8	0.5	0.3	0.0	0.5
Supplements providing energy	0.2	0.5	0.6	0.1	0.1	0.0	0.2	0.2	0.3	0.3	0.1	0.5	0.3
Butter and margarine	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

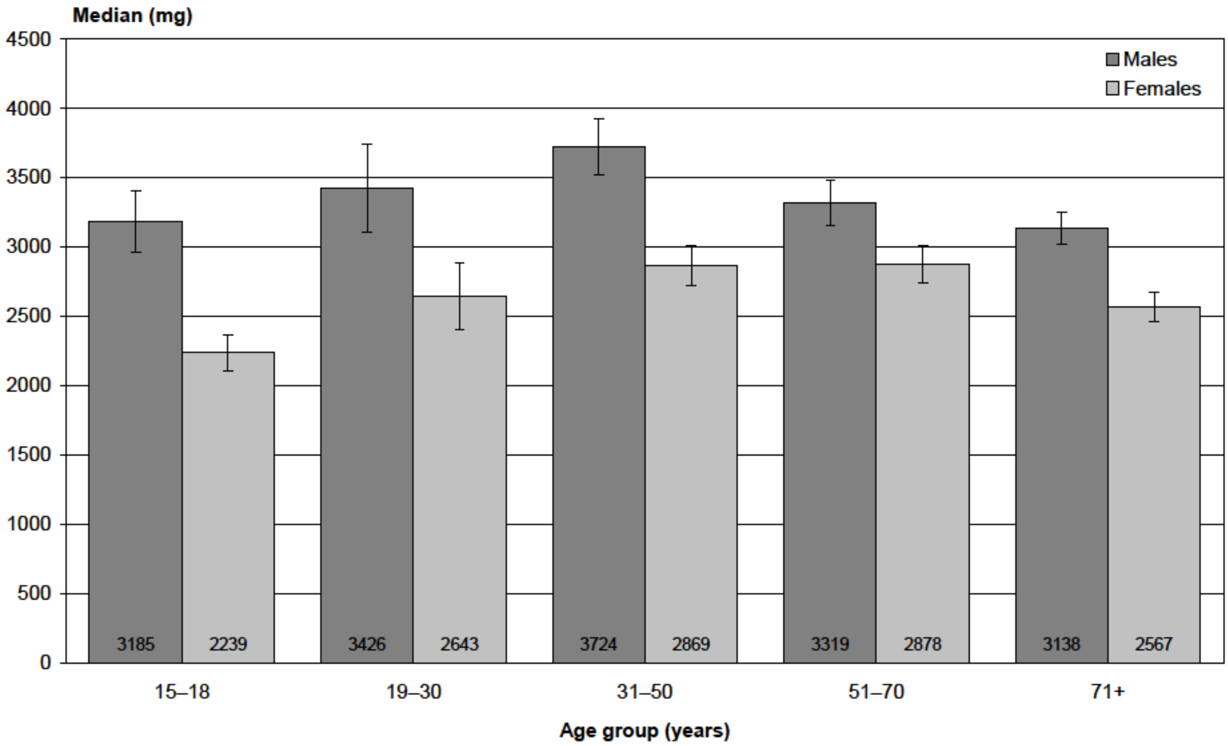
4.9 Potassium

Potassium has a major role in maintaining fluid and electrolyte balance and cell integrity. It also helps nerve impulse transmission and muscle contraction (Rolfes et al 2009). Potassium is found in the cells of all whole foods, so meat, milk, fruits, vegetables, grains and legumes are good sources (Rolfes et al 2009).

Potassium intake

The median usual daily intake of potassium was 3449 mg for males and 2757 mg for females (Table 4.27). Males aged 31–50 years had higher intakes than males aged 15–18 years and those aged 51+ years. Females aged 15–18 years had lower intakes than all older females (Figure 4.27).

Figure 4.27: Median potassium intake (mg), by age group and sex



There were no differences in potassium intake across age groups for Māori males or females. Pacific females aged 15–18 years had lower intakes of potassium than Pacific females aged 19–50 years.

For both males and females there were no differences in intakes of potassium between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of potassium, after adjusting for age, sex and ethnic group.

Dietary sources of potassium

Potatoes, kumara and taro contributed the most potassium to the diet (13%), followed by *Vegetables* (12%), *Non-alcoholic beverages*, *Milk* and *Fruit* (each 10%), and *Bread* (5%) (Table 4.28).

For males and females aged 15–18 years, *Vegetables* contributed less potassium to the diet than to older age groups, particularly those aged 31+ years (Figure 4.28).

Figure 4.28: Percent potassium from vegetables, by age group and sex

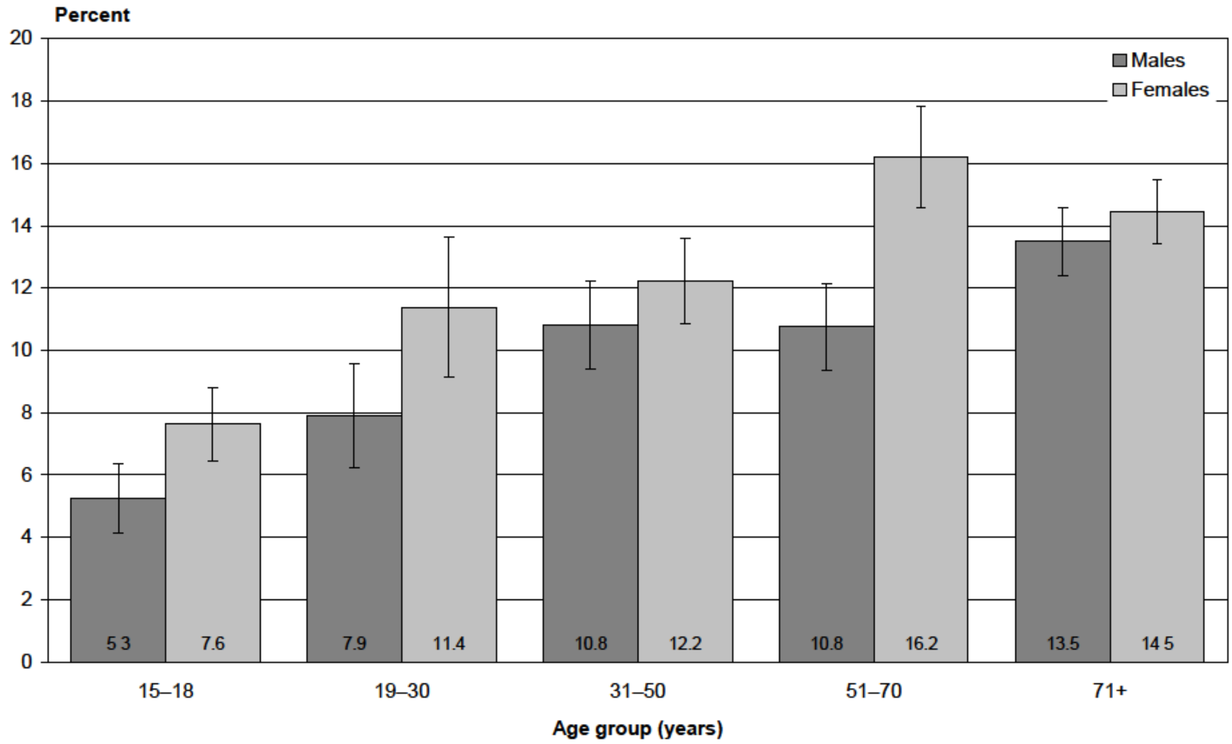


Table 4.27: Potassium intake, by age group, ethnic group, NZDep2006 and sex

		Potassium (mg)[1]			
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**
Total population		3161	2124	3068 (3003–3133)	4317
By age group (years)					
Males	15–18	3291	2215	3185 (2967–3403)	4513
	19–30	3515	2498	3426 (3110–3742)	4643
	31–50	3785	2819	3724 (3518–3930)	4833
	51–70	3407	2307	3319 (3154–3484)	4613
	71+	3176	2253	3138 (3020–3256)	4134
	Total	3535	2493	3449 (3341–3557)	4690
Females	15–18	2306	1512	2239 (2108–2370)	3183
	19–30	2672	2269	2643 (2402–2884)	3118
	31–50	2933	2101	2869 (2727–3011)	3844
	51–70	2921	2047	2878 (2744–3012)	3850
	71+	2634	1782	2567 (2461–2673)	3564
	Total	2817	1955	2757 (2681–2833)	3751
Māori					
Males	15–18	3133	2025	2977 (2413–3541)	4471
	19–30	3693	2257	3477 (3101–3853)	5301
	31–50	3583	2326	3486 (3239–3733)	4964
	51+	3086	2067	3031 (2633–3429)	4168
	Total	3461	2838	3420 (3236–3604)	4137
Females	15–18	2150	1500	2098 (1682–2514)	2866
	19–30	2770	1838	2723 (2380–3066)	3761
	31–50	2768	1843	2702 (2475–2929)	3774
	51+	2569	1677	2508 (2288–2728)	3538
	Total	2673	1721	2608 (2450–2766)	3708
Pacific					
Males	15–18	4042	2926	4051 (2201–5901)	5145
	19–30	3454	1609	3121 (2408–3834)	5714
	31–50	3570	2081	3365 (3014–3716)	5294
	51+	3292	1644	3172 (2692–3652)	5095
	Total	3534	2029	3379 (3091–3667)	5239
Females	15–18	2062	1175	2001 (1752–2250)	3027
	19–30	2809	1681	2691 (2403–2979)	4088
	31–50	2957	2084	2881 (2579–3183)	3927
	51+	2644	1604	2504 (2216–2792)	3861
	Total	2764	2034	2707 (2487–2927)	3565

		Potassium (mg)[1]			
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**
NZEO					
Males	15–18	3244	2055	3127 (2898–3356)	4591
	19–30	3459	2748	3420 (3059–3781)	4222
	31–50	3836	2791	3773 (3503–4043)	4963
	51+	3374	2453	3308 (3178–3438)	4376
	Total	3542	2540	3461 (3342–3580)	4652
Females	15–18	2320	1435	2242 (2107–2377)	3307
	19–30	2715	1801	2649 (2392–2906)	3723
	31–50	2949	2162	2891 (2726–3056)	3809
	51+	2866	2002	2816 (2716–2916)	3793
	Total	2831	1937	2766 (2687–2845)	3802
By NZDep2006 quintile					
Males	1	3556	2816	3513 (3272–3754)	4359
	2	3678	2867	3635 (3380–3890)	4546
	3	3536	2562	3449 (3182–3716)	4627
	4	3397	2154	3267 (2965–3569)	4803
	5	3467	2314	3354 (3113–3595)	4760
Females	1	2875	2116	2844 (2655–3033)	3675
	2	2829	2035	2796 (2664–2928)	3665
	3	2962	2095	2902 (2708–3096)	3904
	4	2704	1796	2614 (2471–2757)	3718
	5	2695	1832	2632 (2362–2902)	3639

1 Usual daily intake. These data were adjusted for the intra-individual variation using PC-SIDE.

2 Percentiles.

Table 4.28: Potassium sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Potatoes, kumara and taro	12.7 (12.0–13.4)	17.6 (14.8–20.4)	13.1 (10.4–15.9)	12.5 (10.7–14.3)	13.0 (11.1–14.9)	14.0 (12.4–15.5)	13.3 (12.3–14.3)	16.1 (13.9–18.3)	14.8 (12.0–17.6)	11.5 (9.9–13.0)	10.3 (8.8–11.7)	11.5 (10.2–12.7)	12.1 (11.2–13.0)
Vegetables	11.6 (11.0–12.2)	5.3 (4.2–6.4)	7.9 (6.2–9.6)	10.8 (9.4–12.2)	10.8 (9.4–12.2)	13.5 (12.4–14.6)	10.0 (9.3–10.8)	7.6 (6.5–8.8)	11.4 (9.1–13.6)	12.2 (10.9–13.6)	16.2 (14.6–17.8)	14.5 (13.4–15.5)	13.0 (12.1–13.9)
Non-alcoholic beverages	9.9 (9.4–10.3)	4.9 (4.1–5.7)	8.9 (7.2–10.6)	9.8 (8.7–10.9)	10.4 (9.4–11.4)	8.0 (7.4–8.5)	9.2 (8.6–9.8)	7.4 (6.3–8.5)	9.2 (7.9–10.5)	11.8 (10.8–12.9)	10.6 (9.7–11.6)	9.4 (8.8–10.0)	10.4 (9.9–11.0)
Milk	9.8 (9.3–10.2)	9.7 (8.3–11.1)	8.0 (6.4–9.7)	9.3 (8.4–10.3)	10.6 (9.4–11.9)	11.0 (9.9–12.1)	9.6 (9.0–10.2)	8.5 (7.1–9.8)	8.3 (7.0–9.6)	10.8 (9.6–11.9)	9.9 (8.9–10.9)	11.1 (10.2–12.1)	9.9 (9.3–10.5)
Fruit	9.8 (9.3–10.2)	7.2 (5.7–8.8)	7.2 (5.6–8.8)	7.6 (6.4–8.7)	8.8 (7.5–10.0)	12.5 (11.2–13.7)	8.2 (7.6–8.9)	9.0 (7.6–10.3)	9.2 (7.7–10.8)	10.1 (9.1–11.1)	13.3 (12.0–14.6)	14.6 (13.6–15.6)	11.2 (10.5–11.8)
Bread	5.5 (5.2–5.7)	5.8 (4.9–6.8)	5.2 (4.2–6.1)	6.4 (5.7–7.2)	5.6 (4.9–6.3)	6.5 (5.8–7.1)	5.9 (5.5–6.3)	5.6 (4.8–6.3)	4.6 (3.8–5.3)	5.0 (4.5–5.6)	4.8 (4.3–5.4)	6.5 (5.6–7.5)	5.1 (4.8–5.4)
Grains and pasta	3.9 (3.5–4.3)	4.8 (3.1–6.6)	6.0 (4.2–7.9)	4.0 (3.0–5.0)	3.5 (2.5–4.5)	2.7 (2.0–3.4)	4.2 (3.6–4.9)	5.0 (3.8–6.3)	5.7 (3.8–7.7)	3.7 (2.8–4.5)	2.1 (1.6–2.6)	2.3 (1.6–2.9)	3.6 (3.1–4.2)
Bread-based dishes	3.7 (3.3–4.2)	9.3 (7.4–11.1)	8.0 (5.2–10.9)	3.7 (2.8–4.6)	3.2 (2.0–4.4)	1.0 (0.6–1.3)	4.7 (3.8–5.5)	7.3 (5.5–9.2)	4.0 (2.7–5.2)	3.1 (2.2–4.0)	1.3 (0.9–1.7)	0.8 (0.5–1.1)	2.8 (2.4–3.3)
Beef and veal	3.6 (3.3–4.0)	4.0 (2.7–5.4)	4.1 (2.4–5.8)	4.5 (3.3–5.6)	4.0 (2.8–5.3)	3.9 (3.1–4.7)	4.2 (3.5–4.8)	3.2 (2.2–4.2)	2.3 (1.2–3.3)	3.4 (2.7–4.1)	3.4 (2.5–4.3)	3.0 (2.4–3.7)	3.1 (2.7–3.5)
Poultry	3.5 (3.1–3.9)	4.8 (3.4–6.1)	4.2 (2.7–5.6)	4.5 (3.2–5.8)	3.1 (2.1–4.1)	1.6 (1.2–2)	3.8 (3.2–4.4)	4.6 (3.4–5.9)	4.3 (3.4–5.3)	3.4 (2.7–4.1)	2.3 (1.6–2.9)	1.7 (1.2–2.2)	3.2 (2.8–3.6)
Fish and seafood	3.0	1.9	2.1	3.7	3.5	3.6	3.1	1.4	2.6	2.9	3.7	2.9	2.9
Pork	2.5	3.6	3.8	2.4	3.1	2.8	3.0	1.9	1.8	2.2	1.9	2.0	2.0
Dairy products	2.3	2.5	1.9	2.1	1.9	1.7	2.0	3.2	3.2	2.0	2.8	3.0	2.6
Breakfast cereals	2.2	1.7	1.4	2.0	3.3	2.5	2.2	1.5	1.6	2.3	2.5	2.5	2.2
Alcoholic beverages	1.9	1.2	2.5	2.6	2.5	1.9	2.4	0.5	1.5	1.8	1.3	1.1	1.4
Savoury sauces and condiments	1.7	2.1	2.0	2.0	1.5	1.1	1.8	2.0	1.9	1.6	1.3	1.2	1.6
Soups and stocks	1.6	0.5	1.7	1.0	1.0	2.4	1.2	1.2	1.7	1.8	2.1	2.6	1.9
Cakes and muffins	1.4	0.7	1.1	1.4	1.6	1.4	1.3	1.9	1.7	1.3	1.7	1.9	1.6
Pies and pasties	1.3	2.3	2.3	1.5	1.0	0.8	1.5	1.6	1.6	1.0	0.8	0.7	1.1
Sugar and sweets	1.3	1.1	1.8	1.2	0.9	0.7	1.2	2.1	1.9	1.5	0.9	0.6	1.4
Sausages and processed meats	1.2	1.5	1.8	1.5	1.0	1.0	1.4	2.0	1.1	1.1	1.0	0.9	1.1
Eggs and egg dishes	1.0	1.1	0.8	1.0	1.0	1.2	1.0	0.8	1.4	0.8	0.9	1.2	1.0

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Nuts and seeds	0.9	0.8	0.7	0.9	1.1	0.7	0.9	0.5	0.6	1.3	1.2	0.5	1.0
Biscuits	0.8	0.9	0.4	0.8	0.8	1.0	0.7	1.4	0.8	1.0	0.9	1.0	1.0
Lamb and mutton	0.7	0.5	0.6	0.6	1.1	0.6	0.7	0.5	0.7	0.4	0.8	0.6	0.6
Puddings and desserts	0.5	0.6	0.1	0.5	0.5	1.2	0.5	0.5	0.6	0.5	0.6	0.7	0.5
Snack bars	0.5	1.4	0.4	0.7	0.3	0.1	0.5	1.0	0.3	0.4	0.5	0.2	0.4
Cheese	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.4	0.2	0.4	0.3	0.3	0.3
Supplements providing energy	0.3	1.0	0.9	0.2	0.1	0.0	0.4	0.3	0.4	0.3	0.0	0.3	0.2
Snack foods	0.3	0.5	0.5	0.2	0.1	0.0	0.3	0.7	0.6	0.3	0.2	0.0	0.3
Other meat	0.2	0.1	0.1	0.2	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.2
Butter and margarine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

4.10 Selenium

Selenium is a constituent of selenoproteins in the body. Selenoproteins are involved in a range of processes, including antioxidant defence and redox metabolism, thyroid metabolism, immune function, reproductive function, and many others (Mann and Truswell 2007).

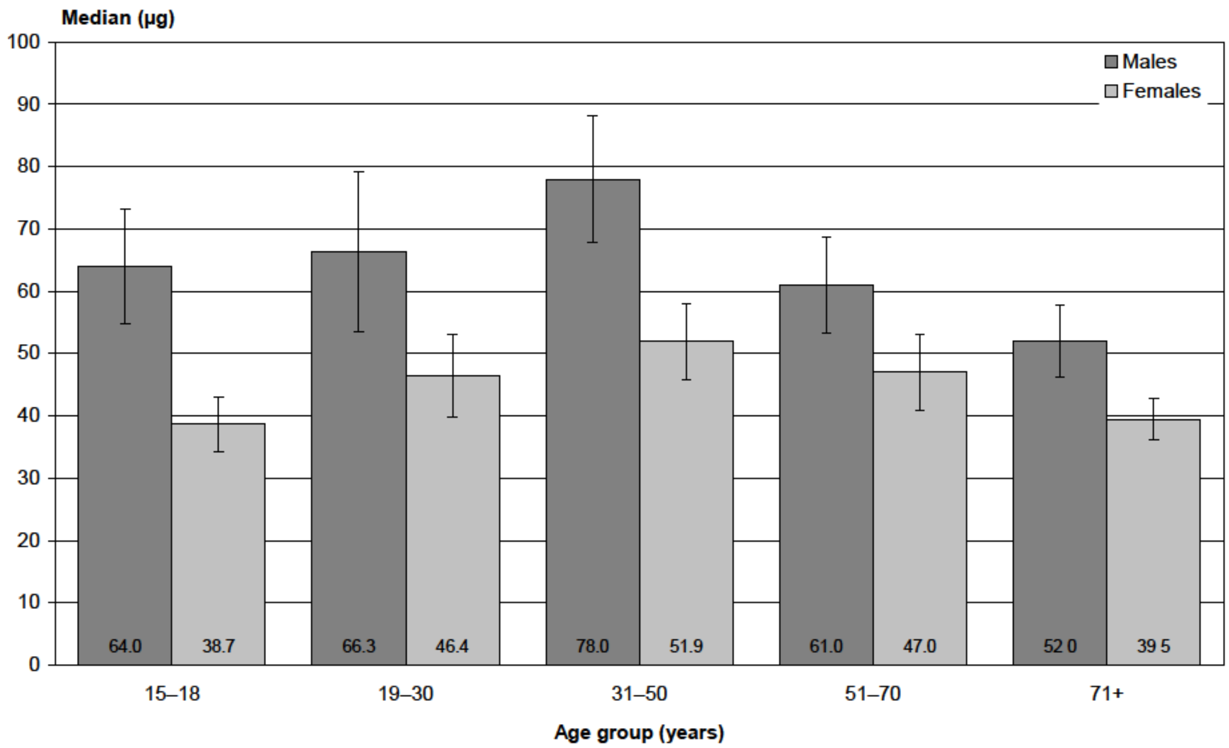
The selenium content of plant foods is dependent on the selenium content of the soils in which they are grown. Fruit, vegetables and grains grown in New Zealand tend to have lower selenium levels than plant foods from countries where the soil selenium concentrations are higher. The selenium content of animal foods is less variable than that of plant foods.

In the North Island, but not the South Island, bread is predominantly made from Australian wheat and other imported wheat, which has a higher selenium content than New Zealand wheat. This was not accounted for in the analysis as bread from a manufacturer may be distributed throughout New Zealand.

Selenium intake

The median usual daily selenium intake was 67.0 µg for males and 47.1 µg for females (Table 4.29). Older males and females aged 71+ years (52.0 µg and 39.5 µg, respectively) and females aged 15–18 years (38.7 µg) had lower intakes of selenium than 31–50-year-old males and females (78.0 µg and 51.9 µg, respectively) (Figure 4.29).

Figure 4.29: Median selenium intake (µg), by age group and sex



Among Māori and Pacific males and females there were no differences in selenium intake by age group.

For both males and females there were no differences in intakes of selenium between NZDep2006 quintiles. Overall, there was no gradient across NZDep2006 quintiles in intakes of selenium, after adjusting for age, sex and ethnic group.

The estimated prevalence of inadequate intake of selenium was 45% (males 32%; females 58%). Females aged 15–18 years had a consistently high prevalence of inadequate intake (over 70%) across all ethnic groups.

Dietary sources of selenium

The *Bread* group was the largest single contributor of selenium to the diet (15%), followed by *Fish and seafood* (12%), *Poultry* (10%), *Bread-based dishes* and *Eggs and egg dishes* (each 7%), *Grains and pasta* (6%) and *Pork* (5%) (Table 4.30).

Older males and females (71+ years) obtained proportionately more selenium from *Bread* than younger males aged 15–50 years or females aged 19–50 years. In contrast, males and females aged 15–18 years obtained more selenium from *Bread-based dishes* than males aged 31+ years and all older females. *Fish and seafood* provided more selenium for males aged 71+ years than for those aged 19–30 years, but less for females aged 15–18 years than for females aged 31+ years (Figure 4.30). *Poultry* provided less selenium for older males and females (71+ years) than for males aged 15–30 years and females aged 19–30 years.

Figure 4.30: Percent selenium from *Fish and seafood*, by age group and sex

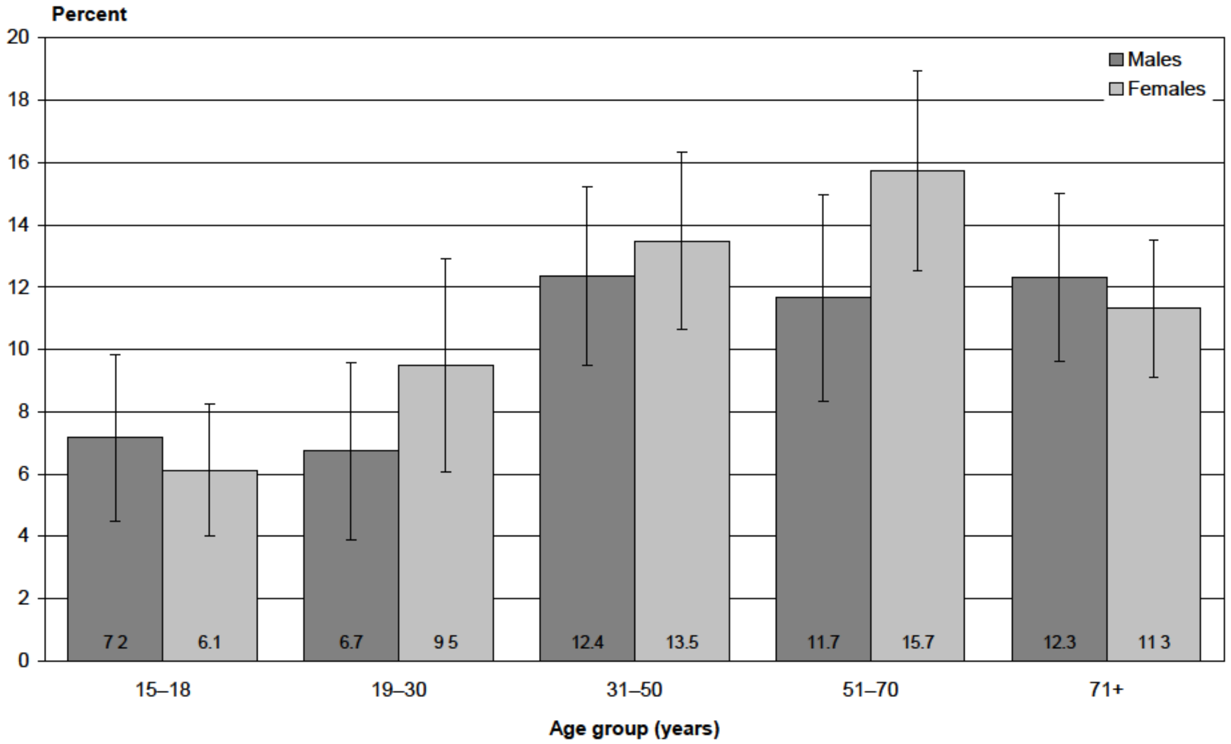


Table 4.29: Selenium intake, by age group, ethnic group, NZDep2006 and sex

		Selenium (mg)[1]				
		Mean	**10th**[2]	**Median (50th),**[2] **(95% CI)**	**90th**[2]	**Inadequate intake (%), (95% CI)**[3]
Total population		59.5	36.0	56.0 (53.0–59.0)	88.0	45.3
By age group (years)						
Males	15–18	66.6	46.0	64.0 (54.8–73.2)	91.0	40.4
	19–30	67.6	52.3	66.3 (53.5–79.1)	84.7	29.7*
	31–50	79.4	59.0	78.0 (67.8–88.2)	102.0	10.9*
	51–70	63.8	43.0	61.0 (53.3–68.7)	87.0	46.8
	71+	56.9	32.0	52.0 (46.3–57.7)	87.0	63.8
	Total	69.7	46.0	67.0 (62.4–71.6)	97.0	31.5
Females	15–18	41.1	26.1	38.7 (34.3–43.1)	59.0	78.2
	19–30	47.1	37.5	46.4 (39.7–53.1)	57.6	71.7
	31–50	54.2	37.4	51.9 (45.8–58.0)	73.8	43.8
	51–70	52.3	28.0	47.0 (40.8–53.2)	82.0	55.0
	71+	41.6	27.6	39.5 (36.2–42.8)	58.2	78.5
	Total	49.9	31.7	47.1 (44.3–49.9)	71.6	58.2
Māori						
Males	15–18	65.8	40.0	61.0 (49.4–72.6)	99.0	48.6
	19–30	80.3	46.0	76.0 (65.7–86.3)	120.0	26.9
	31–50	86.7	42.0	73.0 (62.4–83.6)	145.0	32.7
	51+	80.5	47.0	77.0 (55.2–98.8)	118.0	24.7*
	Total	83.0	63.0	81.0 (69.9–92.1)	106.0	31.5*
Females	15–18	42.3	21.0	37.0 (28.3–45.7)	70.0	72.9
	19–30	57.9	30.0	52.0 (42.5–61.5)	93.0	45.7
	31–50	49.8	36.2	48.1 (36.9–59.3)	65.5	54.5
	51+	54.9	29.0	50.0 (39.0–61.0)	87.0	50.1
	Total	53.8	34.0	51.0 (45.0–57.0)	77.0	53.3
Pacific						
Males	15–18	66.1	45.0	64.0 (25.4–102.6)	90.0	41.2*
	19–30	82.8	35.0	70.0 (43.3–96.7)	146.0	39.0
	31–50	103.9	35.0	70.0 (54.3–85.7)	194.0	39.7
	51+	79.3	29.0	64.0 (49.4–78.6)	147.0	46.0
	Total	86.4	34.0	70.0 (60.9–79.1)	158.0.	40.9
Females	15–18	38.0	20.1	35.1 (16.8–53.4)	59.4	81.0
	19–30	53.2	31.0	50.0 (39.8–60.2)	79.0	49.7
	31–50	65.1	30.0	58.0 (48.9–67.1)	110.0	40.6
	51+	57.3	30.0	51.0 (32.3–69.7)	91.0	47.4
	Total	59.8	39.0	57.0 (47.2–66.8)	85.0	54.4

		Selenium (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%), (95% CI)[3]**
NZEO						
Males	15–18	64.5	42.0	62.0 (53.1–70.9)	91.0	46.6
	19–30	61.1	31.0	55.0 (46.5–63.5)	98.0	57.5
	31–50	76.6	51.0	74.0 (64.1–83.9)	106.0	23.3*
	51+	60.2	35.0	56.0 (50.6–61.4)	90.0	57.6
	Total	67.1	44.0	65.0 (59.7–70.3)	93.0	44.6
Females	15–18	39.8	27.2	38.0 (33.6–42.4)	54.7	83.2
	19–30	43.7	34.3	43.0 (37.5–48.5)	53.9	82.4
	31–50	52.8	33.9	49.6 (43.8–55.4)	75.4	51.1
	51+	48.5	28.9	45.1 (41.1–49.1)	72.3	61.3
	Total	48.6	30.5	45.5 (43.1–47.9)	70.2	62.9
By NZDep2006 quintile						
Males	1	66.9	53.7	66.1 (52.8–79.4)	81.2	[4]
	2	70.1	46.0	66.0 (58.3–73.7)	98.0	[4]
	3	71.0	34.0	62.0 (53.6–70.4)	118.0	[4]
	4	64.7	41.0	61.0 (53.1–68.9)	92.0	[4]
	5	75.1	46.0	69.0 (58.9–79.1)	112.0	[4]
Females	1	47.9	29.8	45.0 (39.9–50.1)	69.5	[4]
	2	53.3	35.3	50.4 (43.3–57.5)	74.8	[4]
	3	48.3	33.2	46.7 (42.0–51.4)	65.5	[4]
	4	47.7	25.0	43.0 (38.6–47.4)	75.0	[4]
	5	50.8	41.2	50.1 (45.1–55.1)	61.2	[4]

1 Usual daily intake. These data were adjusted for intra-individual variation using PC-SIDE.

2 Percentiles.

3 Calculated by probability analysis (see Chapter 2).

4 NZDep2006 quintiles consist of a range of age groups. Because the requirements differ for each age group, an overall figure was not calculated.

* Coefficient of variation of estimated inadequate intake is greater than 50% and confidence interval lies outside range (0–5%). Estimate should be interpreted with caution due to the high level of imprecision relative to the estimate.

Table 4.30: Selenium sources, percent (95% CI),[1] by age group, sex and food group

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Bread	15.1 (14.5–15.8)	14.4 (12.0–16.8)	14.4 (11.5–17.4)	15.3 (13.6–16.9)	15.9 (13.8–18.0)	19.6 (17.6–21.6)	15.6 (14.6–16.6)	16.0 (14.0–17.9)	12.5 (10.4–14.5)	13.5 (12.0–15.1)	15.8 (13.8–17.7)	19.2 (17.6–20.8)	14.7 (13.8–15.6)
Fish and seafood	11.6 (10.6–12.7)	7.2 (4.5–9.8)	6.7 (3.9–9.6)	12.4 (9.5–15.2)	11.7 (8.3–15.0)	12.3 (9.6–15.0)	10.6 (9.1–12.1)	6.1 (4.0–8.2)	9.5 (6.1–12.9)	13.5 (10.7–16.3)	15.7 (12.5–18.9)	11.3 (9.1–13.5)	12.6 (11.0–14.1)
Poultry	9.6 (8.7–10.4)	11.6 (9–14.3)	10.9 (7.6–14.2)	11.2 (8.7–13.7)	8.2 (5.8–10.5)	5.2 (3.9–6.5)	9.8 (8.5–11.1)	11.0 (8.0–13.9)	12.8 (10.2–15.4)	9.7 (7.9–11.5)	6.9 (5.2–8.7)	6.5 (4.8–8.1)	9.3 (8.3–10.3)
Bread-based dishes	6.7 (5.9–7.4)	14.0 (11.0–17.0)	12.0 (8.3–15.8)	6.5 (5.0–8.1)	6.3 (4.1–8.5)	2.7 (1.7–3.7)	7.8 (6.6–9.1)	12.9 (10.1–15.6)	7.3 (5.1–9.5)	6.1 (4.6–7.7)	3.0 (2.1–4.0)	2.0 (1.3–2.7)	5.6 (4.8–6.4)
Eggs and egg dishes	6.6 (6.0–7.2)	6.2 (3.7–8.7)	4.9 (3.0–6.9)	6.6 (5.0–8.2)	7.6 (5.8–9.5)	7.3 (5.7–9.0)	6.6 (5.7–7.5)	4.1 (2.7–5.6)	8.2 (5.7–10.7)	5.6 (4.4–6.9)	6.8 (5.3–8.3)	8.2 (6.3–10.2)	6.6 (5.8–7.4)
Grains and pasta	5.7 (5.0–6.3)	5.8 (4.2–7.3)	8.4 (5.6–11.3)	5.5 (4.0–6.9)	4.9 (3.4–6.4)	3.2 (2.3–4.1)	5.7 (4.8–6.7)	8.8 (6.7–11.0)	8.1 (5.6–10.5)	6.2 (4.6–7.7)	3.3 (2.2–4.3)	3.1 (2.3–4.0)	5.6 (4.8–6.5)
Pork	5.2 (4.7–5.7)	5.2 (3.6–6.8)	7.4 (4.8–10.0)	4.9 (3.6–6.2)	6.2 (4.3–8.2)	6.3 (5.0–7.7)	5.9 (5.0–6.8)	4.2 (2.9–5.5)	3.3 (1.9–4.8)	4.8 (3.7–5.9)	4.9 (3.6–6.1)	5.5 (4.2–6.8)	4.6 (3.9–5.2)
Milk	4.4 (4.2–4.7)	3.7 (3.1–4.3)	3.2 (2.5–3.9)	3.8 (3.2–4.3)	4.7 (4–5.4)	5.1 (4.5–5.7)	4.0 (3.7–4.3)	4.2 (3.2–5.1)	4.3 (3.3–5.2)	5.2 (4.3–6.0)	4.8 (4.1–5.6)	5.2 (4.7–5.8)	4.8 (4.4–5.3)
Beef and veal	3.9 (3.5–4.3)	3.5 (2.4–4.7)	3.2 (1.9–4.4)	4.4 (3.2–5.6)	4.5 (3.0–6.1)	5.2 (4.1–6.3)	4.2 (3.5–4.9)	3.5 (2.3–4.8)	2.3 (1.3–3.3)	3.9 (3.0–4.8)	3.8 (2.8–4.8)	4.7 (3.6–5.8)	3.6 (3.2–4.1)
Vegetables	3.2 (2.9–3.6)	2.7 (1.0–4.4)	1.8 (1.3–2.4)	3.6 (2.6–4.7)	2.1 (1.6–2.6)	3.4 (2.6–4.1)	2.8 (2.3–3.2)	2.0 (1.4–2.6)	3.8 (2.5–5.1)	3.7 (2.9–4.6)	3.8 (3.0–4.6)	3.8 (3.1–4.4)	3.7 (3.2–4.1)
Breakfast cereals	3.2	3.7	2.7	3.0	4.4	3.7	3.4	2.6	2.4	2.8	3.6	3.8	3.0
Non-alcoholic beverages	2.9	0.7	2.1	2.4	3.1	2.7	2.4	1.5	2.6	3.8	3.4	3.4	3.3
Pies and pasties	2.6	3.8	4.8	3.1	2.7	1.9	3.3	3.0	2.5	1.9	1.9	1.7	2.0
Sausages and processed meats	2.1	2.5	2.6	2.3	2.2	2.0	2.3	2.3	2.1	2.0	1.9	2.0	2.0
Cakes and muffins	2.1	1.2	1.8	2.2	2.0	2.0	2.0	3.1	2.8	1.7	2.2	3.0	2.3
Cheese	2.1	1.9	2.5	2.1	1.5	1.5	1.9	2.3	1.5	2.6	2.1	1.9	2.2
Fruit	1.8	1.4	1.5	1.4	1.6	2.6	1.6	1.5	1.7	1.7	2.5	2.7	2.0
Potatoes, kumara and taro	1.7	2.4	1.4	1.5	1.7	1.8	1.6	2.0	2.4	1.9	1.4	1.5	1.8
Nuts and seeds	1.4	0.7	0.6	1.5	1.1	2.1	1.2	0.5	0.5	1.5	3.1	1.4	1.7
Lamb and mutton	1.3	0.8	1.3	1.0	1.5	1.1	1.2	0.7	1.6	0.9	1.9	1.7	1.3
Soups and stocks	1.0	0.4	1.0	0.4	1.0	1.8	0.8	1.0	1.0	1.1	1.6	1.2	1.2
Dairy products	1.0	0.7	0.7	0.8	0.8	0.7	0.8	1.0	1.3	1.1	1.1	1.3	1.1

Food group	Total population	Male						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Savoury sauces and condiments	0.8	1.1	1.1	0.7	0.8	0.5	0.8	0.9	0.9	0.8	0.7	0.6	0.8
Biscuits	0.7	0.7	0.2	0.6	0.7	1.1	0.6	1.1	0.5	0.8	0.8	1.1	0.8
Alcoholic beverages	0.7	0.3	0.6	0.6	0.6	0.7	0.6	0.2	1.3	0.7	0.7	0.4	0.7
Puddings and desserts	0.6	0.5	0.2	0.7	0.7	1.6	0.7	0.6	0.7	0.4	0.8	0.9	0.6
Sugar and sweets	0.6	0.6	0.7	0.4	0.6	0.6	0.6	1.0	0.8	0.7	0.7	0.4	0.7
Other meat	0.4	0.2	0.2	0.3	0.4	0.9	0.4	0.1	0.3	0.3	0.5	0.7	0.4
Snack bars	0.3	1.2	0.2	0.3	0.1	0.1	0.3	0.6	0.3	0.4	0.2	0.1	0.3
Butter and margarine	0.2	0.1	0.2	0.2	0.3	0.4	0.2	0.1	0.2	0.2	0.3	0.4	0.2
Snack foods	0.2	0.4	0.2	0.1	0.0	0.0	0.1	0.5	0.5	0.3	0.1	0.0	0.2
Supplements providing energy	0.1	0.4	0.3	0.1	0.1	0.0	0.1	0.3	0.1	0.1	0.0	0.3	0.1
Fats and oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

5 Dietary Supplements

For the purposes of this survey, dietary supplements were products the participant considered or intended ‘as a supplement to their diet’. This included both prescribed and self-selected supplements in a variety of forms, such as tablets, capsules, powders and liquid preparations. Supplements included, individually or in combination: vitamins, minerals, herbal and botanical preparations, oils such as ‘fish oil’, and products providing glucosamine and/or chondroitin.

Participants were asked to recall the supplements they had consumed at any time in the past year. Details of each supplement were recorded using the product container whenever possible to enable a detailed description. For each supplement the frequency with which it was consumed was also recorded. Using label information and/or website product information, supplements were grouped into the following categories:

- oils – includes fish oils, omega 3 products (alone or plus omega 6 and 9), flax/linseed oil, evening primrose oil
- multi-vitamins and multi-minerals
- herbal-plus (vitamin and/or mineral) – includes echinacea plus vitamin C, gingko plus multi-vitamins/multi-minerals, nettle plus B vitamins and iron
- single vitamin
- single mineral
- botanicals – includes garlic, echinacea, gingko, ginseng, guarana; plant extracts (from, eg, parsley, thistle, hops, motherwort); roots (of, eg, ginger, gentian, black cohosh); seaweeds and algae (eg, kelp, spirulina)
- multi-vitamins
- multi-minerals
- glucosamine/chrondroitin
- bee products
- sport supplements
- weight management
- ‘other supplements’ – includes green mussel powder, co-enzyme Q10, deer velvet, colloidal silver, freeze-dried stag blood.

Participants were considered *Regular* users if they had consumed at least one supplement: daily, more than once per week or once per week. Any consumption less than once per week was classified as *Occasional* use.

All survey respondents were asked whether they took any supplements at any time during the last 12 months.

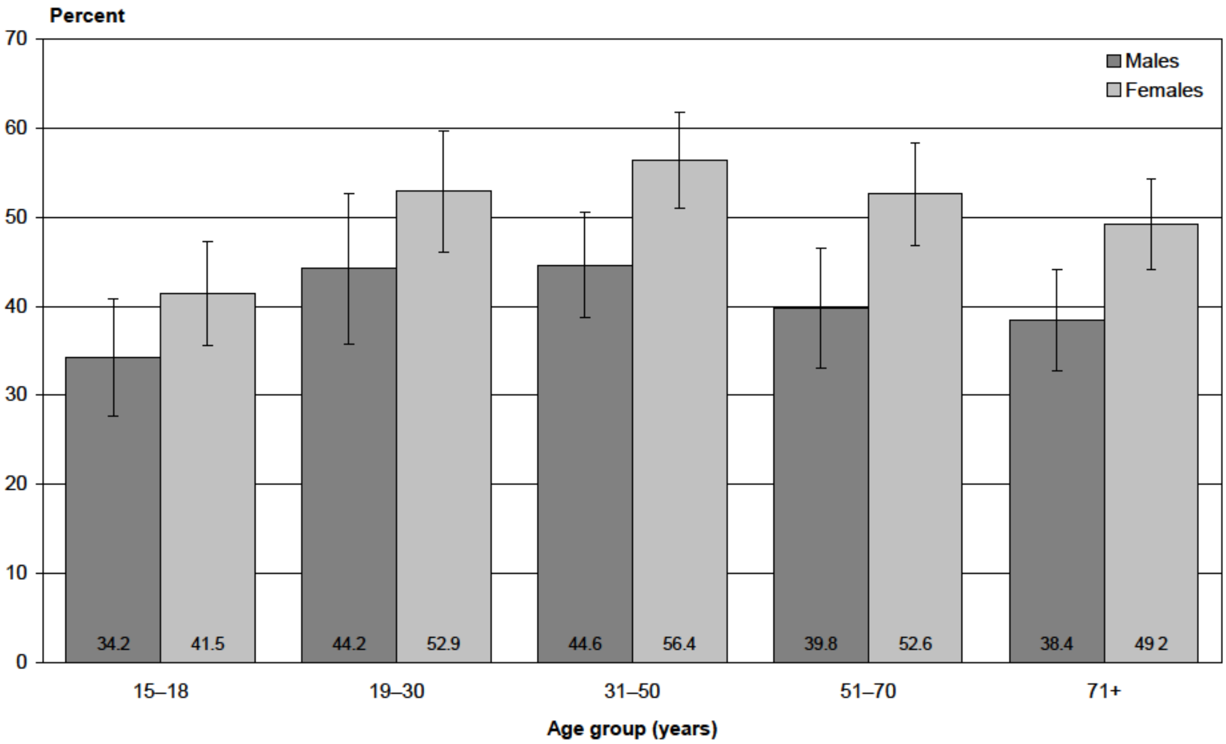
If yes, then the type of supplement was recorded: multi-vitamins and multi-minerals, multi-vitamins, multi-minerals, single vitamin and/or single mineral, oil, other supplement.

5.1 Use in the last year

Any supplement use in the last year was reported by 47.6% of New Zealanders aged 15 years and over, although the proportion was higher for females (53.0%) than for males (41.9%) (Table 5.1). Of the total population, 30.7% were *Regular* users (males 25.5%; females 35.5%). A further 16.9% were *Occasional* users (males 16.4%; females 17.4%).

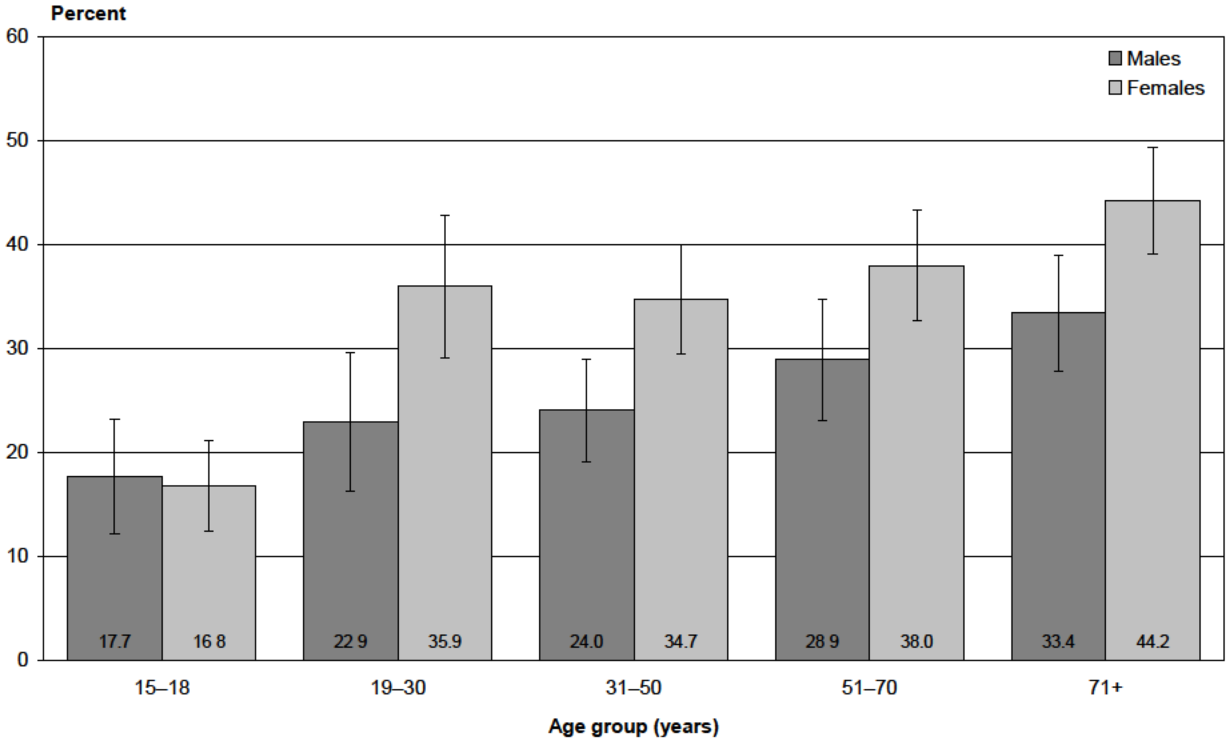
Among females, those aged 31–50 years were more likely to report *Any* supplement use than those aged 15–18 years (56.4% versus 41.5%) (Figure 5.1).

Figure 5.1: Percent *Any* supplement use, by age group and sex



Among males, those aged 71+ years were more often *Regular* users than males aged 15–18 years (33.4% versus 17.7%) (Figure 5.2). Among females, *Regular* use increased with age, from 16.8% for those aged 15–18 years to 44.2% for those aged 71+ years.

Figure 5.2: Percent *Regular* supplement use, by age group and sex



In contrast, *Occasional* use was higher among younger males and females. Older males and females (71+ years) were less likely to be *Occasional* users than males aged 31–50 years and all younger females.

There were no differences in *Any* supplement use in the last year reported across age groups among Māori or Pacific males and females.

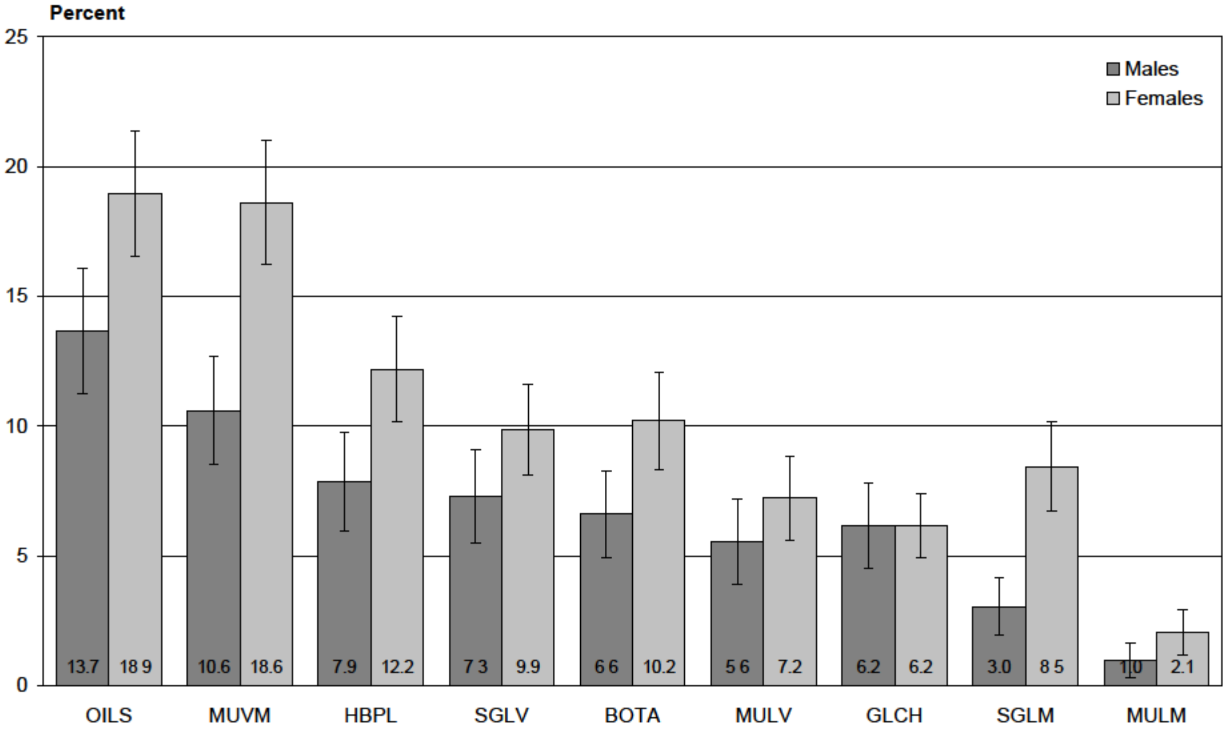
For females (but not males), *Any* supplement use in the last year was reported more often by those in NZDep2006 quintiles 1, 2 and 3 than by those in NZDep2006 quintile 5. Overall, *Any* supplement use in the last year decreased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

5.2 Types of supplements consumed

The most frequently consumed supplements were oils at 16.4% (males 13.7%; females 18.9%) and multi-vitamins/multi-minerals at 14.8% (males 10.6%; females 18.6%). Herbal-plus supplements were consumed by 10.1% of the population (males 7.9%; females 12.2%), followed by single vitamins (8.6%), botanicals (8.5%), multi-vitamins (6.4%), glucosamine/chrondroitin (6.2%), single minerals (5.8%) and multi-minerals (1.5%) (Figure 5.3).

Oils, multi-vitamins/multi-minerals, herbal-plus supplements, botanicals and single minerals were all consumed more frequently by females than by males. Sports supplements were consumed more frequently by males than by females.

Figure 5.3: Types of supplements, by sex



Note: OILS = oils; MUVM = multi-mineral and multi-vitamin; HBPL = herbal-plus; SGLV = single vitamin; BOTA = botanicals; MULV = multi-vitamin; GLCH = glucosamine/chondroitin; SGLM = single mineral; MULM = multi-mineral.

Oils

Younger females aged 15–18 years were less likely to consume oils than females aged 31+ years. Females living in NZDep2006 quintile 5 were less likely to consume oils than those in NZDep2006 quintiles 1–3.

Multi-vitamins/multi-minerals

Frequency of use of this category of supplement among men did not vary with age. However, older (71+ years) females consumed these supplements less often than those in the middle years (31–50 years). There were no differences across quintiles of neighbourhood deprivation for males or females.

Herbal-plus

Frequency of use of this category of supplement did not vary with age among men, but for females those aged 71+ years (7.4%) consumed them less often than those aged 31–50 years (15.4%). For females, those in NZDep2006 quintile 5 (7.6%) consumed this category less often than those in NZDep2006 quintile 2 (17.2%).

Single vitamins

Frequency of use by males did not vary across age groups, but females aged 71+ years (5.5%) consumed them less frequently than females aged 31–50 years (11.6%). Among females, those living in NZDep2006 quintile 5 consumed them less frequently than those in NZDep2006 quintiles 2–4.

Botanicals

Frequency of use by males did not vary across age groups. Females aged 15–18 years consumed botanicals less frequently than females aged 31–50 years. There were no differences for females or males across NZDep2006 quintiles.

Multi-vitamins

Frequency of use by males aged 71+ years (2.2%) was less than for men aged 31–50 years (7.1%). There were no differences across age groups for females, or across NZDep2006 quintiles for males or females.

Glucosamine/chrondroitin

This category of supplements was consumed more frequently by older age groups. Among males, those aged 71+ years consumed them more frequently than males aged 15–50 years. Among females, those aged 51+ years consumed them more frequently than did all younger females. There were no differences in the use of this category of supplements across NZDep2006 quintiles.

Single minerals

There were no differences across age groups for males or females. Males living in NZDep2006 quintile 5 (0.5%) consumed single minerals less frequently than males living in NZDep2006 quintile 3 (5.9%). Females living in NZDep2006 quintile 4 consumed single minerals less frequently than those in all other NZDep2006 quintiles.

Multi-minerals

Males aged 51–70 years consumed multi-minerals more frequently than males aged 15–30 years, but there were no differences across age groups among females. Females living in NZDep2006 quintile 2 (3.8%) consumed multi-minerals more frequently than those living in NZDep2006 quintile 5 (0.6%).

Table 5.1: Dietary supplement use, by age group, ethnic group, NZDep2006 and sex

		Frequency of supplement use (%), (95% CI)		
		Consumers in last year[1]	Regular[2]	Occasional[3]
Total population		47.6 (45.3–50.0)	30.7 (28.6–32.8)	16.9 (15.2–18.7)
By age group (years)				
Males	15–18	34.2 (27.6–40.9)	17.7 (12.2–23.2)	16.5 (12.3–20.8)
	19–30	44.2 (35.7–52.7)	22.9 (16.3–29.5)	21.3 (14.6–28.1)
	31–50	44.6 (38.7–50.5)	24.0 (19.1–29.0)	20.6 (15.7–25.5)
	51–70	39.8 (33.1–46.6)	28.9 (23.1–34.7)	10.9 (6.6–15.3)
	71+	38.4 (32.7–44.1)	33.4 (27.9 –39.0)	5.0 (2.1–7.8)
	Total	41.9 (38.4–45.3)	25.5 (22.5–28.4)	16.4 (13.8–19.0)
Females	15–18	41.5 (35.6–47.3)	16.8 (12.4–21.2)	24.6 (19.6–29.7)
	19–30	52.9 (46.1–59.8)	35.9 (29.1–42.8)	17.0 (11.5–22.5)
	31–50	56.4 (51.1–61.8)	34.7 (29.4–40.0)	21.7 (17.5–25.9)
	51–70	52.6 (46.8–58.4)	38.0 (32.6–43.3)	14.6 (10.3–19.0)
	71+	49.2 (44.1–54.3)	44.2 (39.0–49.4)	5.0 (2.9–7.1)
	Total	53.0 (49.8–56.1)	35.5 (32.6–38.5)	17.4 (15.1–19.8)
Māori				
Males	15–18	20.6 (6.0–35.1)	10.3 (1.3–32.4)	10.2 (2.6–17.9)
	19–30	24.0 (11.3–36.8)	8.2 (2.5–13.9)	15.8 (3.4–28.3)
	31–50	37.7 (27.6–47.8)	23.0 (13.4–32.5)	14.7 (6.8–22.7)
	51+	36.6 (23.3–49.9)	23.5 (12.3–34.7)	13.1 (1.8–24.3)
	Total	31.4 (25.1–37.7)	17.3 (12.1–22.5)	14.1 (8.9–19.2)
Females	15–18	30.6 (16.3–44.8)	10.2 (2.2–26.6)	20.4 (8.8–32.1)
	19–30	42.2 (31.8–52.6)	24.9 (13.6–36.2)	17.3 (10.8–23.8)
	31–50	39.7 (32.0–47.4)	21.5 (13.1–29.9)	18.2 (11.8–24.6)
	51+	34.2 (25.2–43.2)	24.3 (15.6–33.0)	9.9 (3.5–16.2)
	Total	38.2 (33.1–43.2)	21.7 (16.8–26.7)	16.4 (12.9–20.0)
Pacific				
Males	15–18	29.4 (11.9–46.9)	11.4 (0.3–22.5)	17.9 (3.3–32.5)
	19–30	20.6 (11.0–30.1)	11.4 (4.6–18.3)	9.1 (2.5–15.8)
	31–50	17.4 (10.2–24.5)	9.1 (4.3–13.8)	8.3 (2.8–13.8)
	51+	12.3 (3.7–20.8)	3.0 (0.4–9.8)	9.3 (1.5–17.1)
	Total	19.0 (13.9–24.2)	8.9 (5.6–12.3)	10.1 (6.2–14.0)
Females	15–18	15.2 (3.0–27.4)	7.7 (1.3–22.6)	7.5 (1.3–21.5)
	19–30	17.1 (10.1–24.1)	9.9 (4.1–15.7)	7.2 (2.4–12.0)
	31–50	22.8 (15.9–29.7)	13.8 (7.9–19.6)	9.0 (4.4–13.7)
	51+	14.8 (6.7–22.9)	12.2 (5.3–19.0)	2.6 (0.1–13.7)
	Total	18.6 (14.4–22.7)	11.5 (8.1–15.0)	7.0 (4.2–9.8)

		Frequency of supplement use (%), (95% CI)		
		Consumers in last year[1]	Regular[2]	Occasional[3]
NZEO				
Males	15–18	38.8 (31.4–46.2)	20.3 (13.8–26.9)	18.4 (13.6–23.2)
	19–30	49.1 (39.5–58.7)	25.0 (17.4–32.7)	24.0 (16.3–31.8)
	31–50	47.8 (41.1–54.4)	25.3 (19.8–30.9)	22.4 (16.9–28.0)
	51+	41.0 (35.4–46.6)	31.5 (26.5–36.5)	9.5 (5.9–13.0)
	Total	44.8 (41.0–48.7)	27.3 (24.0–30.5)	17.6 (14.7–20.5)
Females	15–18	45.1 (38.7–51.5)	18.9 (13.9–24.0)	26.2 (20.6–31.8)
	19–30	57.9 (50.0–65.9)	40.0 (32.1–48.0)	17.9 (11.4–24.4)
	31–50	60.4 (54.3–66.6)	37.5 (31.5–43.5)	22.9 (18.2–27.7)
	51+	53.7 (48.9–58.5)	41.4 (36.9–46.0)	12.3 (8.8–15.8)
	Total	56.4 (53.0–59.9)	38.2 (35.0–41.5)	18.2 (15.5–20.8)
By NZDep2006 quintile				
Males	1	46.9 (38.2–55.5)	25.4 (18.3–32.6)	21.4 (14.6–28.3)
	2	44.0 (36.1–51.8)	30.3 (23.4–37.2)	13.7 (8.6-18.8)
	3	43.6 (36.0–51.2)	24.8 (17.9–31.6)	18.9 (12.9-24.8)
	4	40.9 (33.4–48.5)	27.7 (21.3–34.1)	13.2 (8.2-18.2)
	5	31.9 (25.0–38.8)	18.4 (13.7–23.1)	13.5 (8.2-18.8)
Females	1	54.2 (47.1–61.3)	37.2 (30.3–44.0)	17.0 (11.0–23.1)
	2	59.7 (52.4–67.0)	39.8 (33.1–46.6)	19.8 (14.7-24.9)
	3	59.5 (51.5–67.6)	41.3 (33.8–48.9)	18.2 (12.4–23.9)
	4	50.3 (43.8–56.8)	33.6 (27.3–39.8)	16.7 (11.7–21.8)
	5	39.1 (33.2–45.0)	24.4 (19.6–29.2)	14.7 (10.4–19.0)

1 Any consumption over the past year.

2 At least one supplement consumed daily, more than once per week or once per week.

3 Any consumption less than once per week.

Table 5.2: Prevalence of use by type of dietary supplement,[1] by age group, ethnic group, NZDep2006 and sex

	Age	OILS	MUVM	HBPL	SGLV	BOTA	MULV	GLCH	SGLM	OTHER	MULM	SPTS	WMGT	BEEP
Total population		16.4 (14.8–18.2)	14.8 (13.2–16.4)	10.1 (8.6–11.7)	8.6 (7.4–10.0)	8.5 (7.1–10.0)	6.4 (5.3–7.7)	6.2 (5.2–7.3)	5.8 (4.9–7.0)	5.8 (4.8–6.8)	1.5 (1.0–2.2)	1.9 (1.4–2.5)	1.2 (0.7–1.6)	0.7 (0.3–1.0)
Males	15–18	10.6 (5.9–17.3)	8.1 (4.7–12.7)	6.0 (1.5–15.0)	5.8 (3.4–8.9)	4.4 (1.7–8.9)	3.8 (1.9–6.8)	0.3 (0.0–1.2)	2.1 (0.7–4.8)	4.2 (1.7–8.7)	0.0	6.2 (3.2–10.8)	0.0	0.0
	19–30	8.7 (4.4–15.0)	11.9 (7.2–18.1)	7.4 (3.8–12.7)	8.5 (4.5–14.2)	5.7 (2.4–11.0)	4.8 (1.9–9.7)	3.9 (1.2–9.2)	2.6 (0.4–7.8)	3.5 (1.2–7.7)	0.1 (0.0–0.3)	5.9 (2.8–10.7)	1.6 (0.3–5.0)	0.0
	31–50	14.1 (10.1–18.8)	12.7 (8.9–17.3)	8.4 (5.4–12.5)	8.4 (5.4–12.2)	6.7 (4.0–10.3)	7.1 (4.4–10.8)	4.1 (2.0–7.4)	1.8 (0.5–4.2)	3.6 (1.7–6.5)	0.6 (0.0–2.9)	2.6 (1.3–4.8)	1.5 (0.5–3.3)	0.8 (0.1–2.9)
	51–70	15.9 (11.0–21.8)	8.1 (5.0–12.3)	8.7 (5.2–13.3)	6.5 (3.5–10.7)	7.4 (4.3–11.7)	5.8 (3.0–9.8)	10.0 (6.5–14.4)	4.1 (1.9–7.5)	8.2 (4.7–13.0)	2.2 (0.7–5.2)	1.0 (0.1–3.9)	0.3 (0.0–1.1)	0.1 (0.0–0.3)
	71+	19.4 (14.2–25.5)	9.3 (5.3–14.7)	6.0 (3.3–10.0)	4.1 (2.5–6.3)	8.3 (4.5–13.9)	2.2 (1.1–3.7)	13.0 (8.2–19.4)	6.7 (4.1–10.3)	5.9 (3.2–9.9)	2.0 (0.2–6.6)	0.0	0.1 (0.0–0.7)	2.2 (0.8–4.9)
	Total	13.7 (11.3–16.3)	10.6 (8.6–12.9)	7.9 (6.1–10.0)	7.3 (5.6–9.3)	6.6 (5.0–8.5)	5.6 (4.0–7.4)	6.2 (4.6–8.0)	3.0 (2.0–4.4)	5.1 (3.7–6.4)	1.0 (0.4–2.0)	2.9 (1.9–4.0)	0.9 (0.4–1.8)	0.5 (0.2–1.2)
Females	15–18	6.9 (4.4–10.3)	13.7 (10.2–18.0)	11.5 (7.9–16.0)	8.3 (5.4–12.2)	5.2 (2.9–8.4)	4.0 (2.2–6.6)	0.4 (0.0–1.5)	5.4 (3.2–8.4)	4.4 (2.3–7.4)	0.7 (0.1–2.3)	0.8 (0.2–2.4)	2.2 (0.4–6.3)	0.0
	19–30	14.3 (9.4–20.4)	20.5 (14.9–27.1)	11.6 (7.0–17.7)	8.3 (4.7–13.4)	8.0 (3.9–14.2)	10.1 (5.9–15.9)	0.1 (0.0–0.3)	10.3 (5.9–16.4)	6.1 (3.0–11.0)	1.1 (0.2–3.4)	1.6 (0.2–5.6)	2.1 (0.5–5.5)	0.1 (0.0–0.3)
	31–50	17.9 (13.7–22.7)	22.0 (17.6–26.9)	15.4 (11.6–19.9)	11.6 (8.5–15.4)	11.9 (8.7–15.7)	7.5 (4.9–10.8)	3.4 (1.7–6.1)	8.1 (5.2–11.8)	6.0 (3.4–9.8)	1.7 (0.6–3.8)	1.2 (0.5–2.5)	1.5 (0.5–3.3)	0.5 (0.1–1.4)
	51–70	24.8 (20.0–30.1)	16.2 (12.3–20.8)	10.1 (6.8–14.4)	10.7 (7.2–15.0)	11.5 (8.1–15.7)	5.4 (3.1–8.8)	12.5 (9.2–16.4)	7.8 (5.1–11.2)	7.4 (4.2–10.6)	4.0 (1.9–7.2)	0.7 (0.2–2.1)	0.8 (0.2–2.1)	2.1 (0.7–4.6)
	71+	24.9 (20.3–30.0)	12.2 (8.5–16.7)	7.4 (5.3–9.9)	5.5 (3.7–8.0)	8.4 (5.9–11.5)	7.7 (4.4–12.3)	15.4 (10.9–20.8)	9.9 (7.3–13.1)	7.4 (5.1–9.7)	1.1 (0.4–2.1)	0.2 (0.0–0.8)	0.4 (0.1–1.2)	0.7 (0.2–1.6)
	Total	18.9 (16.6–21.5)	18.6 (16.3–21.2)	12.2 (10.2–14.4)	9.9 (8.2–11.8)	10.2 (8.4–12.2)	7.2 (5.7–9.0)	6.2 (5.0–7.5)	8.5 (6.8–10.4)	6.4 (4.8–8.1)	2.1 (1.3–3.1)	1.0 (0.5–1.8)	1.4 (0.7–2.1)	0.8 (0.4–1.5)
Māori														
Male	15–18	9.2 (0.7–32.5)	13.1 (2.8–33.4)	2.4 (0.2–9.1)	2.8 (0.2–10.6)	8.6 (0.2–33.8)	1.0 (0.0–6.4)	0.0	0.0	8.4 (0.4–34.4)	0.0	1.4 (0.0–7.8)	0.0	0.0
	19–30	1.0 (0.0–6.1)	11.7 (2.5–30.2)	3.9 (1.0–10.3)	1.2 (0.1–4.7)	3.5 (0.7–9.8)	0.6 (0.0–3.8)	0.0	0.0	0.7 (0.0–3.7)	0.4 (0.0–2.3)	6.7 (2.4–14.4)	2.8 (0.5–8.6)	0.0
	31–50	10.9 (3.9–22.8)	8.1 (2.7–17.7)	8.8 (2.5–20.6)	4.8 (1.9–9.8)	2.2 (0.7–5.2)	6.4 (2.0–14.9)	1.0 (0.1–3.9)	1.3 (0.2–3.9)	5.1 (1.4–12.6)	0.0	8.2 (3.3–16.3)	0.7 (0.1–2.6)	0.0
	51+	9.5 (3.8–19.0)	11.9 (4.0–25.3)	5.8 (0.7–18.3)	3.3 (0.7–9.0)	2.6 (0.6–6.7)	4.8 (0.6–15.3)	10.0 (2.1–25.7)	1.7 (0.1–6.5)	6.8 (0.6–24.4)	0.6 (0.0–3.4)	0.0	1.2 (0.1–4.1)	0.5 (0.0–2.7)
	Total	7.7 (4.0–13.1)	10.6 (6.1–16.7)	6.0 (2.9–10.7)	3.2 (1.7–5.4)	3.5 (1.4–7.0)	3.8 (1.6–7.3)	2.5 (0.7–6.3)	0.8 (0.2–2.1)	4.7 (2.1–9.0)	0.2 (0.0–0.9)	5.1 (2.9–8.3)	1.3 (0.5–2.8)	0.1 (0.0–0.6)

	Age	OILS	MUVM	HBPL	SGLV	BOTA	MULV	GLCH	SGLM	OTHER	MULM	SPTS	WMGT	BEEP
Female	15–18	2.7 (0.3–9.2)	4.9 (1.0–13.3)	5.6 (1.5–13.4)	9.3 (1.6–26.2)	1.0 (0.0–6.4)	2.3 (0.2–8.5)	0.0	4.3 (0.9–11.7)	2.6 (0.1–13.7)	0.0	0.0	4.2 (0.1–21.5)	0.0
	19–30	7.2 (2.5–15.4)	18.2 (9.6–29.8)	10.8 (3.9–22.4)	6.0 (3.1–10.3)	1.7 (0.4–4.4)	8.5 (1.5–23.7)	0.4 (0.0–2.2)	6.6 (3.4–11.3)	3.1 (1.2–6.5)	0.4 (0.0–2.0)	4.1 (0.1–21.4)	3.3 (0.3–11.9)	0.4 (0.0–2.0)
	31–50	9.0 (5.3–14.1)	10.8 (6.5–16.5)	13.7 (6.3–24.7)	3.7 (1.4–7.8)	9.3 (5.2–14.9)	4.3 (2.3–7.3)	1.3 (0.0–6.2)	3.8 (1.4–8.0)	3.0 (0.9–7.3)	2.0 (0.3–6.1)	0.6 (0.1–2.3)	1.1 (0.2–3.4)	0.9 (0.2–2.7)
	51+	10.3 (3.9–20.8)	2.7 (0.6–7.7)	5.9 (1.2–15.6)	6.9 (1.2–19.7)	2.4 (0.5–6.7)	6.2 (2.3–13)	6.5 (2.0–14.9)	3.8 (1.3–8.6)	1.5 (0.3–4.5)	2.5 (0.1–11.1)	0.6 (0.0–3.4)	0.5 (0.0–2.8)	0.0
	Total	8.0 (5.4–11.3)	10.5 (7.2–14.6)	10.3 (6.3–15.7)	5.7 (3.4–8.8)	4.7 (3.0–7.0)	5.6 (3.1–9.4)	2.0 (0.8–4.2)	4.6 (3.0–6.8)	2.7 (1.5–4.5)	1.4 (1.0–3.4)	1.5 (0.1–6.0)	1.9 (0.6–4.5)	0.5 (0.1–1.2)
Pacific														
Males	15–18	12.0 (2.1–32.2)	5.9 (0.4–21.2)	0.0	0.0	0.0	0.0	0.0	0.0	2.5 (0.1–13.1)	0.0	8.9 (1.9–23.8)	0.0	0.0
	19–30	2.0 (0.1–7.5)	4.3 (1.0–11.1)	3.7 (0.9–9.7)	2.3 (0.2–8.9)	1.8 (0.1–6.7)	2.6 (0.2–9.8)	0.0	0.0	1.7 (0.2–6.0)	0.7 (0.0–4.3)	7.4 (3.0–14.8)	1.4 (0.0–7.8)	0.0
	31–50	5.6 (1.6–13.6)	2.3 (0.7–5.4)	2.2 (0.3–7.1)	3.1 (1.0–7.0)	1.8 (0.3–5.5)	2.5 (0.7–5.8)	2.2 (0.3–7.1)	0.8 (0.0–5.1)	0.6 (0.0–3.3)	0.6 (0.0–3.6)	1.9 (0.5–4.8)	0.9 (0.1–3.3)	0.0
	51+	1.3 (0.1–5.2)	3.4 (0.2–12.4)	1.6 (0.0–9.7)	6.5 (1.4–17.6)	0.0	0.0	2.7 (0.2–9.9)	0.0	0.4 (0.0–4.9)	0.0	0.0	0.0	0.9 (0.0–4.9)
	Total	4.6 (2.1–8.5)	3.6 (1.8–6.3)	2.2 (0.8–4.9)	3.1 (1.4–5.8)	1.2 (0.4–2.7)	1.7 (0.6–3.7)	1.3 (0.4–3.3)	0.3 (0.0–1.9)	1.2 (0.3–2.9)	0.4 (0.0–1.6)	4.2 (2.2–7.0)	0.8 (0.1–2.5)	0.2 (0.0–1.0)
Females	15–18	4.2 (0.0–23)	6.0 (0.4–22.0)	7.6 (0.6–26.1)	0.0	3.4 (0.0–19.2)	2.4 (0.0–13.8)	0.0	3.4 (0.2–12.6)	7.6 (0.9–24.7)	4.2 (0.0–23.0)	0.0	0.0	0.0
	19–30	2.2 (0.4–6.4)	4.3 (1.3–9.9)	4.0 (0.8–10.9)	4.7 (1.3–11.5)	2.1 (0.1–7.8)	2.5 (0.4–7.4)	0.0	6.1 (2.3–12.9)	0.7 (0.0–3.9)	0.7 (0.0–4.4)	0.7 (0.0–3.9)	0.7 (0.0–3.9)	0.0
	31–50	4.7 (2.2–8.7)	6.3 (3.1–11.3)	2.5 (0.6–6.5)	1.9 (0.5–4.8)	3.2 (1.1–7.0)	3.8 (1.5–7.9)	1.0 (0.1–3.9)	5.5 (2.2–11.4)	0.5 (0.0–2.8)	0.0	2.9 (0.4–10.0)	1.5 (0.1–5.7)	0.5 (0.0–2.6)
	51+	7.7 (2.7–16.3)	3.5 (0.6–10.5)	2.3 (0.2–8.8)	2.6 (0.1–13.7)	1.1 (0.0–5.7)	0.0	1.8 (0.0–9.6)	2.2 (0.2–8.4)	0.0	0.0	0.0	0.0	0.0
	Total	4.5 (2.6–7.2)	5.1 (3.1–7.8)	3.5 (1.7–6.4)	2.6 (1.1–5.1)	2.5 (1.2–4.6)	2.5 (1.2–4.4)	0.7 (0.1–2.3)	4.8 (2.8–7.6)	1.4 (0.3–3.6)	0.7 (0.1–3.0)	1.3 (0.2–4.0)	0.8 (0.1–2.4)	0.2 (0.0–1.0)

	Age	OILS	MUVM	HBPL	SGLV	BOTA	MULV	GLCH	SGLM	OTHER	MULM	SPTS	WMGT	BEEP
NZEO														
Males	15–18	12.1 (6.4–20.2)	8.7 (4.9–14.2)	7.4 (2.1–17.9)	7.1 (4.3–10.9)	5.4 (2.1–11.0)	4.7 (2.3–8.4)	0.4 (0.1–1.5)	2.6 (0.9–5.9)	5.0 (1.9–10.3)	0.0	6.6 (3.0–12.4)	0.0	0.0
	19–30	10.0 (5.0–17.4)	13.3 (7.9–20.6)	8.4 (4.3–14.5)	9.9 (5.3–16.7)	6.3 (2.5–12.7)	5.3 (2.0–11.0)	4.6 (1.4–10.7)	3.1 (0.5–9.1)	4.0 (1.3–8.9)	0.0	5.7 (2.3–11.5)	1.4 (0.1–5.7)	0.0
	31–50	14.8 (10.4–20.1)	14.0 (9.7–19.3)	8.8 (5.4–13.2)	9.3 (5.9–13.7)	7.3 (4.3–11.4)	7.5 (4.5–11.6)	4.6 (2.2–8.4)	1.9 (0.5–4.8)	3.7 (1.7–7.0)	0.6 (0.0–3.7)	2.3 (1.0–4.4)	1.6 (0.5–3.7)	0.9 (0.1–3.3)
	51+	17.7 (13.4–22.7)	8.7 (5.9–12.2)	8.3 (5.5–12.0)	6.0 (3.6–9.4)	8.1 (5.3–11.7)	5.1 (2.9–8.3)	11.3 (8.1–15.1)	5.0 (3.1–7.6)	8.1 (5.0–11.3)	2.3 (0.9–4.7)	0.8 (0.1–3.2)	0.2 (0.0–0.9)	0.6 (0.2–1.4)
	Total	14.7 (12.1–17.7)	11.5 (9.2–14.1)	8.4 (6.5–10.7)	8.0 (6.1–10.3)	7.3 (5.5–9.4)	6.0 (4.3–8.1)	6.8 (5.1–8.9)	3.4 (2.2–4.8)	5.5 (3.9–7.1)	1.1 (0.4–2.2)	2.7 (1.6–3.8)	0.9 (0.4–1.9)	0.6 (0.2–1.3)
Females	15–18	7.7 (4.9–11.4)	14.9 (10.9–19.8)	12.9 (8.7–18.0)	9.2 (5.8–13.6)	5.9 (3.2–9.6)	4.2 (2.1–7.3)	0.5 (0.0–1.8)	6.2 (3.6–9.7)	4.1 (2.0–7.1)	0.4 (0.0–1.5)	0.9 (0.2–2.8)	1.6 (0.2–5.7)	0.0
	19–30	16.4 (10.6–23.7)	22.7 (16.0–30.6)	13.4 (8.0–20.7)	8.9 (4.6–15.2)	9.4 (4.5–16.8)	10.4 (5.7–17.2)	0.0	11.2 (5.9–18.7)	7.1 (3.3–12.9)	1.3 (0.2–4.0)	2.0 (0.3–6.7)	2.0 (0.4–6.1)	0.1 (0.0–0.4)
	31–50	19.8 (15.1–25.3)	24.1 (19.0–29.6)	16.8 (12.4–21.9)	13.0 (9.5–17.2)	12.6 (9.0–17.0)	8.0 (5.1–11.9)	3.8 (1.8–6.8)	8.8 (5.6–13.2)	6.5 (3.5–11.0)	1.8 (0.6–4.2)	1.1 (0.3–2.7)	1.5 (0.5–3.7)	0.5 (0.1–1.6)
	51+	26.3 (22.2–30.7)	16.0 (12.9–19.5)	9.7 (7.1–13.0)	9.8 (7.0–13.2)	11.3 (8.6–14.5)	6.1 (3.8–9.4)	14.1 (11.3–17.3)	8.7 (6.5–11.4)	8.0 (5.3–10.6)	3.4 (1.8–5.8)	0.6 (0.1–1.6)	0.7 (0.2–1.7)	1.8 (0.7–3.7)
	Total	20.8 (18.2–23.7)	20.1 (17.4–23.0)	13.2 (11.0–15.7)	10.8 (8.9–12.9)	11.1 (9.0–13.4)	7.5 (5.8–9.5)	6.8 (5.5–8.4)	9.1 (7.2–11.2)	7.0 (5.1–8.9)	2.2 (1.4–3.4)	1.1 (0.5–1.9)	1.3 (0.7–2.3)	0.9 (0.4–1.6)
NZDep2006														
Males	1	19.4 (13.2–26.9)	9.0 (5.1–14.6)	9.2 (5.1–15.0)	7.8 (4.1–13.4)	7.7 (4.5–12.1)	8.0 (4.2–13.4)	6.9 (3.8–11.4)	2.9 (1.1–6.0)	5.4 (2.6–9.7)	0.7 (0.0–3.4)	2.5 (1.0–5.0)	0.0	0.9 (0.0–4.4)
	2	11.9 (7.6–17.4)	13.2 (8.4–19.3)	9.8 (6.0–14.8)	10.1 (5.7–16.4)	7.1 (3.7–12.0)	5.3 (2.1–10.7)	6.6 (3.7–10.7)	3.2 (1.0–7.5)	5.3 (2.7–9.4)	1.6 (0.2–5.5)	4.4 (1.7–9.1)	1.3 (0.1–4.6)	0.1 (0.0–0.5)
	3	11.7 (7.0–17.9)	11.2 (6.7–17.3)	9.1 (4.9–15.1)	8.4 (4.6–13.9)	6.2 (2.8–11.7)	5.5 (2.6–10.0)	8.6 (4.2–15.1)	5.9 (3.0–10.1)	4.0 (1.6–8.2)	1.3 (0.2–4.5)	4.1 (1.5–8.8)	1.4 (0.2–4.9)	1.1 (0.3–2.8)
	4	13.6 (9.1–19.2)	9.0 (5.4–13.9)	5.2 (2.1–10.4)	5.2 (2.8–8.7)	9.3 (5.2–14.9)	5.1 (2.5–9.0)	5.4 (2.6–9.6)	2.4 (0.7–5.6)	6.6 (3.3–11.6)	1.3 (0.2–4.0)	1.2 (0.4–2.8)	1.2 (0.3–3.3)	0.1 (0.0–0.3)
	5	10.6 (6.8–15.6)	10.6 (6.6–15.9)	5.3 (2.4–10.0)	4.2 (2.2–7.0)	2.4 (0.8–5.5)	3.4 (1.2–7.4)	2.8 (1.0–5.9)	0.5 (0.1–1.3)	3.9 (1.3–8.8)	0.0	2.2 (1.1–4.1)	1.1 (0.3–2.8)	0.2 (0.0–0.7)

	Age	OILS	MUVM	HBPL	SGLV	BOTA	MULV	GLCH	SGLM	OTHER	MULM	SPTS	WMGT	BEEP
Females	1	24.6 (17.8–32.4)	16.4 (10.9–23.1)	12.8 (8.2–18.6)	10.0 (6.2–14.9)	10.4 (6.2–16.1)	7.3 (4.0–12.2)	7.1 (4.0–11.7)	11.5 (7.2–17.1)	6.0 (2.6–11.4)	1.7 (0.4–4.5)	2.9 (0.9–7.0)	0.5 (0.0–2.3)	1.0 (0.0–5.7)
	2	23.3 (18.4–28.7)	21.5 (16.0–27.8)	17.2 (12.2–23.1)	11.8 (7.8–16.8)	13.3 (9.0–18.7)	6.5 (3.6–10.6)	8.1 (5.3–11.8)	11.4 (7.7–16.1)	7.9 (4.6–11.2)	3.8 (1.6–7.4)	1.2 (0.2–3.6)	1.3 (0.2–3.8)	0.8 (0.2–2.3)
	3	23.6 (17.4–30.6)	19.9 (14.3–26.6)	9.4 (6.0–14.0)	12.6 (8.4–18.0)	9.8 (6.1–14.6)	10.8 (6.5–16.5)	5.7 (3.2–9.2)	9.3 (5.1–15.3)	8.7 (4.4–15.0)	2.7 (0.8–6.4)	0.1 (0.0–0.6)	1.7 (0.3–4.9)	0.9 (0.1–3.2)
	4	13.1 (9.8–17.0)	21.1 (15.7–27.3)	13.4 (9.0–18.9)	9.9 (6.6–14.1)	10.0 (6.4–14.6)	6.3 (3.6–10.0)	5.3 (3.3–8.0)	2.5 (1.6–3.6)	5.2 (2.8–8.9)	1.2 (0.4–2.7)	0.3 (0.1–1.1)	0.6 (0.2–1.5)	0.7 (0.2–1.7)
	5	9.6 (6.8–13.2)	13.1 (9.4–17.5)	7.6 (4.6–11.6)	4.3 (2.6–6.5)	7.0 (3.6–12.0)	5.0 (2.8–8.1)	4.4 (2.6–6.8)	7.6 (4.7–11.4)	3.8 (1.8–7.1)	0.6 (0.1–1.5)	0.9 (0.2–2.4)	2.8 (1.0–6.0)	0.6 (0.1–1.9)

Notes:

OILS = oils; MUVM = multi-mineral and multi-vitamin; HBPL = herbal-plus; SGLV = single vitamin; BOTA = botanicals; MULV = multi-vitamin; GLCH = glucosamine/chondroitin; SGLM = single mineral; MULM = multi-mineral; SPTS = sports; WMGT = weight management; BEEP = bee products.

1 Prevalence of supplement use among the total population aged 15 years and over (includes those who used supplements and those who did not use supplements).

6 Dietary Habits

The Dietary Habits Questionnaire consisted of a series of questions on key dietary patterns and habits associated with diet quality and/or nutritional status. Participants were asked about key behaviours such as breakfast consumption, the frequency of eating certain foods, food preparation and cooking practices (eg, removal of excess fat, addition of salt), and choosing low fat or reduced-salt foods.

Frequency of intake focused on the major food groups, which are important for assessing diet quality, such as vegetables and fruit, breads, meat and seafood, takeaways, sugary drinks and confectionery. Questions on specific foods focused primarily on dietary fat intake by examining the type of milk, spreads and cooking fats usually used.

Most of these questions included five or more response options. Where possible, the responses to these questions were combined to make comparisons against specific nutritional guidelines or recommendations, or to aid interpretation of the results. The number of participants in each response category was often too small to present the results for each ethnic group stratified by age group and sex. Therefore, detailed results for Māori, Pacific and New Zealand European and Other ethnic groups are presented in the online data tables (www.moh.govt.nz).

As with all self-reported dietary data, results may be influenced by social desirability (ie, a tendency to over-report healthy foods and under-report less healthy foods).

6.1 Having breakfast every day

Eating breakfast regularly is associated with the prevention of weight gain and a lower body mass index (BMI) compared to skipping breakfast (Cho et al 2003; Ma et al 2003; van der Heijden et al 2007).

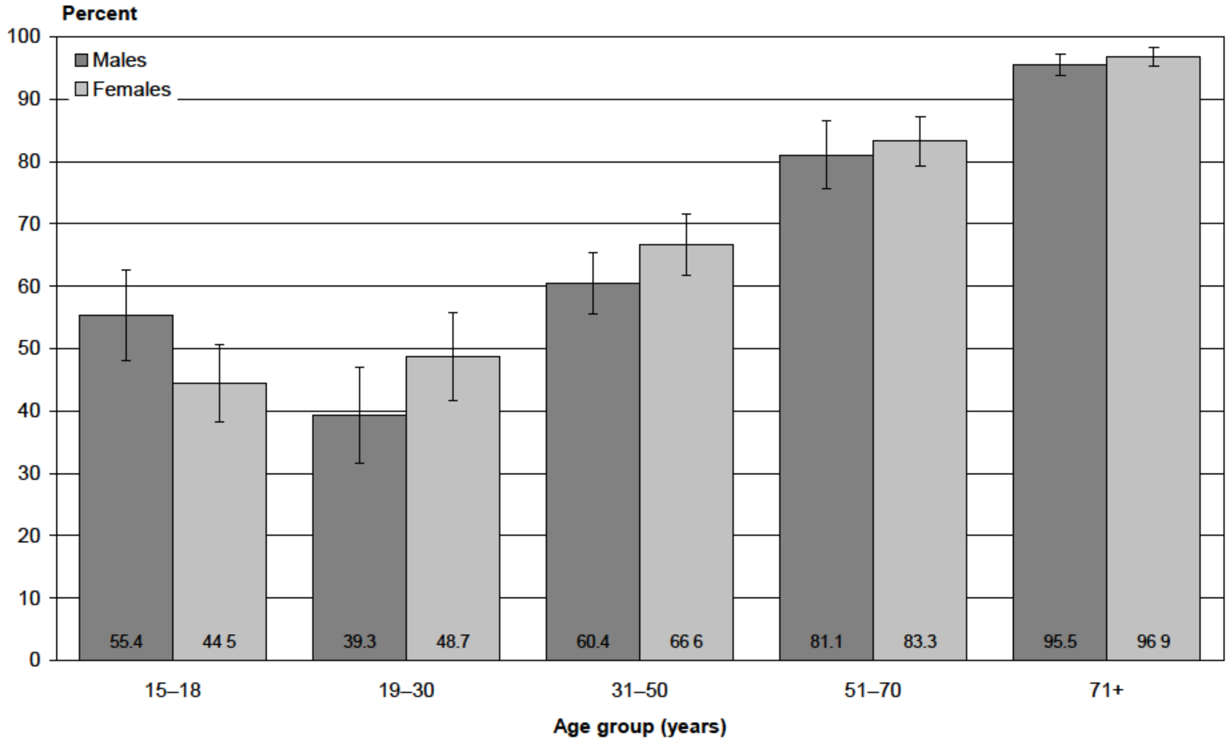
Survey question

How many days in an average week do you have something to eat for breakfast? You may have eaten at home, in a car, at work or in a café.

Breakfast was eaten daily by 66.9% of the total population aged 15 years and over, and a further 18.8% ate breakfast three to six times a week. Six percent did not usually eat breakfast (Table 6.1).

Overall, the proportion of both males and females who reported eating breakfast daily increased with increasing age, except that males aged 19–30 years were less likely to have eaten breakfast daily (39.3%) compared to males aged 15–18 years (55.4%) (Figure 6.1).

Figure 6.1: Percent eating breakfast daily, by age group and sex



There was a decrease in the proportion of those who reported consuming breakfast daily with increasing neighbourhood deprivation in both males and females. Those living in NZDep2006 quintile 1 were more likely to *Eat breakfast daily* (males 72.0%; females 79.0%) compared to those living in quintile 5 (males 54.8%; females 56.6%).

Table 6.1: Frequency of eating breakfast per week, by age group, NZDep2006 and sex

		0–2 times per week (prevalence), (95% CI)	3–6 times per week (prevalence), (95% CI)	7 times per week (prevalence), (95% CI)
NZ population (aged 15+)		14.4 (12.9–15.9)	18.8 (17.1–20.4)	66.9 (65.2–68.6)
By age group (years)				
Males	15–18	13.9 (9.6–18.3)	30.7 (23.7–37.7)	55.4 (48.0–62.7)
	19–30	27.0 (19.7–34.3)	33.7 (25.5–41.9)	39.3 (31.6–47.0)
	31–50	18.9 (14.8–23.0)	20.7 (16.3–25.1)	60.4 (55.5–65.3)
	51–70	8.9 (5.4–12.4)	10.0 (6.2–13.8)	81.1 (75.7–86.5)
	71+	1.7 (0.8–3.1)	2.8 (1.6–4.5)	95.5 (93.9–97.2)
	Total	15.9 (13.7–18.1)	19.6 (17.4–21.9)	64.5 (62.1–66.9)
Females	15–18	21.0 (16.4–25.5)	34.5 (29.1–40.0)	44.5 (38.3–50.7)
	19–30	21.7 (16.2–27.2)	29.6 (23.1–36.0)	48.7 (41.7–55.7)
	31–50	14.6 (11.1–18.2)	18.8 (14.1–23.4)	66.6 (61.7–71.5)
	51–70	6.6 (4.0–9.2)	10.1 (7.2–13.0)	83.3 (79.3–87.3)
	71+	1.3 (0.4–2.9)	1.8 (0.9–3.2)	96.9 (95.5–98.4)
	Total	13.0 (11.1–14.8)	17.9 (15.7–20.2)	69.1 (66.7–71.5)
By NZDep2006 quintile				
Males	1	12.0 (6.4–17.5)	16.0 (10.1–22.0)	72.0 (65.1–78.9)
	2	13.3 (8.8–17.9)	17.6 (11.6–23.6)	69.0 (62.9–75.2)
	3	16.4 (11.5–21.3)	18.6 (13.0–24.2)	64.9 (57.6–72.3)
	4	18.0 (11.9–24.1)	23.2 (17.5–28.9)	58.8 (52.1–65.5)
	5	21.2 (15.9–26.5)	24.0 (18.4–29.7)	54.8 (49.0–60.6)
Females	1	8.7 (4.2–15.5)	12.3 (7.9–16.7)	79.0 (73.0–84.9)
	2	8.4 (5.4–11.4)	14.3 (10.0–18.7)	77.3 (72.6–82.0)
	3	11.5 (7.4–15.6)	18.9 (12.1–25.8)	69.5 (61.5–77.5)
	4	15.5 (10.3–20.7)	21.9 (16.7–27.1)	62.6 (56.6–68.7)
	5	21.4 (16.5–26.3)	22.0 (18.2–25.7)	56.6 (51.5–61.8)

Notes:
Frequency for never, 1, 2, 3, 4, 5, 6, 7 times per week are presented in the online data tables.
Results for Māori, Pacific and NZEO are presented in the online data tables.

6.2 Eating from the four major food groups

The *Food and Nutrition Guidelines for Healthy Adults* (Ministry of Health 2003b) recommend that people consume a variety of nutritious foods from each of the four major food groups each day. These are:

- vegetables and fruit
- breads and cereals, preferably whole-grain
- milk and milk products, preferably reduced- or low-fat options
- lean meat, poultry, seafood, eggs or alternatives.

Vegetables and fruit

Vegetables and fruit are highly nutritious and have been shown to protect against heart disease, stroke and high blood pressure (World Health Organization 2003). There is also evidence that vegetables and fruit protect against cancers of the mouth, larynx, pharynx, oesophagus and stomach, and that fruit also protects against lung cancer (World Cancer Research Fund and American Institute for Cancer Research 2007).

In New Zealand it is recommended that adults eat at least three servings of vegetables and at least two servings of fruit each day (Ministry of Health 2003b). Note that this recommendation allows up to one serving of juice to be counted, whereas the survey question excluded juice. The *Food and Nutrition Guidelines* recommend limiting the consumption of fruit juice because of the high sugar content.

Survey questions

On average, how many servings of fruit (fresh, frozen, canned or stewed) do you eat a day? Do not include fruit juice or dried fruit. (A serving is the same as a medium piece of fruit like an apple or two small pieces of fruit like two apricots, or half a cup of stewed fruit).

On average, how many servings of vegetables (fresh, frozen or canned) do you eat a day? Do not include vegetable juices. (A serving is the same as one potato, half a cup of peas or a cup of salad).

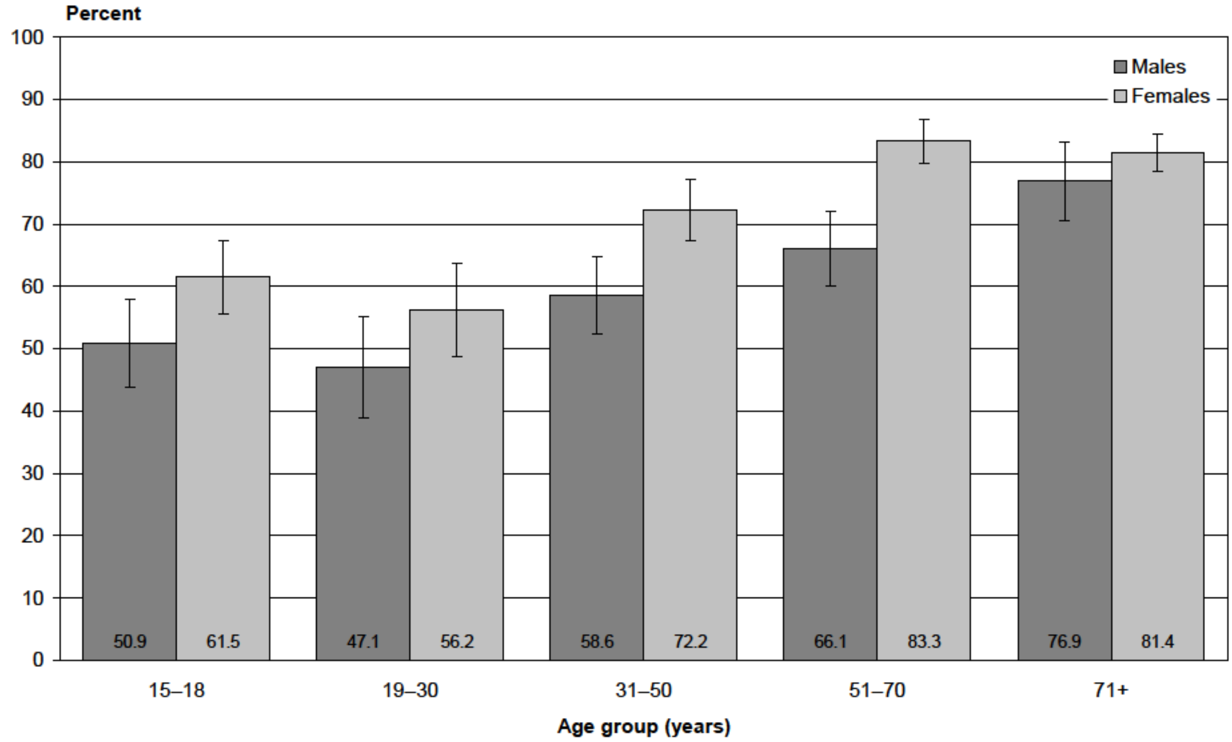
The recommended three or more servings of vegetables each day was eaten by 66.0% of the total population aged 15 years and over (Table 6.2). The recommended two or more servings of fruit each was eaten by 60.4% of the total population aged 15 years and over (Table 6.3).

Recommended vegetable intake

The recommended three or more servings of vegetables each day was eaten by 72.2% of females and 59.3% of males (Table 6.2). Females aged 31–50 and 51–70 years were more likely than males in these age groups to have reported eating at least three servings of vegetables a day (Figure 6.2). There were no differences between males and females for the other age groups.

Younger females (15–30 years) were less likely to report eating at least three servings of vegetables a day compared to females of other ages, with those aged 51+ years most likely to report consuming the recommended intake. Younger males (15–30 years) were less likely to report eating at least three servings of vegetables a day compared to males aged 51+ years.

Figure 6.2: Consumption of 3+ servings of vegetables a day, by age group and sex



Males and females living in the least deprived neighbourhoods (quintile 1) were more likely to report eating three or more servings of vegetables per day (males 65.6%; females 82.2%) than males and females living in the most deprived neighbourhoods (quintile 5: males 54.4%; females 62.4%).

Overall, the proportion of New Zealanders aged 15 years and over eating at least three servings of vegetables a day decreased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.2: Number of servings of vegetables consumed per day, by age group, NZDep2006 and sex

		< 1 serving a day (prevalence), (95% CI)	**1 serving a day (prevalence), (95% CI)**	**2 servings a day (prevalence), (95% CI)**	**3+ servings a day (prevalence), (95% CI)**
Total population		2.8 (2.1–3.6)	10.1 (8.7–11.5)	20.9 (19.1–22.7)	66.0 (63.7–68.2)
By age group (years)					
Males	15–18	4.5 (2.3–7.8)	17.5 (11.3–23.7)	26.5 (20.6–32.4)	50.9 (43.8–57.9)
	19–30	4.7 (2.1–8.8)	21.1 (14.6–27.7)	27.0 (20.0–34.0)	47.1 (39.1–55.2)
	31–50	3.1 (1.3–5.0)	13.0 (9.2–16.8)	25.2 (20.1–30.3)	58.6 (52.4–64.7)
	51–70	3.2 (1.3–6.5)	10.1 (6.1–14.1)	20.4 (15.1–25.6)	66.1 (60.1–72.1)
	71+	2.0 (1.0–3.4)	4.8 (3.2–6.5)	16.3 (10.3–22.2)	76.9 (70.6–83.2)
	Total	3.5 (2.2–4.7)	13.5 (11.0–16.0)	23.6 (20.7–26.4)	59.3 (55.7–62.9)
Females	15–18	4.0 (2.2–6.6)	8.1 (5.2–11.0)	26.4 (20.8–32.0)	61.5 (55.6–67.4)
	19–30	2.4 (1.0–4.8)	13.1 (8.6–17.5)	27.9 (21.6–34.1)	56.2 (48.7–63.7)
	31–50	2.7 (1.3–4.9)	6.4 (3.9–8.9)	18.3 (24.4–22.2)	72.2 (67.3–77.1)
	51–70	1.5 (0.7–3.0)	3.6 (2.0–5.3)	11.5 (8.2–14.8)	83.3 (79.9–86.8)
	71+	0.9 (0.4–1.9)	5.1 (3.3–7.0)	12.6 (9.8–15.3)	81.4 (78.4–84.4)
	Total	2.2 (1.5–3.0)	7.0 (5.6–8.4)	18.4 (16.1–20.6)	72.2 (69.5–74.8)
By NZDep2006 quintile					
Males	1	3.2 (0.6–9.4)	9.7 (5.3–16.1)	21.4 (15.2–27.7)	65.6 (57.9–73.4)
	2	1.7 (0.4–4.6)	10.1 (5.6–14.6)	21.4 (13.9–28.9)	66.7 (58.3–75.1)
	3	3.2 (1.1–7.1)	13.2 (7.8–18.6)	28.7 (22.8–34.6)	54.7 (47.7–61.7)
	4	3.2 (1.4–6.4)	20.0 (14.0–26.0)	23.7 (18.6–28.7)	52.9 (46.4–59.4)
	5	6.5 (3.7–9.3)	16.0 (10.7–21.2)	22.8 (17.6–27.9)	54.4 (47.9–61.0)
Females	1	0.9 (0.0–4.4)	3.4 (1.4–7.0)	13.5 (9.2–17.8)	82.2 (78.0–86.4)
	2	2.5 (0.9–5.4)	3.6 (1.5–7.2)	19.9 (14.8–25.0)	74.0 (69.0–79.0)
	3	1.1 (0.3–2.8)	7.3 (4.4–10.3)	15.7 (10.3–21.2)	75.6 (69.5–81.7)
	4	2.7 (1.6–4.2)	9.1 (5.2–13.1)	20.1 (15.3–24.8)	67.1 (61.1–73.1)
	5	4.0 (1.9–6.0)	11.5 (8.9–14.1)	22.2 (18.1–26.2)	62.4 (57.7–67.0)

Notes:

Never eat vegetables = 0.2%, and so was not recorded in the table.

Results for 3, 4, 5+ servings a day are presented in the online data tables.

Results for Māori, Pacific and NZEO are presented in the online data tables.

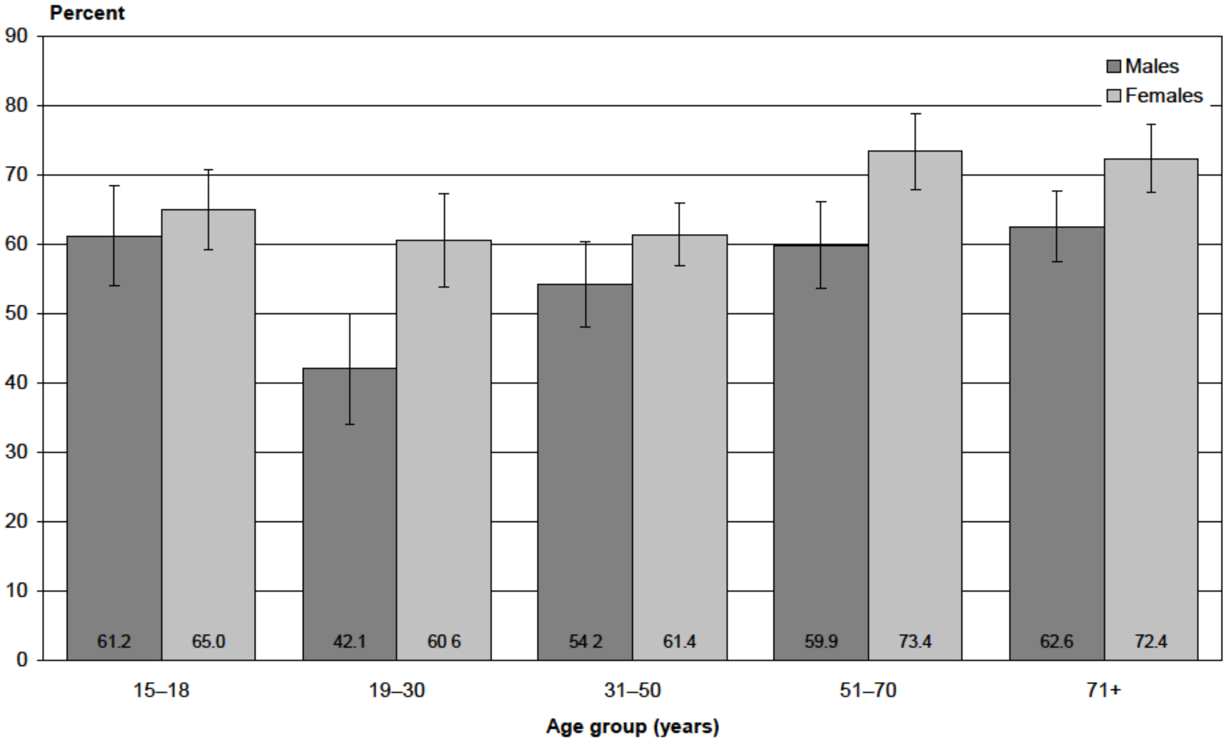
Recommended fruit intake

The recommended two or more servings of fruit each day was reported to be eaten by 54.6% of males and 65.8% of females (Table 6.3). This did not include fruit juice.

Females aged 19–30 and 51–70 years were more likely to report eating the recommended number of servings compared to males in the same age groups (Figure 6.3). There were no differences between males and females for the other age groups.

Males aged 19–30 years were less likely to report eating at least two servings of fruit a day compared to males in other age groups, except 31–50 years. Females aged 19–30 years were less likely to report eating at least two servings of fruit a day compared to females aged 51+ years.

Figure 6.3: Consumption of 2+ servings of fruit per day, by age group and sex



Males living in areas of high neighbourhood deprivation (quintile 5) were less likely to report eating at least two servings of fruit a day (42.8%) compared to males living in areas of low neighbourhood deprivation (quintile 1: 66.0%).

Females living in areas of high neighbourhood deprivation (quintile 5) were less likely to report eating at least two servings of fruit a day (57.4%) compared to females living in areas of low neighbourhood deprivation (quintile 1: 73.6%).

Overall, there was a decrease in the proportion of those who reported eating at least two servings of fruit a day with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.3: Number of servings of fruit consumed per day, by age group, NZDep2006 and sex

		Never (prevalence), (95% CI)	< 1 serving a day (prevalence), (95% CI)	1 serving a day (prevalence), (95% CI)	2+ servings a day (prevalence), (95% CI)
Total population		2.6 (1.9–3.3)	14.8 (13.4–16.3)	22.2 (20.2–24.1)	60.4 (58.6–62.1)
By age group (years)					
Males	15–18	3.2 (1.7–5.6)	16.8 (11.7–21.9)	18.7 (12.9–24.6)	61.2 (54.0–68.4)
	19–30	4.8 (2.0–9.6)	25.6 (18.1–33.0)	27.5 (19.3–35.6)	42.1 (34.2–50.1)
	31–50	3.6 (1.8–6.3)	18.1 (13.4–22.7)	24.1 (18.5–29.7)	54.2 (48.1–60.4)
	51–70	2.4 (0.8–5.2)	14.0 (9.6–18.5)	23.7 (18.0–29.4)	59.9 (53.5–66.2)
	71+	2.6 (1.3–4.6)	10.4 (7.7–13.1)	24.4 (19.8–29.1)	62.6 (57.4–67.7)
	Total	3.4 (2.3–4.5)	17.7 (15.2–20.2)	24.3 (20.9–27.6)	54.6 (51.4–57.8)
Females	15–18	1.7 (0.7–3.3)	11.7 (8.2–15.2)	21.6 (16.8–26.5)	65.0 (59.3–70.7)
	19–30	3.3 (1.2–7.1)	14.4 (9.8–19.1)	21.7 (15.8–27.5)	60.6 (53.8–67.4)
	31–50	2.1 (1.0–3.8)	14.2 (11.2–17.3)	22.3 (18.2–26.4)	61.4 (56.9–65.9)
	51–70	1.1 (0.3–2.9)	10.1 (6.8–13.3)	15.4 (10.8–20.0)	73.4 (67.9–78.9)
	71+	0.7 (0.2–1.9)	5.9 (3.9–7.9)	21.0 (16.2–25.9)	72.4 (67.5–77.3)
	Total	1.9 (1.1–2.7)	12.1 (10.5–13.8)	20.2 (18.0–22.4)	65.8 (63.6–67.9)
By NZDep2006 quintile					
Males	1	1.5 (0.2–4.7)	11.9 (7.0–16.8)	20.6 (14.3–27.0)	66.0 (59.3–72.7)
	2	2.3 (0.7–5.7)	16.7 (10.7–22.7)	26.8 (19.7–33.9)	54.3 (46.1–62.4)
	3	2.9 (0.9–6.8)	14.7 (9.0–20.5)	24.6 (18.2–31.0)	57.8 (51.2–64.3)
	4	5.5 (2.5–10.4)	22.2 (15.5–28.9)	23.7 (17.2–30.3)	48.6 (40.6–56.5)
	5	5.6 (3.0–9.4)	25.3 (20.5–30.1)	26.4 (20.3–32.5)	42.8 (37.2–48.4)
Females	1	0.1 (0.0–0.4)	11.3 (7.3–16.5)	15.1 (9.8–20.4)	73.6 (67.9–79.3)
	2	1.4 (0.3–3.8)	10.7 (6.1–15.4)	15.3 (10.8–19.9)	72.5 (67.2–77.9)
	3	2.2 (0.5–6.1)	11.6 (7.2–16.0)	24.4 (19.0–29.9)	61.8 (55.7–67.8)
	4	2.5 (1.2–4.5)	12.4 (9.0–15.9)	21.5 (16.4–26.7)	63.5 (57.8–69.3)
	5	3.1 (1.7–5.3)	15.0 (11.0–19.0)	24.4 (19.9–28.9)	57.4 (52.1–62.7)

Notes:
Results for 2, 3, 4+ servings a day are presented in the online data tables.
Results for Māori, Pacific and NZEO are presented in the online data tables.

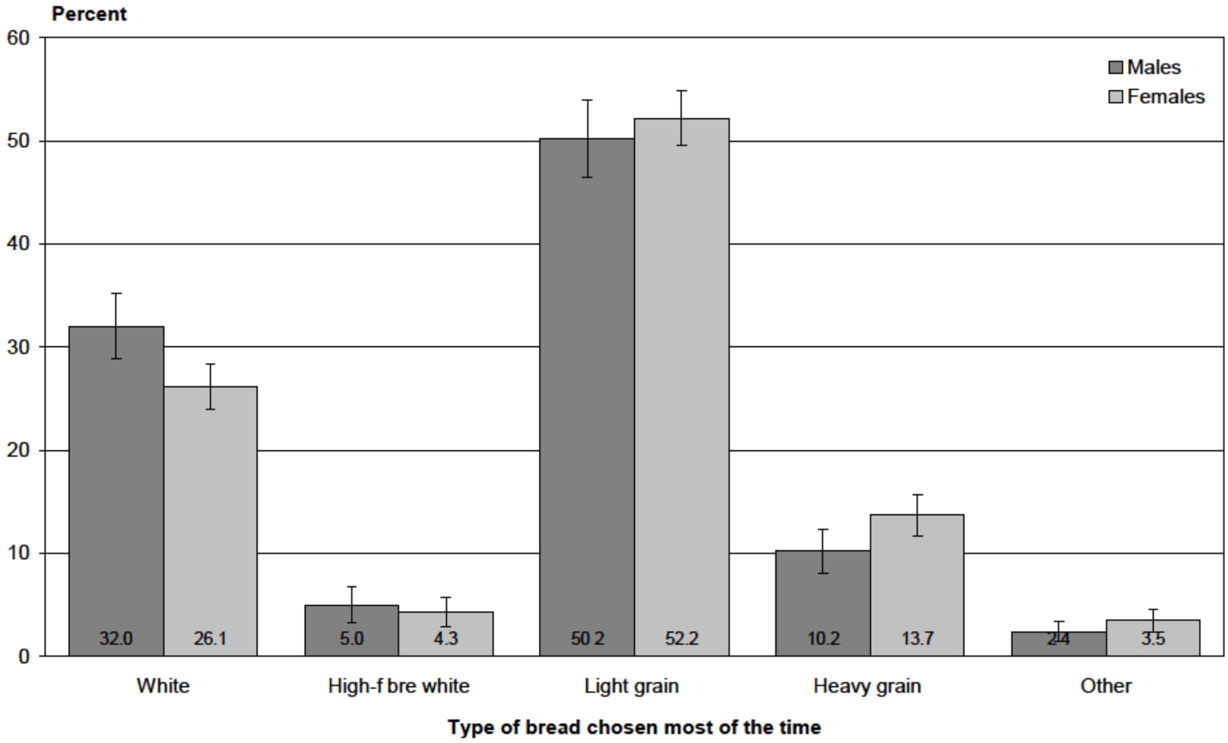
Bread

The *Food and Nutrition Guidelines* recommend that adults eat at least six servings of breads and cereals each day, preferably whole-grain varieties. This report comments on the type of bread chosen.

> **Survey question**
>
> What type of bread, rolls or toast do you eat most of?
>
> Response options: White, high-fibre white, light grain, heavy grain, other.

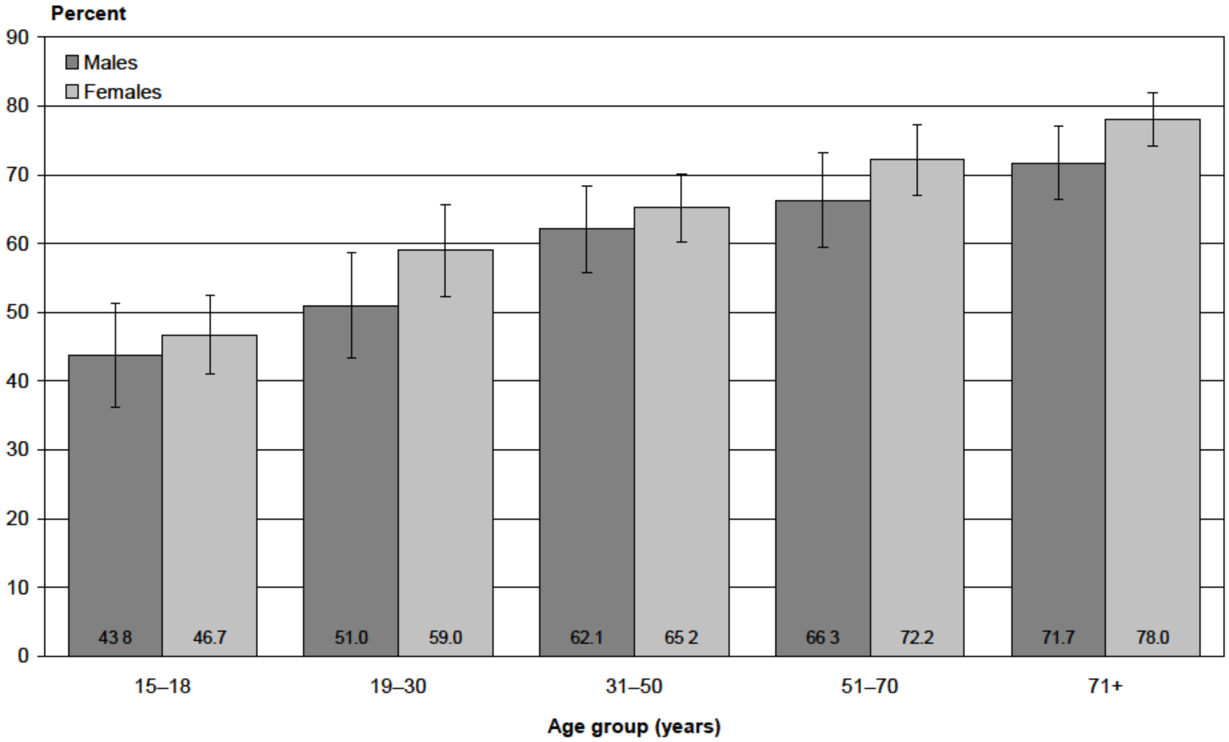
Whole-grain bread (heavy- or light-grain) was chosen most often by 63.3% of the total population aged 15 years and over, with white bread chosen most often by 28.9% (Table 6.4, Figure 6.4). A small proportion ate mostly high-fibre white bread (4.6%) or another type of bread (3.0%).

Figure 6.4: Type of bread chosen most of the time, by sex



There were no differences in each age group in the proportion of males and females who reported choosing light-grain or heavy-grain bread. The prevalence of eating mostly light-grain or heavy-grain bread increased with increasing age, with 43.8% of males and 46.7% of females aged 15–18 years choosing these breads, compared to 71.7% of males and 78.0% of females aged 71+ years (Figure 6.5).

Figure 6.5: Light- or heavy-grain bread eaten most of the time, by age group and sex



Males and females living in the least deprived neighbourhoods (NZDep2006 quintile 1) were more likely to eat mostly light- or heavy-grain bread (males 68.0%; females 76.9%) than males (45.1%) and females (53.4%) living in the most deprived neighbourhoods (quintile 5). Overall, there was a decrease in the proportion of those eating mostly light- or heavy-grain bread with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.4: Type of bread consumed most of the time, by age group, NZDep2006 and sex

		White (prevalence), (95% CI)	High-fibre white (prevalence), (95% CI)	Light or heavy grain bread (prevalence), (95% CI)	Other type of bread (prevalence), (95% CI)
Total population		28.9 (27.0–30.9)	4.6 (3.5–5.7)	63.3 (61.2–65.3)	3.0 (2.3–3.7)
By age group (years)					
Males	15–18	49.7 (42.7–56.7)	5.2 (1.4–12.8)	43.8 (36.1–51.4)	1.3 (0.5–2.8)
	19–30	42.0 (34.6–49.4)	5.1 (1.9–10.7)	51.0 (43.2–58.7)	1.7 (0.3–5.3)
	31–50	31.2 (25.8–36.5)	3.9 (1.9–7.1)	62.1 (55.7–68.4)	2.8 (1.2–5.4)
	51–70	24.1 (17.8–30.4)	6.6 (3.5–11.1)	66.3 (59.3–73.2)	2.6 (0.9–5.6)
	71+	21.3 (16.5–26.0)	3.8 (2.2–6.1)	71.7 (66.4–77.0)	3.2 (1.9–5.0)
	Total	32.0 (28.8–35.2)	5.0 (3.2–6.7)	60.4 (56.9–64.0)	2.4 (1.4–3.4)
Females	15–18	48.6 (42.4–54.7)	2.5 (1.1–4.7)	46.7 (40.9–52.4)	1.8 (0.6–4.0)
	19–30	33.9 (28.2–39.6)	5.7 (2.4–11.3)	59.0 (52.3–65.7)	1.3 (0.5–2.9)
	31–50	27.6 (22.7–32.6)	4.1 (2.1–6.1)	65.2 (60.2–70.2)	2.8 (1.3–5.0)
	51–70	17.1 (13.0–21.2)	3.8 (1.8–7.0)	72.2 (67.0–77.3)	6.6 (3.9–10.5)
	71+	13.5 (10.2–16.7)	4.4 (2.6–6.9)	78.0 (74.1–81.9)	3.9 (2.4–6.0)
	Total	26.1 (23.9–28.3)	4.3 (2.9–5.7)	65.9 (63.6–68.2)	3.5 (2.5–4.6)
By NZDep2006 quintile					
Males	1	22.8 (17.1–28.6)	6.8 (2.9–12.9)	68.0 (60.8–75.1)	2.5 (0.7–6.3)
	2	26.7 (19.5–34.0)	4.8 (2.1–9.2)	63.9 (55.3–72.4)	3.7 (1.5–7.7)
	3	30.0 (23.3–36.8)	4.1 (1.6–8.5)	63.1 (56.1–70.1)	2.8 (1.1–5.8)
	4	34.7 (27.0–42.3)	4.8 (1.8–10.3)	58.9 (51.9–65.9)	1.5 (0.5–3.2)
	5	49.5 (42.9–56.1)	3.9 (1.6–7.8)	45.1 (38.6–51.6)	1.4 (0.5–3.3)
Females	1	17.3 (11.6–23.1)	3.0 (1.2–6.2)	76.9 (71.3–82.5)	2.7 (1.0–5.6)
	2	20.1 (14.6–25.6)	4.7 (2.2–8.7)	68.8 (62.4–75.2)	5.9 (3.4–9.6)
	3	25.9 (18.8–32.9)	5.4 (2.1–11.1)	64.4 (57.7–71.2)	4.0 (1.5–8.4)
	4	27.5 (22.6–32.5)	3.3 (1.6–6.0)	66.4 (61.7–71.1)	2.6 (1.1–5.1)
	5	39.8 (34.6–45.0)	4.8 (2.0–7.5)	53.4 (47.9–58.9)	2.1 (0.7–4.8)

Notes:

Other type of bread = 3.0%, and so was not recorded in the table.

Results for Māori, Pacific and NZEO are presented in the online data tables.

Milk and milk products

The *Food and Nutrition Guidelines* recommend that adults choose low- or reduced-fat options for milk and milk products.

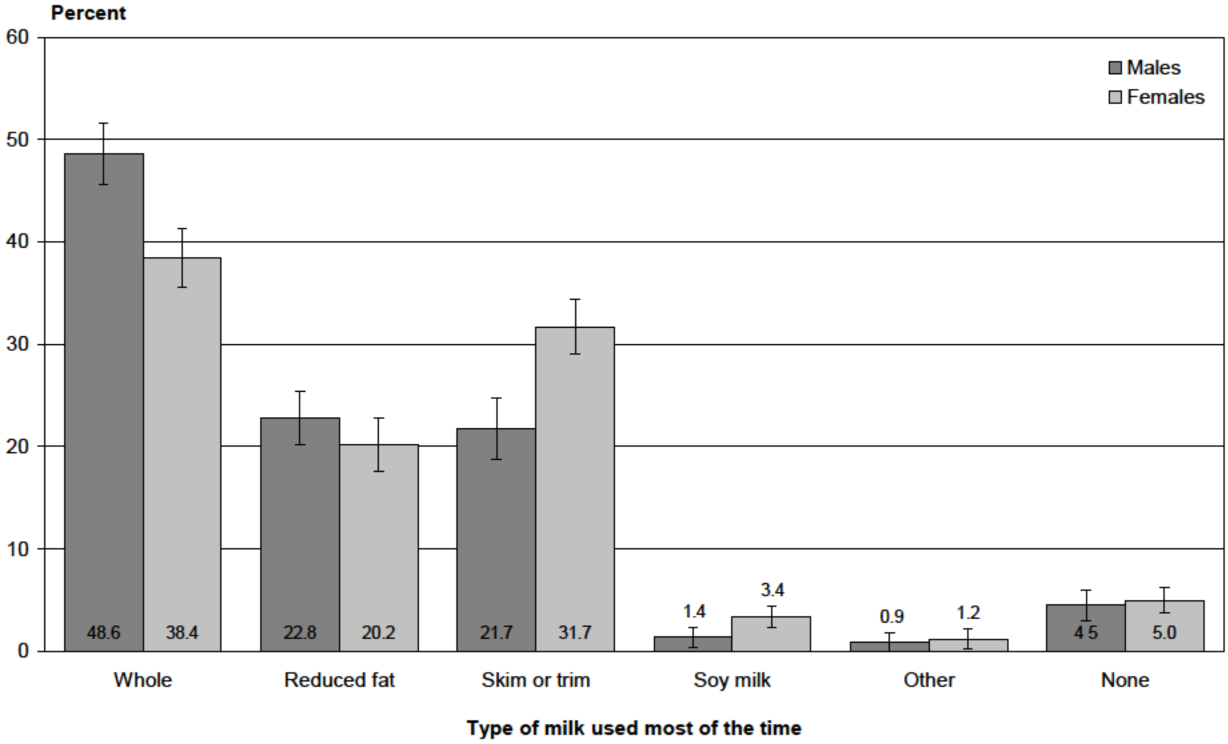
Survey question

What type of milk do you use the most of?

Response options: None, whole or standard milk, reduced fat, skim or trim, soy, other.

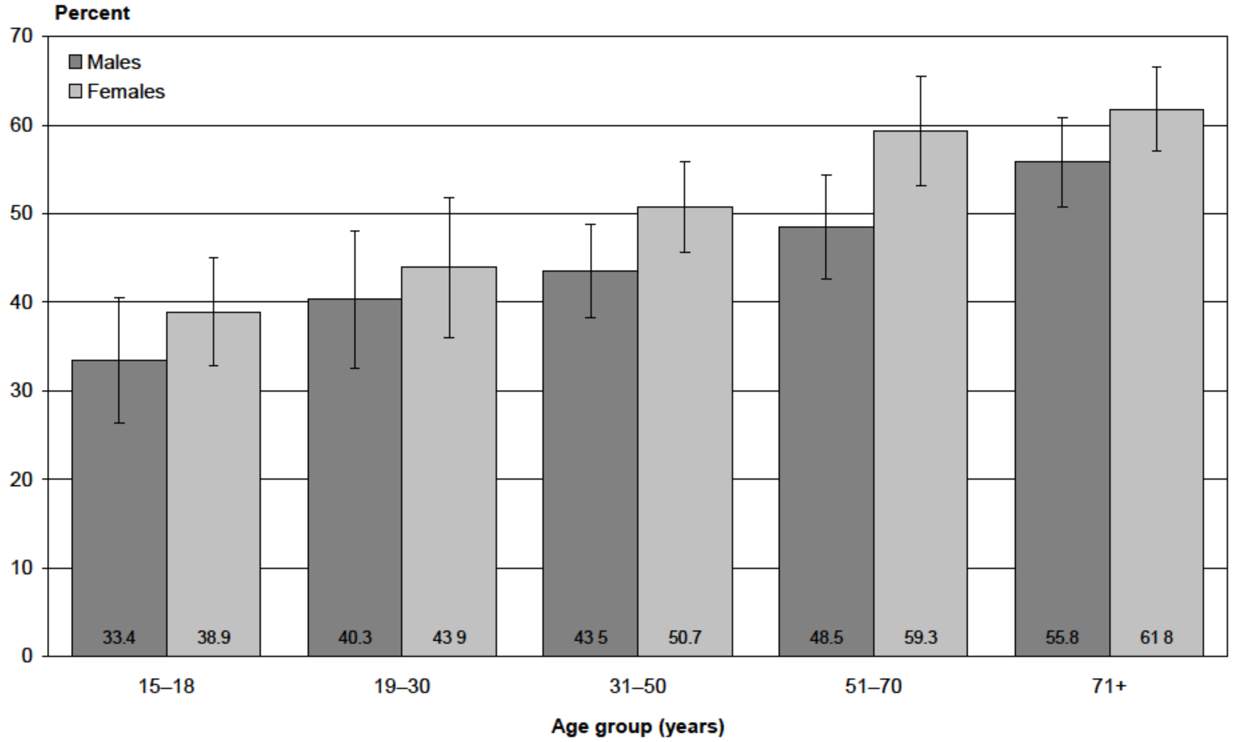
Reduced-fat or trim milk was used most of the time by 48.4% of the total population aged 15 years and over, while 43.3% used whole or standard milk most of the time (Table 6.5, Figure 6.6).

Figure 6.6: Type of milk used most of the time, by sex



There were no significant differences in use of reduced-fat or trim milk most of the time between males and females within each age group. The use of reduced-fat or trim milk increased with increasing age for both males and females, although it levelled off at 51+ years in females (Figure 6.7).

Figure 6.7: Reduced-fat or trim milk chosen most of the time, by age group and sex



Males and females living in the least deprived neighbourhoods were more likely to use trim or reduced-fat milk most of the time (NZDep2006 quintile 1: males 54.7%; females 56.5%) than those living in the most deprived neighbourhoods (quintile 5: males 32.9%; females 40.5%). Overall, there was a decrease in the proportion of those using trim or reduced-fat milk most of the time with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.5: Type of milk used most of the time, by age group, NZDep2006 and sex

		Whole/ standard (prevalence), (95% CI)	Reduced fat (prevalence), (95% CI)	Skim or trim (prevalence), (95% CI)	Soy milk (prevalence), (95% CI)	None (prevalence), (95% CI)	Reduced fat or skim or trim (prevalence), (95% CI)
Total population		43.3 (41.3–45.4)	21.4 (19.7–23.2)	26.9 (24.9–28.9)	2.4 (1.7–3.1)	4.8 (3.8–5.8)	48.4 (46.2–50.5)
By age group (years)							
Males	15–18	60.8 (53.7–67.9)	21.7 (15.4–28.1)	11.7 (7.8–15.6)	1.0 (0.2–3.1)	2.0 (0.6–4.8)	33.4 (26.4–40.5)
	19–30	55.3 (47.8–62.8)	22.4 (15.2–29.6)	17.9 (11.5–24.3)	1.8 (0.2–6.5)	2.6 (0.6–6.7)	40.3 (32.5–48.1)
	31–50	50.1 (44.9–55.2)	23.9 (19.3–28.6)	19.6 (15.1–24.1)	0.8 (0.2–2.1)	4.0 (2.1–6.8)	43.5 (38.2–48.8)
	51–70	41.7 (35.3–48.1)	20.8 (15.7–25.8)	27.7 (22.4–33.1)	2.1 (0.7–4.8)	7.7 (3.9–11.5)	48.5 (42.6–54.4)
	71+	38.1 (33.1–43.0)	26.2 (22.0–30.4)	29.5 (24.1–35.0)	1.4 (0.6–2.9)	3.9 (2.1–6.5)	55.8 (50.6–60.9)
	Total	48.6 (45.6–51.6)	22.8 (20.2–25.4)	21.7 (18.8–24.7)	1.4 (0.8–2.4)	4.5 (3.1–6.0)	44.5 (41.6–47.5)
Females	15–18	51.1 (45.3–56.9)	21.6 (16.2–27.0)	17.3 (12.8–21.8)	3.9 (2.1–6.7)	5.6 (3.5–8.5)	38.9 (32.8–45.0)
	19–30	47.2 (39.6–54.8)	16.7 (11.2–22.1)	27.2 (19.9–34.5)	4.2 (1.8–8.2)	4.3 (1.9–8.2)	43.9 (35.9–51.8)
	31–50	40.9 (36.0–45.9)	20.1 (16.3–23.9)	30.6 (26.1–35.0)	2.6 (1.3–4.6)	3.5 (1.7–6.2)	50.7 (45.5–55.8)
	51–70	27.6 (22.7–32.4)	20.5 (15.1–25.8)	38.9 (33.6–44.1)	4.7 (2.5–8.0)	7.8 (4.6–11.0)	59.3 (53.2–65.5)
	71+	31.6 (27.0–36.2)	25.7 (20.8–30.5)	36.2 (31.5–40.8)	0.9 (0.3–2.0)	4.7 (2.9–7.1)	61.8 (57.2–66.5)
	Total	38.4 (35.6–41.3)	20.2 (17.6–22.8)	31.7 (29.1–34.4)	3.4 (2.3–4.4)	5.0 (3.8–6.3)	51.9 (48.7–55.1)
By NZDep2006 quintile							
Males	1	39.8 (33.6–46.0)	26.2 (20.7–31.8)	28.5 (21.5–35.5)	1.7 (0.3–4.7)	2.2 (0.6–5.8)	54.7 (48.5–60.9)
	2	50.5 (42.2–58.9)	20.3 (13.2–27.4)	23.4 (16.6–30.2)	0.7 (0.2–1.7)	4.0 (1.4–8.9)	43.6 (35.1–52.1)
	3	44.7 (38.0–51.5)	20.8 (14.7–26.9)	24.9 (17.8–32.0)	1.6 (0.4–4.2)	6.9 (3.4–12.2)	45.7 (38.7–52.7)
	4	49.8 (42.1–57.4)	26.2 (20.0–32.3)	16.5 (9.8–23.2)	1.9 (0.3–6.0)	5.6 (2.7–10.2)	42.6 (35.1–50.1)
	5	61.3 (54.7–67.9)	20.1 (14.8–25.5)	12.7 (8.1–17.4)	1.3 (0.2–4.4)	4.2 (2.1–7.4)	32.9 (26.1–39.7)
Females	1	29.7 (22.0–37.4)	21.0 (15.7–26.2)	35.5 (28.1–42.9)	4.8 (2.2–8.8)	7.4 (3.6–13.2)	56.5 (47.8–65.1)
	2	29.1 (24.0–34.2)	21.1 (15.4–26.8)	38.0 (31.5–44.5)	5.3 (2.8–9.0)	5.4 (2.9–9.1)	59.1 (52.6–65.6)
	3	35.9 (28.0–43.8)	21.8 (13.6–30.1)	36.1 (29.0–43.1)	2.1 (0.7–4.8)	3.2 (1.3–6.5)	57.9 (49.3–66.6)
	4	46.5 (41.4–51.6)	19.5 (14.9–24.2)	24.8 (19.7–29.8)	2.6 (1.0–5.4)	5.5 (3.0–8.0)	44.3 (38.4–50.2)
	5	51.8 (46.2–57.4)	17.2 (12.6–21.8)	23.3 (17.7–29.0)	2.1 (1.0–3.7)	4.0 (2.2–6.7)	40.5 (34.4–46.6)

Notes:

Other category = 1.1%, and so was not recorded in the table.

Results for Māori, Pacific and NZEO are presented in the online data tables.

Meat, chicken, seafood, and processed meat

The *Food and Nutrition Guidelines* recommend that adults consume at least one serving a day of lean meat, poultry, chicken, seafood, eggs, nuts and seeds, or legumes.

Survey questions

In the past four weeks, which of the following have you eaten at all?

Response options: Red meat; chicken; seafood; none of these foods.

How often do you eat red meat? (Includes beef, pork, mutton, lamb, goat)

How often do you eat chicken? (Chicken breast, drumsticks, whole chicken, not nuggets or chicken roll)

How often do you eat fresh or frozen fish or shellfish? Do not include battered/fried or canned fish or seafood.

How often do you eat battered or fried fish or shellfish? This may include battered or deep-fried fish bought from the 'Fish and Chip' shop.

How often do you eat canned fish or shellfish? Canned fish includes products such as tuna, salmon and sardines.

Response options: Never; less than once per week; 1–2 times per week; 3–4 times per week; 5–6 times per week; 7 or more times per week.

Red meat or chicken

Most of the total population aged 15 years and over (94.5%) reported eating red meat in the past four weeks, with red meat eaten one to two times per week by 30.1% and three to four times per week by 45.4% (Table 6.6).

Most of the total population aged 15 years and over (93.4%) reported eating chicken in the past four weeks. Most reported eating chicken either one to two times per week (56.4%) or three to four times per week (24.2%) (Table 6.7).

Patterns of red meat and chicken consumption were similar across quintiles of neighbourhood deprivation.

Table 6.6: Frequency of eating red meat, by age group, NZDep2006 and sex

		Never or not consumed in past 4 weeks Prevalence (95% CI)	Less than 1 time per week Prevalence (95% CI)	1–2 times per week Prevalence (95% CI)	3–4 times per week Prevalence (95% CI)	5+ times per week Prevalence (95% CI)
Total population		5.5 (4.6–6.5)	4.5 (3.5–5.5)	30.1 (28.0–32.2)	45.4 (43.2–47.7)	14.4 (12.7–16.1)
By age group (years)						
Males	15–18	3.6 (1.8–6.3)	3.2 (1.6–5.8)	34.3 (27.0–41.5)	45.4 (39.1–51.8)	13.5 (10.3–16.7)
	19–30	3.2 (1.0–7.5)	3.0 (0.9–7.4)	26.9 (19.7–34.1)	46.9 (38.5–55.2)	20.0 (13.5–26.5)
	31–50	5.9 (3.3–9.5)	2.5 (1.1–4.8)	28.0 (22.5–33.4)	48.6 (42.7–54.5)	15.1 (11.4–18.8)
	51–70	3.9 (1.7–7.4)	5.3 (2.5–9.8)	31.6 (25.7–37.6)	47.0 (40.3–53.7)	12.1 (8.2–16.0)
	71+	3.6 (2.3–5.4)	5.5 (3.2–8.6)	25.7 (20.8–30.7)	43.8 (39.0–48.6)	21.4 (17.0–25.7)
	Total	4.4 (3.0–5.8)	3.7 (2.4–5.0)	29.0 (26.2–31.8)	47.1 (43.7–50.6)	15.7 (13.6–17.8)
Females	15–18	8.4 (5.4–11.3)	7.8 (4.6–12.3)	31.8 (26.5–37.2)	40.5 (34.0–46.9)	11.5 (7.3–15.6)
	19–30	7.7 (3.4–12.0)	7.5 (3.8–13.2)	34.9 (28.7–41.2)	34.8 (27.8–41.8)	15.0 (10.2–19.8)
	31–50	6.4 (3.8–9.1)	4.7 (2.1–7.3)	31.8 (26.7–36.8)	45.2 (40.6–49.8)	11.9 (8.2–15.6)
	51–70	6.4 (3.6–9.3)	3.5 (2.0–5.7)	27.9 (22.8–33.0)	50.4 (44.8–55.9)	11.8 (8.7–14.9)
	71+	4.4 (2.6–6.9)	5.8 (3.1–8.5)	28.9 (24.9–32.9)	42.0 (36.9–47.1)	18.9 (14.5–23.4)
	Total	6.6 (5.1–8.1)	5.3 (3.8–6.7)	31.1 (28.1–34.1)	43.8 (41.2–46.5)	13.2 (11.1–15.3)
By NZDep2006 quintile						
Males	1	2.6 (0.8–6.3)	2.4 (0.6–6.2)	28.8 (22.9–34.7)	53.0 (45.7–60.3)	13.2 (8.5–17.9)
	2	4.3 (1.7–8.8)	2.9 (0.8–7.1)	29.5 (22.6–36.5)	47.6 (40.6–54.6)	15.7 (10.5–20.8)
	3	5.0 (2.2–9.4)	5.6 (2.3–10.9)	30.3 (22.8–37.8)	45.1 (37.3–52.9)	14.0 (9.6–18.4)
	4	3.0 (1.2–6.1)	3.2 (1.1–6.9)	30.9 (23.6–38.1)	45.3 (36.9–53.7)	17.7 (13.2–22.2)
	5	7.7 (4.2–11.2)	4.6 (1.9–7.4)	25.3 (19.7–31.0)	43.3 (37.2–49.4)	19.1 (14.3–23.8)
Females	1	6.3 (2.5–12.7)	5.0 (2.3–9.1)	36.9 (28.2–45.6)	40.9 (32.8–49.0)	10.9 (5.8–16.1)
	2	5.4 (2.7–9.5)	5.2 (2.5–9.4)	28.5 (22.8–34.2)	48.4 (41.6–55.3)	12.5 (8.4–16.6)
	3	7.1 (3.5–12.7)	5.6 (2.2–11.3)	27.5 (20.3–34.8)	42.8 (36.6–49.1)	17.0 (11.3–22.6)
	4	6.5 (3.9–9.1)	4.7 (2.6–6.9)	31.6 (27.2–36.0)	46.4 (41.2–51.6)	10.8 (7.2–14.5)
	5	7.9 (4.7–11.1)	5.9 (3.3–8.4)	32.5 (27.0–37.9)	39.5 (34.1–44.9)	14.3 (10.9–17.7)

Note: Results for Māori, Pacific and NZEO are presented in the online data tables.

Table 6.7: Frequency of eating chicken, by age group, NZDep2006 and sex

		Never or not consumed in past 4 weeks Prevalence (95% CI)	Less than 1 time per week Prevalence (95% CI)	1–2 times per week Prevalence (95% CI)	3–4 times per week Prevalence (95% CI)	5+ times per week Prevalence (95% CI)
Total population		6.6 (5.5–7.6)	8.3 (7.1–9.4)	56.4 (54.4–58.4)	24.2 (22.1–26.4)	4.5 (3.5–5.6)
By age group (years)						
Males	15–18	3.4 (1.7–5.8)	11.0 (6.4–15.6)	50.6 (43.5–57.7)	27.3 (20.8–33.7)	7.7 (3.4–14.6)
	19–30	4.8 (1.9–9.9)	8.5 (4.6–14.2)	49.5 (40.9–58.0)	30.9 (22.7–39.1)	6.3 (3.2–11.1)
	31–50	5.5 (3.2–8.7)	5.5 (2.8–8.2)	61.5 (56.0–66.9)	23.6 (18.6–28.6)	3.9 (1.5–6.3)
	51–70	10.0 (6.5–13.5)	9.2 (5.5–12.9)	60.4 (53.9–67.0)	16.4 (10.7–22.1)	3.9 (1.3–8.6)
	71+	16.6 (12.2–21.0)	12.3 (9.3–15.3)	59.3 (53.4–65.1)	10.7 (7.5–13.8)	1.1 (0.4–2.5)
	Total	7.4 (5.7–9.1)	8.2 (6.4–10.0)	57.7 (54.8–60.6)	22.3 (19.2–25.4)	4.4 (2.8–6.1)
Females	15–18	7.4 (4.5–11.2)	6.9 (4.4–10.1)	46.2 (40.3–52.1)	33.5 (28.1–38.9)	6.0 (3.6–9.4)
	19–30	5.1 (2.1–10.2)	3.2 (1.2–6.8)	54.1 (47.4–60.7)	31.7 (25.1–38.3)	5.9 (3.1–8.8)
	31–50	2.9 (1.4–4.4)	8.9 (6.3–11.6)	54.8 (50.4–59.2)	27.3 (23.1–31.5)	6.0 (3.5–8.6)
	51–70	8.2 (5.5–10.9)	9.3 (6.3–12.4)	56.4 (51.5–61.3)	23.6 (18.9–28.3)	2.4 (1.0–4.9)
	71+	10.4 (8.0–12.7)	14.3 (11.0–17.6)	61.1 (56.1–66.1)	12.3 (7.5–17.0)	2.0 (1.0–3.3)
	Total	5.8 (4.6–7.0)	8.3 (6.8–9.9)	55.1 (52.7–57.6)	26.1 (23.5–28.7)	4.7 (3.5–5.9)
By NZDep2006 quintile						
Males	1	6.6 (3.4–11.4)	4.0 (1.5–8.4)	63.7 (58.1–69.3)	18.2 (11.7–24.6)	7.6 (3.5–14.0)
	2	6.8 (3.6–11.6)	10.2 (5.4–15.0)	58.0 (50.8–65.2)	22.4 (16.7–28.1)	2.6 (0.7–6.6)
	3	4.5 (2.4–7.6)	8.0 (3.9–12.1)	58.9 (51.5–66.2)	25.8 (18.3–33.4)	2.8 (0.7–7.2)
	4	8.7 (4.6–12.8)	9.3 (5.8–12.8)	52.4 (44.8–59.9)	24.1 (17.5–30.7)	5.5 (2.3–10.9)
	5	11.3 (6.9–15.7)	10.2 (6.5–13.9)	53.8 (47.4–60.1)	21.6 (15.3–27.9)	3.2 (2.0–4.8)
Females	1	3.9 (1.5–8.0)	8.6 (5.1–13.3)	58.7 (51.3–66.1)	25.9 (18.6–33.1)	3.0 (0.9–7.0)
	2	6.2 (4.0–8.4)	9.5 (6.1–13.0)	58.0 (51.0–65.0)	23.2 (17.4–29.0)	3.1 (1.1–6.8)
	3	5.4 (2.2–8.5)	8.1 (4.3–11.8)	55.6 (49.4–61.8)	26.9 (20.3–33.5)	4.0 (1.9–7.3)
	4	5.3 (3.5–7.1)	6.0 (3.9–8.1)	53.8 (48.2–59.5)	28.1 (22.7–33.6)	6.7 (3.6–9.8)
	5	8.0 (5.1–11.0)	9.5 (6.5–12.6)	49.4 (44.4–54.3)	26.5 (21.5–31.5)	6.6 (4.0–9.1)

Note: Results for Māori, Pacific and NZEO are presented in the online data tables.

Seafood (fish and shellfish)

Eighty percent of the total population aged 15 years and over reported eating seafood in the past four weeks. The proportion eating seafood was highest for those aged 31 years and over, and lowest in those aged 15–18 years, for both males and females.

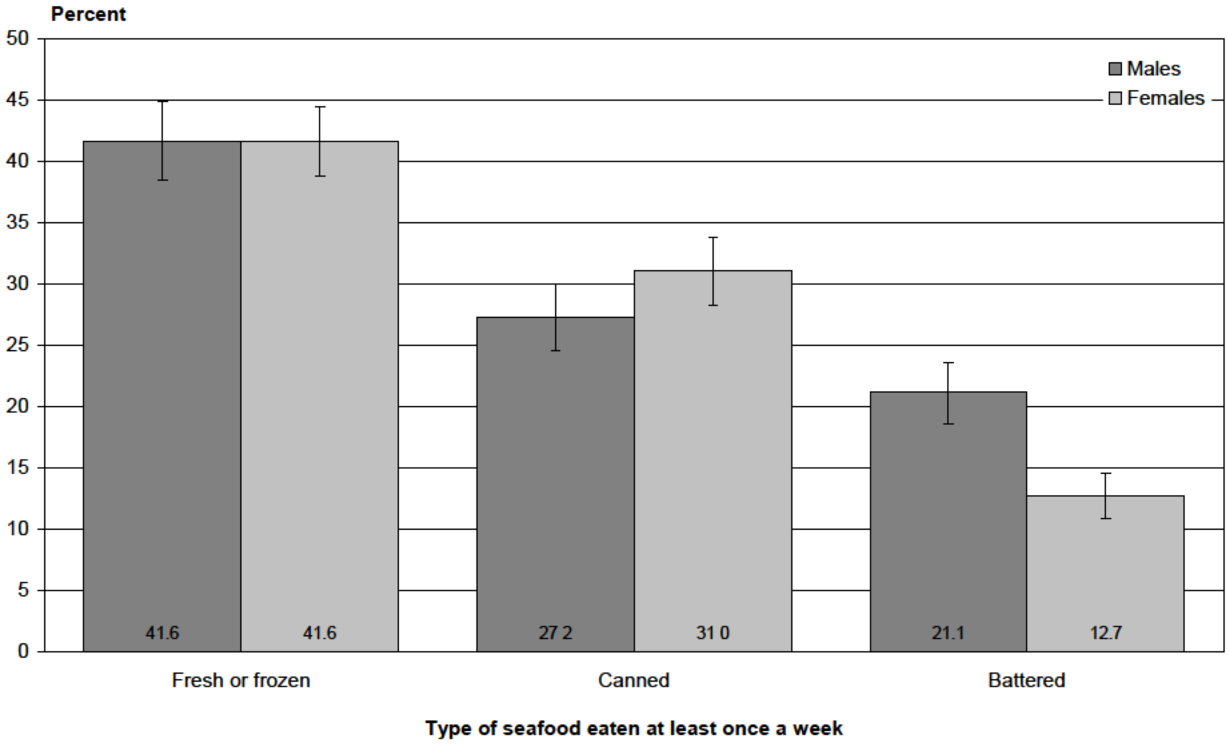
Fresh or frozen seafood was eaten by 41.6% of the total population aged 15 years and over one or more times a week, and by 30.0% less than once a week. Fresh or frozen seafood was not eaten in the past four weeks, or never, by 28.4% of the adult population (Table 6.8).

Canned seafood was eaten by 29.2% of the total population aged 15 years and over one or more times a week, and by 29.2% less than once a week. Canned seafood was not eaten in the past four weeks, or never, by 41.6% (Table 6.9).

Battered or fried seafood was not eaten in the past four weeks, or never, by 40.9% of the total population aged 15 years and over. Battered or fried seafood was eaten by 16.7% of the adult population one or more times a week, and by 42.4% less than once a week (Table 6.10).

Fresh or frozen seafood was the most common type of seafood consumed at least once a week by the total population aged 15 years and over, followed by canned seafood (Figure 6.8).

Figure 6.8: Type of seafood eaten at least once a week, by sex



There were no differences in the proportion of males and females who reported eating fresh or frozen seafood, or canned seafood one or more times a week, within each age group. Males aged 31+ years were more likely than females aged 31+ years to have eaten battered seafood one or more times a week.

Males aged 51+ years were more likely to have eaten fresh or frozen seafood one or more times a week compared to males aged 15–50 years. Females aged 51+ years were more likely to have eaten fresh or frozen seafood one or more times a week compared to females aged 15–30 years.

Males and females aged 19+ years were more likely to have eaten canned seafood one or more times a week compared to those aged 15–18 years. There were no significant differences in frequency of eating battered or fried seafood one or more times a week between age groups.

There were no differences in the reported frequency of consumption of frozen seafood or canned seafood by neighbourhood deprivation. More people living in the most deprived neighbourhoods ate battered or fried fish one or more times a week (NZDep2006 quintile 5: males 27.2%; females 17.8%) than people living in the least deprived neighbourhoods (quintile 1: males 16.0%; females 9.5%).

Table 6.8: Frequency of eating fresh or frozen seafood (fish or shellfish), by age group, NZDep2006 and sex

		Never, or not consumed in past 4 weeks (prevalence), (95% CI)	Less than 1 time per week (prevalence), (95% CI)	1+ times per week (prevalence), (95% CI)
Total population		28.4 (26.3–30.6)	30.0 (27.8–32.2)	41.6 (39.3–43.8)
By age group (years)				
Males	15–18	50.9 (42.5–59.2)	23.8 (17.1–30.5)	25.3 (18.2–32.4)
	19–30	32.4 (23.9–40.8)	32.7 (25.2–40.3)	34.9 (27.2–42.6)
	31–50	27.9 (23.2–32.7)	35.8 (30.7–40.9)	36.3 (30.9–41.6)
	51–70	20.7 (15.7–25.8)	23.2 (18.0–28.4)	56.0 (49.6–62.5)
	71+	28.3 (22.9–33.8)	22.9 (17.7–28.1)	48.8 (42.9–54.7)
	Total	28.7 (25.7–31.8)	29.7 (26.7–32.7)	41.6 (38.4–44.8)
Females	15–18	52.4 (45.6–59.2)	23.2 (18.0–28.5)	24.4 (18.7–30.0)
	19–30	36.8 (30.0–43.6)	31.0 (24.7–37.4)	32.2 (25.5–38.8)
	31–50	25.9 (21.4–30.4)	33.7 (28.3–39.1)	40.4 (35.6–45.2)
	51–70	21.1 (16.0–26.2)	29.3 (23.6–34.9)	49.6 (43.1–56.2)
	71+	21.5 (17.7–25.4)	23.9 (19.0–28.8)	54.6 (49.4–59.7)
	Total	28.2 (25.5–30.8)	30.3 (27.6–33.0)	41.6 (38.7–44.4)
By NZDep2006 quintile				
Males	1	24.5 (17.7–31.2)	27.2 (21.1–33.3)	48.4 (40.8–55.9)
	2	26.6 (20.7–32.5)	35.2 (27.9–42.5)	38.1 (30.9–45.4)
	3	27.2 (19.5–34.8)	31.4 (24.0–38.7)	41.4 (32.9–50.0)
	4	35.4 (27.9–42.9)	27.0 (20.2–33.8)	37.6 (29.7–45.4)
	5	31.6 (25.8–37.3)	27.3 (21.9–32.8)	41.1 (34.2–48.0)
Females	1	20.3 (14.0–26.5)	28.8 (21.8–35.8)	50.9 (43.0–58.9)
	2	21.5 (16.1–26.9)	33.6 (27.2–40.1)	44.8 (38.5–51.1)
	3	30.6 (24.0–37.2)	35.1 (26.9–43.3)	34.3 (26.8–41.8)
	4	34.7 (29.5–39.9)	25.7 (20.8–30.6)	39.6 (33.3–45.9)
	5	33.5 (28.0–38.9)	27.1 (22.9–31.3)	39.5 (33.7–45.2)

Note: Results for Māori, Pacific and NZEO are presented in online data tables.

Table 6.9: Frequency of eating canned seafood (fish or shellfish), by age group, NZDep2006 and sex

		Never, or not consumed in past 4 weeks (prevalence), (95% CI)	Less than 1 time per week (prevalence), (95% CI)	1+ times per week (prevalence), (95% CI)
Total population		41.6 (39.6–43.7)	29.2 (27.1–31.3)	29.2 (27.4–30.9)
By age group (years)				
Males	15–18	74.5 (68.9–80.0)	14.6 (9.9–19.2)	11.0 (7.4–14.6)
	19–30	51.0 (43.3–58.8)	25.0 (17.0–33.0)	24.0 (17.0–31.0)
	31–50	42.6 (37.7–47.5)	27.4 (22.9–31.8)	30.1 (25.4–34.7)
	51–70	37.2 (30.9–43.6)	31.8 (25.3–38.3)	31.0 (25.1–36.9)
	71+	38.5 (32.2–44.8)	35.5 (29.3–41.8)	26.0 (21.5–30.4)
	Total	45.0 (42.1–47.9)	27.8 (25.0–30.7)	27.2 (24.5–29.9)
Females	15–18	69.6 (63.8–75.3)	17.4 (12.3–22.5)	13.0 (9.4–16.7)
	19–30	50.9 (44.2–57.7)	25.7 (19.8–31.7)	23.3 (17.4–29.3)
	31–50	33.3 (29.1–37.4)	32.1 (27.0–37.2)	34.7 (29.9–39.5)
	51–70	31.7 (26.2–37.2)	31.7 (25.9–37.5)	36.6 (30.8–42.5)
	71+	30.3 (25.9–34.6)	39.8 (34.5–45.0)	30.0 (24.6–35.3)
	Total	38.5 (36.1–41.0)	30.5 (27.5–33.5)	31.0 (28.2–33.8)
By NZDep2006 quintile				
Males	1	42.4 (36.7–48.1)	27.4 (22.4–32.5)	30.2 (25.1–35.2)
	2	44.7 (37.0–52.5)	28.4 (20.4–36.4)	26.9 (19.9–33.8)
	3	48.7 (40.3–57.0)	31.8 (24.1–39.5)	19.5 (12.4–26.7)
	4	42.9 (36.2–49.6)	24.2 (17.7–30.8)	32.9 (25.3–40.4)
	5	46.5 (40.1–53.0)	26.7 (21.7–31.7)	26.8 (21.4–32.2)
Females	1	34.8 (28.2–41.5)	31.4 (23.9–38.9)	33.8 (26.7–40.8)
	2	34.5 (28.4–40.6)	30.7 (24.0–37.3)	34.9 (28.8–40.9)
	3	36.6 (29.9–43.3)	32.4 (25.4–39.4)	31.0 (24.2–37.8)
	4	42.7 (37.3–48.0)	31.0 (25.6–36.4)	26.3 (21.3–31.3)
	5	44.4 (39.1–49.7)	26.7 (21.7–31.8)	28.9 (23.9–33.9)

Note: Results for Māori, Pacific and NZEO are presented in the online data tables.

Table 6.10: Frequency of eating battered seafood (fish or shellfish), by age group, NZDep2006 and sex

		Never, or not consumed in past 4 weeks (prevalence), (95% CI)	Less than 1 time per week (prevalence), (95% CI)	1+ times per week (prevalence), (95% CI)
Total population		40.9 (38.8–43.0)	42.4 (40.1–44.6)	16.7 (15.2–18.3)
By age group (years)				
Males	15–18	52.4 (45.1–59.8)	32.5 (25.7–39.4)	15.1 (9.1–21.0)
	19–30	38.4 (29.3–47.4)	41.9 (33.0–50.8)	19.7 (13.2–26.2)
	31–50	34.4 (29.1–39.7)	43.5 (37.1–49.9)	22.1 (17.6–26.5)
	51–70	34.0 (28.3–39.7)	43.6 (37.4–49.9)	22.4 (17.5–27.2)
	71+	43.1 (36.8–49.4)	34.5 (29.5–39.5)	22.4 (17.6–27.2)
	Total	37.3 (34.0–40.7)	41.5 (37.8–45.3)	21.1 (18.7–23.6)
Females	15–18	60.3 (54.4–66.2)	27.1 (21.9–32.3)	12.6 (8.6–16.5)
	19–30	44.8 (38.2–51.4)	43.2 (36.0–50.4)	12.0 (8.2–15.7)
	31–50	38.1 (32.5–43.7)	48.2 (43.0–53.3)	13.7 (10.2–17.3)
	51–70	46.5 (40.6–52.5)	43.0 (36.7–49.3)	10.5 (7.3–13.7)
	71+	48.6 (43.4–53.8)	35.9 (30.8–41.1)	15.5 (11.4–19.5)
	Total	44.2 (41.5–46.9)	43.1 (40.2–46.1)	12.7 (10.9–14.5)
By NZDep2006 quintile				
Males	1	31.5 (25.5–37.5)	52.4 (45.2–59.7)	16.0 (11.4–20.7)
	2	35.7 (28.7–42.6)	40.6 (33.8–47.3)	23.8 (18.2–29.3)
	3	40.3 (32.9–47.8)	41.9 (34.0–49.8)	17.8 (12.5–23.0)
	4	40.8 (33.1–48.5)	36.7 (29.4–44.0)	22.5 (17.0–28.0)
	5	39.7 (34.1–45.2)	33.1 (28.0–38.2)	27.2 (20.9–33.6)
Females	1	42.0 (34.5–49.5)	48.5 (40.9–56.1)	9.5 (5.0–13.9)
	2	44.4 (38.3–50.5)	43.1 (36.0–50.1)	12.6 (7.7–17.4)
	3	44.5 (38.0–51.0)	45.5 (38.3–52.6)	10.0 (6.1–14.0)
	4	43.6 (38.3–48.8)	43.0 (37.0–49.0)	13.4 (9.8–17.1)
	5	46.5 (40.8–52.2)	35.7 (30.9–40.4)	17.8 (14.8–20.9)

Note: Results for Māori, Pacific and NZEO are presented in the online data tables.

Processed meat

The World Cancer Research Fund and American Institute for Cancer Research (2007) recommends avoiding processed meat due to convincing evidence that as more processed meat is consumed there is an increased risk of colorectal cancer. Processed meat is also likely to be relatively high in saturated fatty acids and sodium.

> **Survey questions**
>
> In the past four weeks, which of the following have you eaten at all? Red meat; chicken; processed meats; seafood; none of these foods.
>
> How often do you eat processed meats? (Includes ham, bacon, sausages, luncheon, canned corned beef, pastrami, salami).

Processed meat was eaten in the past four weeks by 87.3% of the total population aged 15 years and over (Table 6.11). Most reported eating processed meat either less than once a week (16.6%), one to two times per week (41.8%) or three to four times per week (20.4%). Males (90.0%) were more likely than females (84.9%) to have eaten processed meat in the past four weeks.

Table 6.11: Frequency of eating processed meat, by age group, NZDep2006 and sex

		Never, or not consumed in past 4 weeks (prevalence), (95% CI)	Less than 1 time per week (prevalence), (95% CI)	1–2 times per week (prevalence), (95% CI)	3–4 times per week (prevalence), (95% CI)	5+ times per week (prevalence), (95% CI)
Total population		12.7 (11.3–14.1)	16.6 (15.1–18.0)	41.8 (39.9–43.7)	20.4 (18.7–22.0)	8.6 (7.3–9.8)
By age group (years)						
Males	15–18	7.1 (4.1–10.0)	9.2 (6.3–12.1)	36.5 (29.1–43.9)	31.8 (24.6–39.0)	15.5 (10.1–20.8)
	19–30	11.0 (6.2–17.6)	12.4 (7.1–17.7)	38.9 (31.9–45.9)	21.8 (15.4–28.2)	15.9 (9.8–22.0)
	31–50	8.3 (5.5–11.1)	10.8 (7.2–14.4)	39.7 (33.9–45.4)	29.0 (24.0–34.0)	12.3 (8.8–15.8)
	51–70	10.9 (6.7–15.2)	17.8 (13.2–22.4)	45.7 (39.6–51.8)	16.2 (10.9–21.4)	9.4 (5.7–14.3)
	71+	14.7 (10.2–19.2)	14.0 (10.3–17.6)	47.7 (40.8–54.5)	16.5 (13.0–20.0)	7.2 (4.8–9.5)
	Total	10.0 (8.0–12.0)	13.2 (10.9–15.4)	41.6 (38.6–44.6)	23.1 (20.5–25.8)	12.0 (9.7–14.3)
Females	15–18	12.0 (8.7–15.4)	17.8 (12.9–22.7)	34.9 (29.9–40.0)	24.4 (19.4–29.4)	10.9 (7.2–14.5)
	19–30	17.3 (11.1–23.5)	17.6 (12.4–22.9)	42.6 (35.6–49.6)	17.5 (11.8–23.1)	5.0 (2.3–7.8)
	31–50	13.3 (9.6–16.9)	17.6 (14.0–21.3)	43.6 (39.4–47.7)	19.7 (15.6–23.8)	5.8 (3.6–8.1)
	51–70	16.7 (12.8–20.6)	22.4 (17.7–27.1)	40.8 (35.6–45.9)	16.4 (12.0–20.7)	3.8 (1.8–6.9)
	71+	15.3 (12.1–18.4)	25.7 (20.8–30.6)	43.2 (38.2–48.2)	11.0 (8.2–13.8)	4.9 (3.0–7.5)
	Total	15.1 (13.2–17.0)	19.7 (17.8–21.6)	42.0 (39.5–44.5)	17.8 (15.7–19.9)	5.4 (4.1–6.6)
By NZDep2006 quintile						
Males	1	11.0 (6.4–15.7)	15.6 (9.3–22.0)	40.1 (33.4–46.8)	21.5 (16.2–26.9)	11.7 (6.4–17.0)
	2	5.8 (2.7–10.5)	11.5 (7.0–16.0)	43.3 (35.8–50.9)	21.9 (15.7–28.0)	17.6 (12.0–23.2)
	3	8.9 (3.4–14.5)	13.6 (8.8–18.5)	39.8 (32.2–47.4)	26.1 (19.9–32.3)	11.5 (6.4–16.6)
	4	9.9 (6.1–13.8)	13.3 (8.3–18.2)	43.6 (35.4–51.7)	24.5 (17.7–31.3)	8.7 (5.0–12.4)
	5	15.0 (9.8–20.2)	11.4 (7.9–14.8)	41.6 (35.0–48.3)	22.0 (17.2–26.7)	10.0 (6.0–14.0)
Females	1	12.2 (8.1–16.3)	23.8 (18.5–29.0)	43.9 (36.9–50.9)	14.7 (9.0–20.4)	5.4 (2.7–9.5)
	2	13.1 (9.4–16.7)	16.9 (12.4–21.4)	45.9 (39.6–52.2)	21.4 (16.3–26.4)	2.8 (0.9–6.2)
	3	18.6 (14.0–23.2)	19.3 (14.1–24.5)	37.5 (30.9–44.2)	17.9 (13.2–22.6)	6.7 (3.5–9.9)
	4	15.7 (10.7–20.8)	19.8 (15.6–24.0)	42.2 (36.0–48.4)	15.9 (11.0–20.7)	6.4 (2.8–10.0)
	5	15.4 (10.7–20.1)	19.7 (14.8–24.6)	40.6 (35.5–45.6)	18.4 (14.1–22.7)	6.0 (3.5–8.4)

Note: Results for Māori, Pacific and NZEO are presented in the online data tables.

6.3 Food preparation and cooking practices

Fat

One major health concern for adults in Western countries is excessive dietary fat intake, particularly saturated fat, which increases the risk of cardiovascular diseases (NHMRC 2006). The *Food and Nutrition Guidelines* encourage adults to reduce the percentage of energy from total fat and replace saturated fat with unsaturated fat.

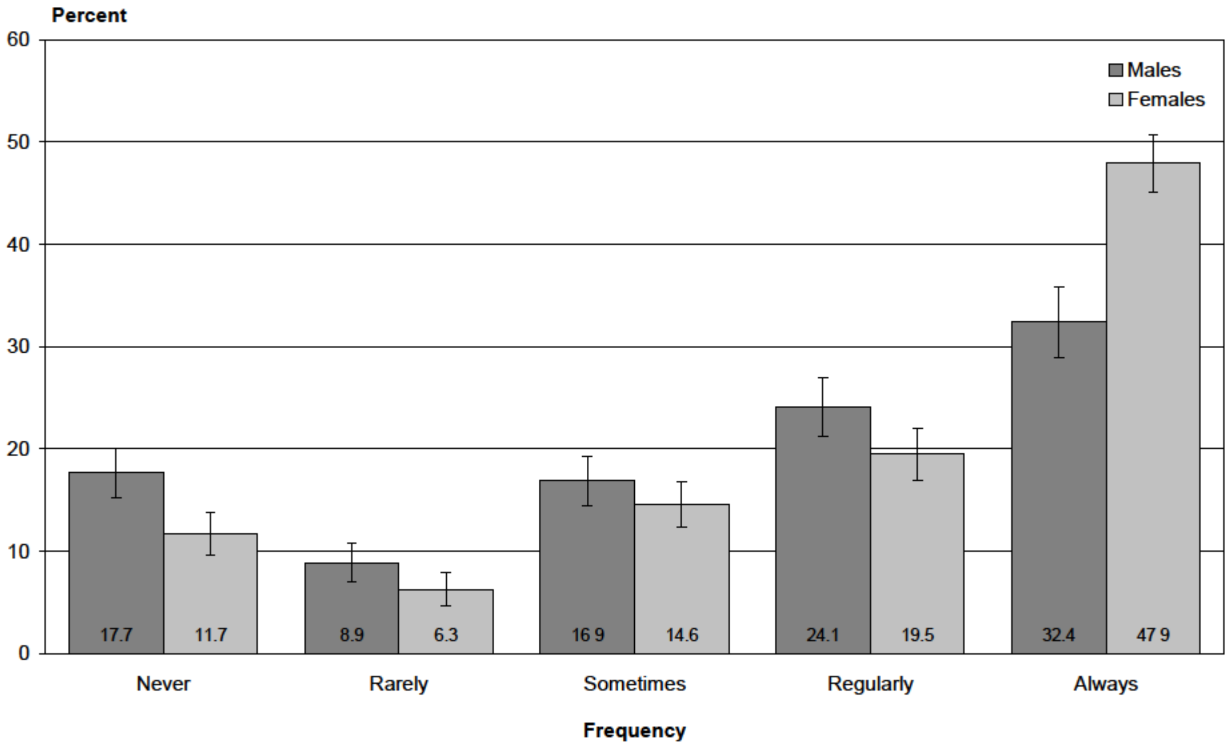
Removing excess fat on meat and skin from chicken

The *Food and Nutrition Guidelines* recommend trimming all visible fat from meat and removing the skin from chicken.

> **Survey questions**
>
> How often do you remove the excess fat from meat?
>
> How often do you remove the skin from chicken?

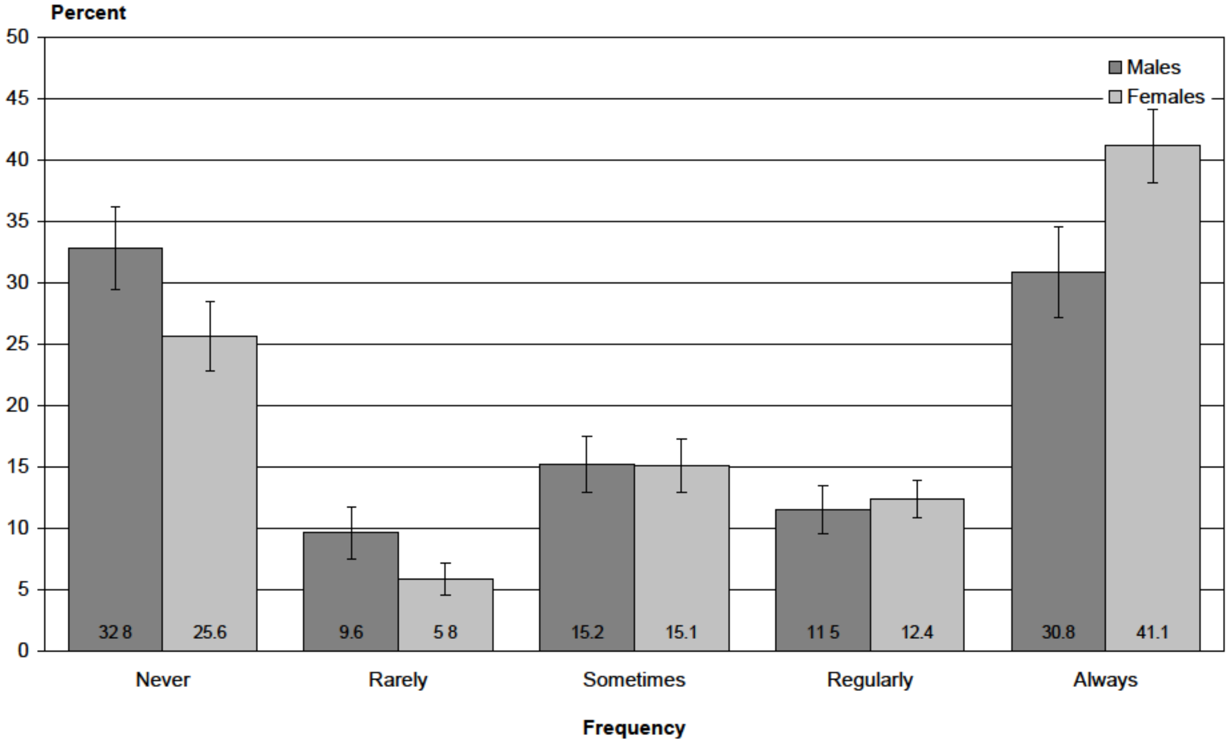
More than half of the total population aged 15 years and over trim excess fat from meat regularly or always (Figure 6.9).

Figure 6.9: Frequency of removal of excess fat from meat, by sex



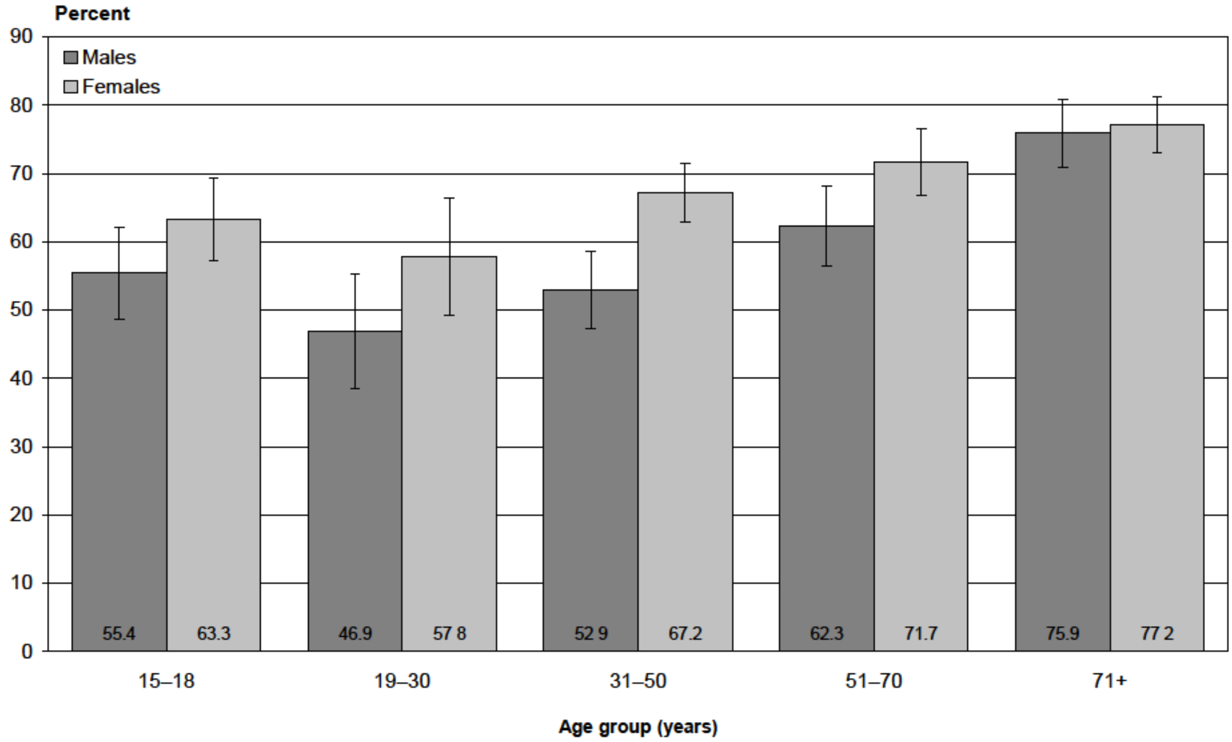
Almost half of the total population aged 15 years and over remove the skin of chicken regularly or always (Figure 6.10). However almost one-third of the population never remove the skin off chicken before eating.

Figure 6.10: Frequency of removal of skin from chicken, by sex



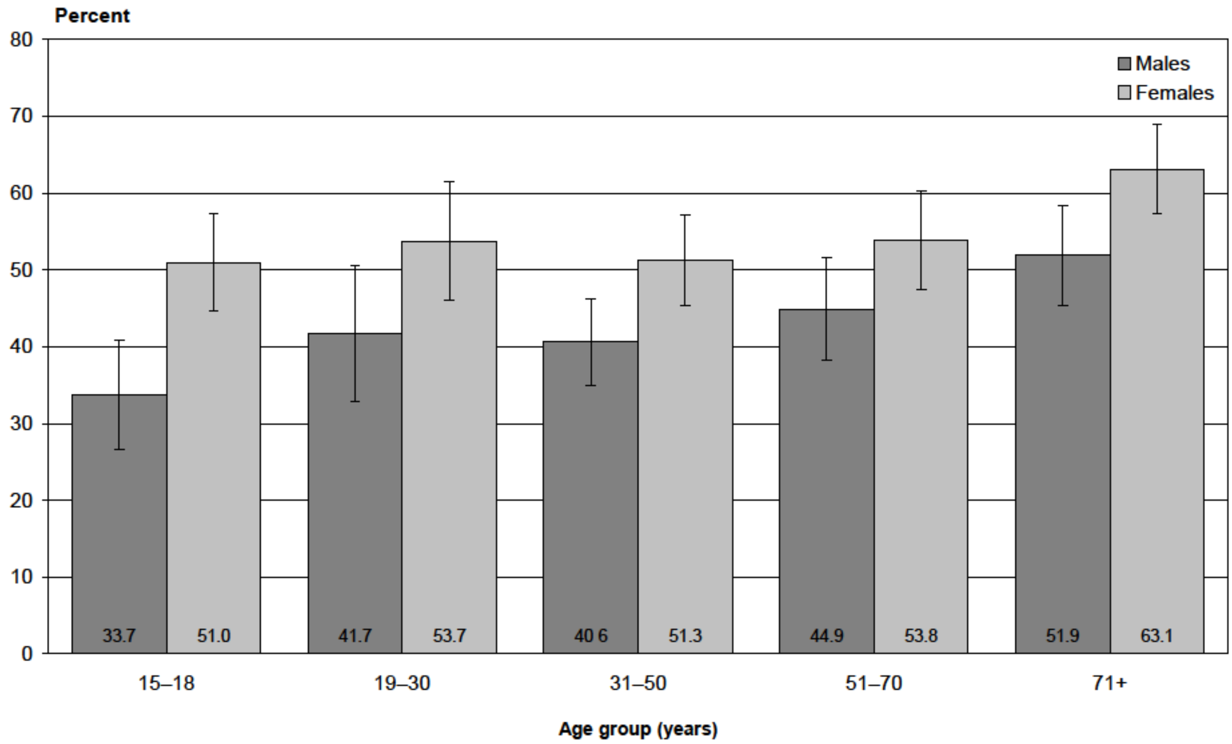
From 19–30 years there was an increase in the proportion of the total population aged 15 years and over removing excess fat regularly or always with increasing age in both males and females (Figure 6.11).

Figure 6.11: Remove excess fat from meat regularly or always, by age group and sex



In males, but not females, there was an increase in the proportion of adults removing the skin from chicken regularly or always with increasing age (Figure 6.12).

Figure 6.12: Remove skin from chicken regularly or always, by sex and age group



Overall, there was a decrease in those regularly or always removing the excess fat off meat, and in those regularly or always removing the skin off chicken with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.12: Frequency of removal of excess fat from meat, and removal of skin from chicken, by age group, NZDep2006 and sex

		Removal of excess fat from meat regularly/always (prevalence), (95% CI)	Removal of chicken skin regularly/always (prevalence), (95% CI)
Total population		62.1 (60.1–64.0)	48.2 (45.8–50.6)
By age group (years)			
Males	15–18	55.4 (48.6–62.2)	33.7 (26.5–40.8)
	19–30	46.9 (38.5–55.3)	41.7 (33.0–50.5)
	31–50	52.9 (47.1–58.6)	40.6 (35.1–46.2)
	51–70	62.3 (56.4–68.2)	44.9 (38.3–51.6)
	71+	75.9 (70.8–80.9)	51.9 (45.5–58.4)
	Total	56.5 (53.4–59.6)	42.3 (38.6–46.1)
Females	15–18	63.3 (57.4–69.3)	51.0 (44.7–57.3)
	19–30	57.8 (49.3–66.4)	53.7 (45.9–61.4)
	31–50	67.2 (63.0–71.5)	51.3 (45.4–57.2)
	51–70	71.7 (66.7–76.6)	53.8 (47.3–60.2)
	71+	77.2 (73.0–81.3)	63.1 (57.3–68.9)
	Total	67.4 (64.7–70.0)	53.5 (50.6–56.5)
By NZDep2006 quintile			
Males	1	61.5 (54.5–68.5)	46.0 (36.8–55.3)
	2	59.7 (51.7–67.8)	41.4 (33.9–48.9)
	3	58.7 (50.6–66.8)	46.9 (38.5–55.3)
	4	50.1 (44.0–56.2)	42.5 (33.2–51.8)
	5	50.1 (43.5–56.8)	32.7 (26.5–39.0)
Females	1	75.1 (68.5–81.7)	57.4 (49.8–65.0)
	2	70.1 (63.8–76.3)	57.6 (50.1–65.0)
	3	65.8 (59.2–72.3)	56.5 (49.5–63.5)
	4	67.4 (61.1–73.6)	50.4 (44.9–55.9)
	5	58.7 (53.8–63.6)	44.9 (38.7–51.1)

Notes:

Results for Māori, Pacific and NZEO are presented in the online data tables.

Results for additional response options are presented in the online data tables.

Type of spread used

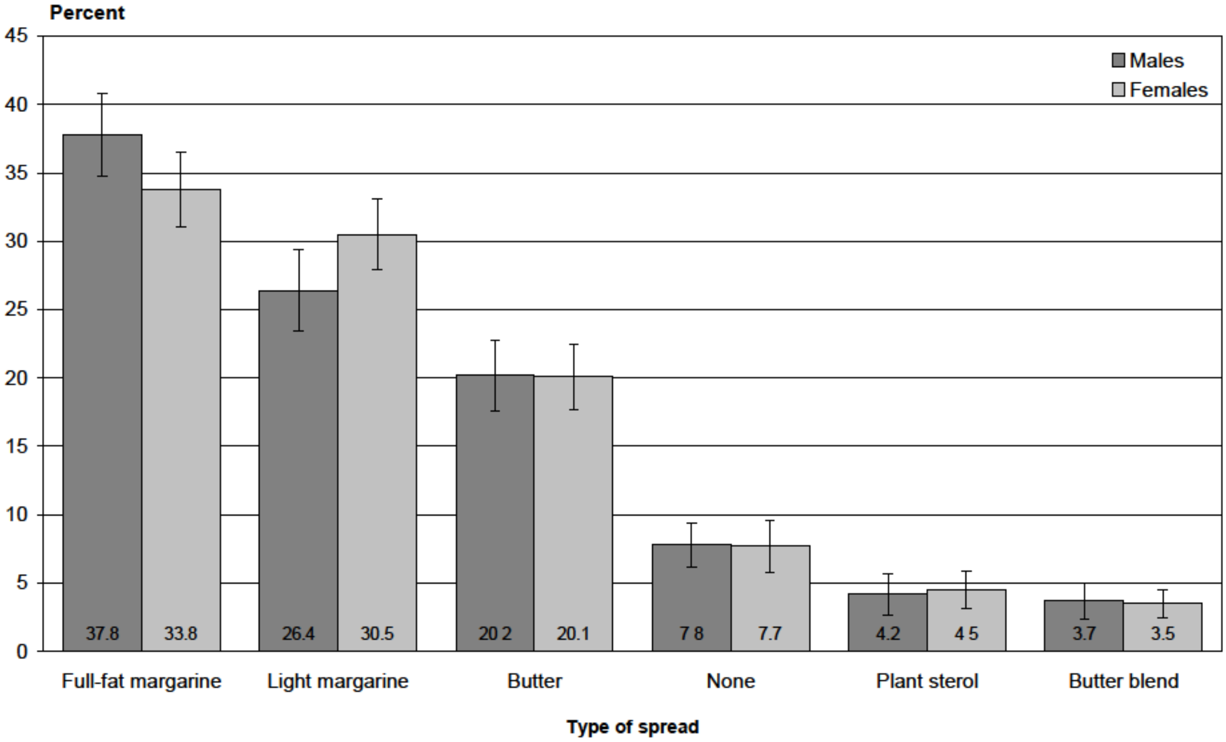
The *Food and Nutrition Guidelines* recommend choosing a margarine or spread (polyunsaturated or monounsaturated) instead of butter, and to use less spread on bread and rolls.

> **Survey question**
>
> What type of butter or margarine spread do you use the most of?
>
> Response options: None, butter, butter and margarine blend, margarine (full-fat), lite or reduced-fat margarine, plant sterol margarine.

Some type of margarine was used as a spread most of the time by 68.6% of the total population aged 15 years and over, 20.1% used butter, while 7.7% used no spread most of the time (Table 6.13).

Margarine (full-fat or light) was the most common type of spread used by the total population aged 15 years and over (Figure 6.13). Plant sterol and butter blend spreads were the least commonly used.

Figure 6.13: Spread used most of the time, by sex



Use of spread was similar among males and females in most age groups, except that males aged 51–70 years were less likely to use reduced-fat margarine (26.0%) than females of the same age group (37.6%). Use of spread was similar across age groups, except for a higher use of plant sterol margarine by those aged 51–70 years compared to younger age groups.

Males living in the most deprived neighbourhoods were less likely to use light or reduced-fat margarine (NZDep2006 quintile 5: 18.9%) than males living in the least deprived neighbourhoods (quintile 1: 38.0%) and more likely to use full-fat margarine (quintile 5: 47.5%; quintile 1: 27.7%).

Females living in the most deprived neighbourhoods (quintile 5) were less likely to use butter (14.2%) than females living in the least deprived neighbourhoods (quintile 1: 31.5%), and more likely to use any type of margarine (full-fat or reduced-fat) (quintile 5: 76.0%; quintile 1: 58.6%). Females living in the most deprived neighbourhoods (quintile 5) were more likely to use full-fat margarine (49.0 %) than females living in the least deprived neighbourhoods (quintile 1: 18.3 %). Overall, there was an increase in those choosing any type of margarine across increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.13: Type of spread used most of the time, by age group, NZDep2006 and sex

		Butter Prevalence (95% CI)	Butter/margarine blend Prevalence (95% CI)	Full-fat margarine Prevalence (95% CI)	Light or reduced-fat margarine Prevalence (95% CI)	Plant sterol margarine Prevalence (95% CI)	None Prevalence (95% CI)	Margarine–full-fat or light/reduced-fat Prevalence (95% CI)
Total population		20.1 (18.3–21.9)	3.6 (2.7–4.4)	35.7 (33.7–37.7)	28.5 (26.2–30.7)	4.4 (3.4–5.4)	7.7 (6.3–9.1)	68.6 (66.4–70.8)
By age group (years)								
Males	15–18	23.6 (17.7–29.6)	3.0 (1.2–6.3)	42.3 (34.9–49.6)	20.9 (15.3–26.5)	2.1 (0.6–5.4)	8.0 (5.0–12.2)	65.3 (58.2–72.4)
	19–30	17.3 (11.4–23.2)	2.0 (0.5–5.6)	40.3 (32.9–47.7)	25.8 (19.0–32.5)	2.3 (0.4–7.0)	12.3 (7.3–19.1)	68.4 (60.9–75.9)
	31–50	21.8 (17.0–26.6)	5.4 (3.0–9.0)	36.4 (30.5–42.4)	27.6 (22.3–32.9)	2.0 (0.7–4.5)	6.7 (3.9–9.5)	66.0 (60.6–71.4)
	51–70	19.4 (14.0–24.9)	3.1 (1.3–6.4)	35.7 (29.3–42.1)	26.0 (19.8–32.2)	8.8 (5.4–13.4)	6.9 (4.0–10.9)	70.5 (64.1–76.9)
	71+	19.1 (13.7–24.5)	2.5 (1.3–4.6)	39.6 (35.3–43.9)	28.7 (23.7–33.7)	5.7 (3.1–9.4)	4.4 (2.6–6.8)	74.0 (68.7–79.3)
	Total	20.2 (17.5–22.8)	3.7 (2.3–5.0)	37.8 (34.7–40.8)	26.4 (23.3–29.4)	4.2 (2.8–5.7)	7.8 (6.1–9.4)	68.4 (65.5–71.2)
Females	15–18	17.2 (12.9–21.4)	2.5 (1.1–4.7)	44.9 (38.9–50.9)	28.5 (23.5–33.6)	0.3 (0.0–1.8)	6.6 (4.1–9.9)	73.8 (69.1–78.5)
	19–30	18.4 (12.7–24.0)	2.8 (1.2–5.5)	37.5 (30.0–45.0)	29.4 (22.6–36.2)	2.3 (0.4–6.8)	9.6 (5.3–15.7)	69.2 (61.8–76.7)
	31–50	24.0 (19.6–28.3)	3.3 (1.7–5.7)	36.9 (32.0–41.7)	24.6 (20.4–28.9)	2.3 (1.2–4.2)	8.9 (5.4–12.4)	63.9 (59.2–68.5)
	51–70	16.9 (12.9–20.9)	4.8 (2.7–7.8)	24.7 (19.9–29.4)	37.6 (32.6–42.7)	9.8 (5.9–13.7)	6.2 (3.5–10.1)	72.1 (66.2–78.0)
	71+	19.4 (15.0–23.8)	2.8 (1.4–4.9)	31.7 (27.2–36.1)	36.4 (31.2–41.7)	5.6 (3.5–7.6)	4.2 (2.1–7.3)	73.6 (68.7–78.6)
	Total	20.1 (17.7–22.5)	3.5 (2.5–4.5)	33.8 (31.1–36.5)	30.5 (27.8–33.1)	4.5 (3.1–5.9)	7.7 (5.8–9.6)	68.8 (65.6–71.9)
By NZDep2006 quintile								
Males	1	21.3 (14.7–27.8)	3.2 (1.2–6.6)	27.7 (21.6–33.8)	38.0 (30.4–45.6)	4.7 (2.1–9.1)	5.1 (2.5–9.2)	70.4 (62.6–78.3)
	2	22.3 (16.1–28.5)	4.0 (1.7–8.0)	40.5 (33.4–47.5)	19.5 (14.3–24.6)	4.5 (1.8–8.9)	9.3 (5.3–13.2)	64.4 (57.2–71.6)
	3	18.7 (13.6–23.7)	4.5 (1.9–8.7)	36.3 (29.7–42.9)	27.8 (20.5–35.1)	5.2 (1.7–11.6)	7.6 (3.8–13.5)	69.2 (62.7–75.8)
	4	18.1 (12.2–24.1)	5.1 (2.1–10.1)	39.7 (32.9–46.6)	25.0 (19.5–30.6)	3.6 (1.4–7.3)	8.5 (3.5–13.5)	68.3 (61.6–75.0)
	5	20.1 (15.4–24.8)	1.5 (0.4–4.0)	47.5 (40.8–54.2)	18.9 (13.8–24.0)	3.0 (0.7–8.2)	9.0 (5.1–13.0)	69.4 (63.0–75.7)
Females	1	31.5 (23.8–39.2)	4.7 (2.0–9.1)	18.3 (13.1–23.5)	33.2 (26.3–40.1)	7.1 (3.9–11.7)	5.2 (2.2–10.3)	58.6 (51.5–65.7)
	2	21.3 (15.8–26.7)	2.8 (1.1–5.8)	31.6 (26.2–37.0)	33.5 (27.0–40.0)	4.7 (2.8–7.5)	6.1 (3.3–10.3)	69.9 (63.3–76.4)
	3	16.3 (11.8–20.8)	4.5 (2.1–8.4)	32.1 (25.5–38.6)	31.3 (24.1–38.5)	4.8 (2.1–9.2)	11.0 (5.4–16.5)	68.2 (60.6–75.8)
	4	18.6 (13.8–23.5)	2.3 (0.7–5.5)	37.0 (31.3–42.6)	30.0 (24.7–35.2)	3.0 (1.5–5.4)	9.1 (4.9–13.3)	70.0 (63.8–76.1)
	5	14.2 (10.8–17.5)	3.3 (1.8–5.7)	49.0 (43.2–54.9)	24.0 (18.8–29.1)	3.0 (1.1–6.4)	6.5 (3.1–9.9)	76.0 (71.5–80.6)

Note: Results for Māori, Pacific and NZEO are presented in the online data tables.

Type of fat or oil used for cooking

The *Food and Nutrition Guidelines* recommend using less fat in cooking, and when using fat, choosing a vegetable oil or oil high in monounsaturated fat (such as olive or canola oil).

> **Survey question**
>
> What type of fat or oil do you use most often when cooking?
>
> Response options: None, butter, margarine, oil, dripping or lard, other.

Oil was used most often when cooking by 89.9% of the total population aged 15 years and over. There were no differences in type of oil used by males and females, or by age group (Table 6.14).

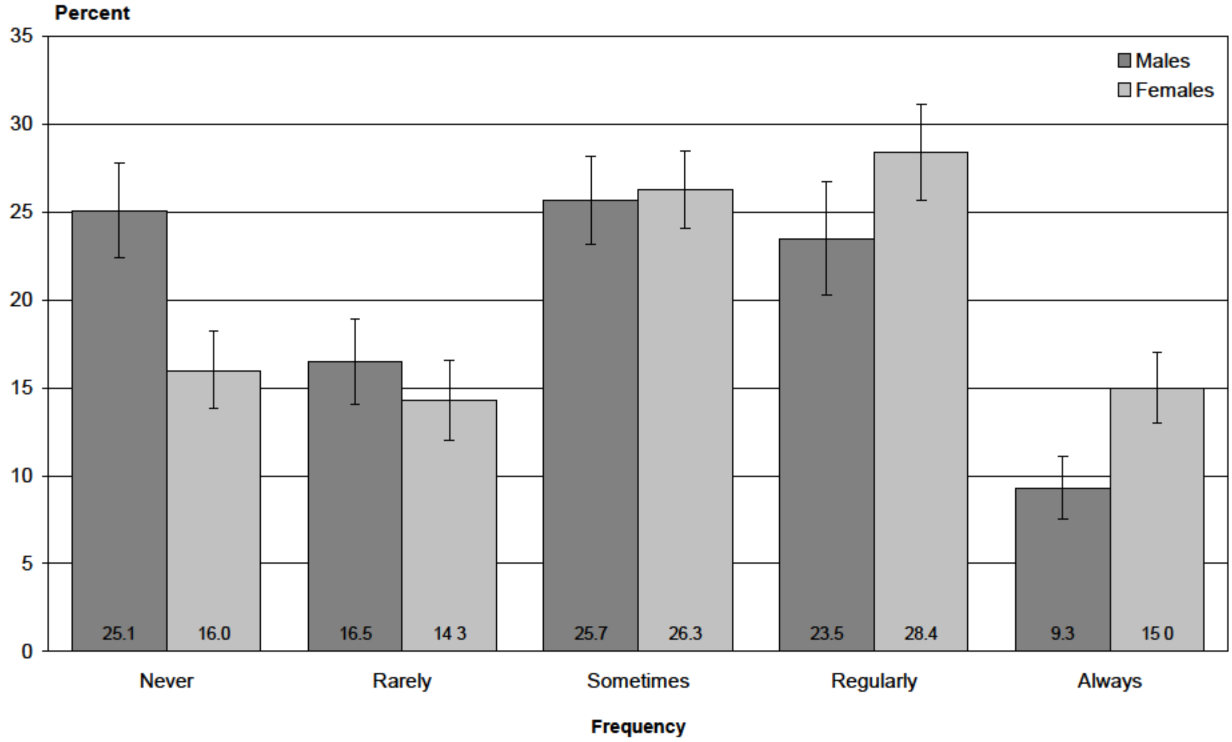
There was no gradient across NZDep2006 quintiles in the proportion of the total population aged 15 years and over choosing less saturated fats (oil or margarine), after adjusting for age, sex and ethnic group.

Use of low or reduced-fat varieties of food

> **Survey question**
>
> How often do you choose low or reduced-fat varieties of foods instead of the standard variety?

Low or reduced-fat varieties of food were chosen regularly or always by 38.3%, sometimes by 26.0%, and never or rarely by 35.7% of the population (Table 6.14). Females aged 15–18 years and 51–70 years were more likely to have chosen low or reduced-fat varieties regularly or always compared to males of these age groups. The proportion of the total population aged 15 years and over who regularly or always chose low or reduced-fat varieties of foods increased with increasing age, then levelled off in those aged 51+ years.

Figure 6.14: Choice of low or reduced-fat varieties of food, by sex



Males and females living in the least deprived areas (NZDep2006 quintile 1: males 38.5%; females 50.1%) were more likely to choose low or reduced-fat varieties of foods regularly or always compared to those living in the most deprived areas (quintile 5: males 24.6%; females 33.6%).

Salt

High sodium intake (principally from salt) is associated with high blood pressure, an important risk factor for cardiovascular disease, particularly stroke (NHMRC 2006). The *Food and Nutrition Guidelines* encourage reducing sodium consumption by preparing meals with minimal added salt, and when purchasing foods and drinks prepared away from home choosing those that are low in salt.

There is concern over the low iodine status of New Zealanders. If using salt for cooking or at the table, it is recommended that iodised salt be used (Ministry of Health 2003b). Mandatory fortification of bread with iodised salt commenced in New Zealand in September 2009.

Survey question

We are interested in whether or not your household uses any iodised salt. Not all salt is iodised, so it is best to view the packet.

How often do you add salt to your food after it has been cooked or prepared?

How often do you choose low- or reduced-salt varieties of foods instead of the standard variety?

Adding salt to food and use of iodised salt

Use of iodised salt

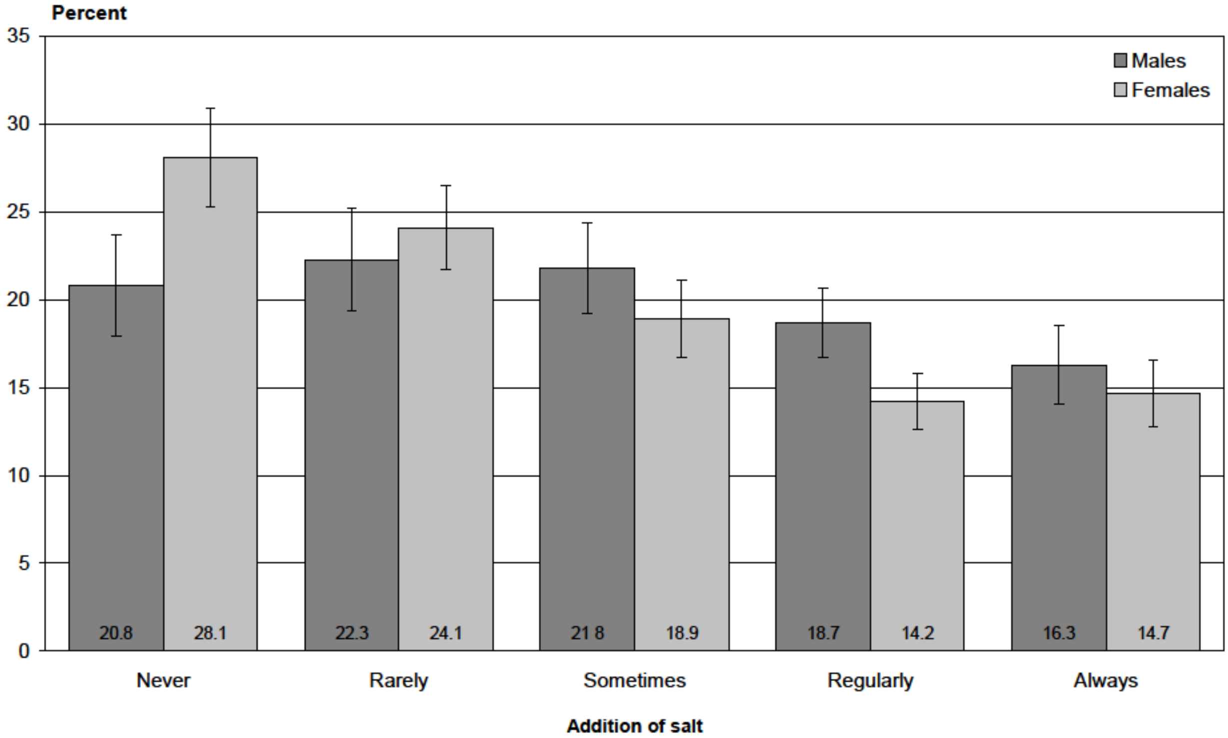
Most of the total population aged 15 years and over (84.2%) used iodised salt at home, while 13.6% did not use iodised salt and 2.2% did not use any salt at home (Table 6.15). There were similar patterns of use of iodised salt among males and females and across age groups. Of those who used salt at home, 85.7% used iodised salt.

Overall, there was no gradient across NZDep2006 quintiles of those who used iodised salt, after adjusting for age, sex and ethnic group.

Addition of salt to food

Salt was never or rarely added to food after it has been cooked or prepared by 47.9% of the total population aged 15 years and over (Table 6.14; Figure 6.15). There were similar patterns of addition of salt to food across age groups.

Figure 6.15: Addition of salt to food after cooking or preparation, by sex

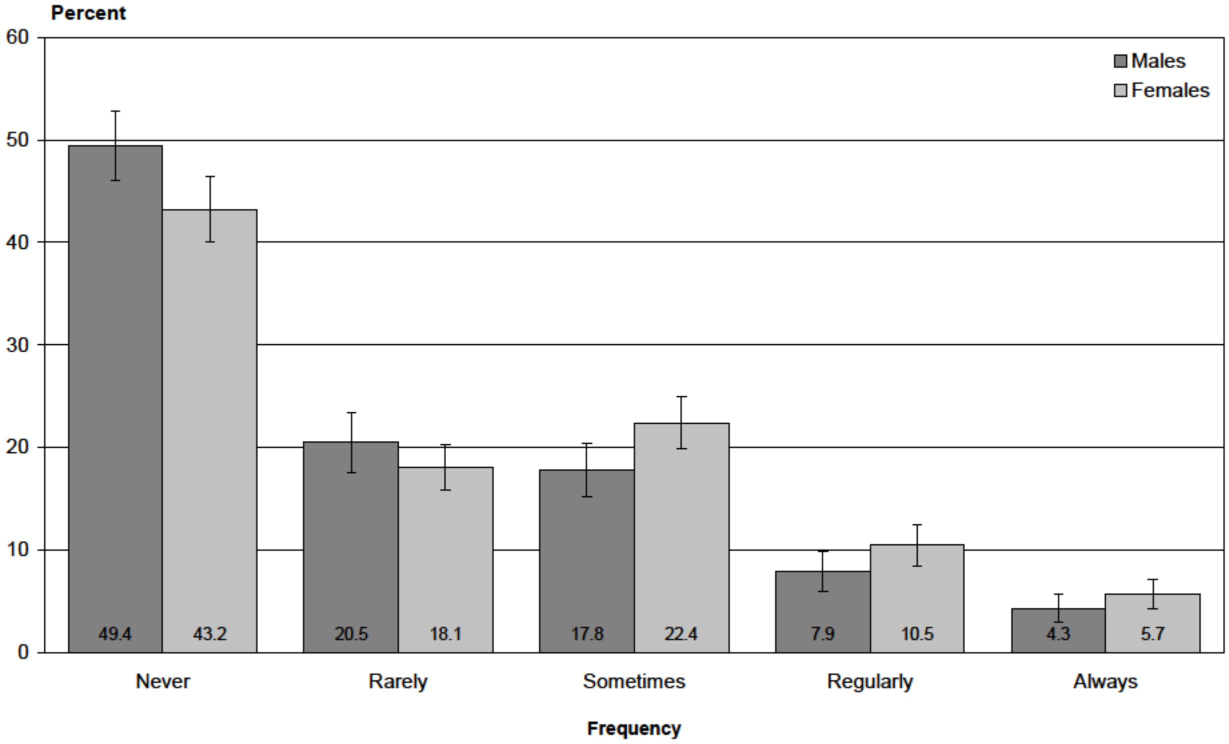


For males and females, there were no differences in the proportion who never or rarely added salt by neighbourhood deprivation. Overall, there was no gradient across NZDep2006 quintiles for those never or rarely adding salt, after adjusting for age, sex and ethnic group.

Use of low- or reduced-salt varieties of food

Low- or reduced-salt varieties of food were chosen regularly or always by 14.3%, sometimes by 20.2%, and never or rarely by 65.4% (Table 6.14). Almost half of the total population aged 15 years and over never chose low-or reduced-salt varieties of food (Figure 6.16).

Figure 6.16: Choice of low- or reduced-salt varieties of food, by sex



There was an increased use of low- or reduced-salt varieties of food regularly or always with increasing age, although in females this was highest among those aged 51–70 years.

Overall, there were no differences in the frequency of choosing low- or reduced-salt varieties of food by neighbourhood deprivation.

Table 6.14: Cooking oil, salt, low-fat, low-salt foods, by age group, NZDep2006 and sex

		Oil used in cooking most of the time (prevalence), (95% CI)	Low- or reduced-fat varieties of foods chosen regularly/ always (prevalence), (95% CI)	Never/rarely add salt to food after it has been cooked or prepared (prevalence), (95% CI)	Low- or reduced-salt varieties of foods chosen regularly/always (prevalence), (95% CI)
Total population		89.9 (88.9–91.0)	38.3 (36.2–40.4)	47.9 (45.5–50.2)	14.3 (12.7–16.0)
By age group (years)					
Males	15–18	88.8 (83.3–94.4)	11.7 (7.7–15.7)	48.4 (41.8–54.9)	5.4 (2.8–9.4)
	19–30	85.3 (80.1–90.4)	23.4 (16.1–30.7)	43.1 (34.0–52.3)	7.9 (4.3–13.1)
	31–50	91.9 (88.9–94.9)	32.2 (26.6–37.8)	41.4 (36.8–46.0)	11.3 (7.4–15.2)
	51–70	90.4 (86.8–94.0)	42.0 (35.0–49.1)	43.5 (37.0–50.0)	15.8 (10.2–21.4)
	71+	89.7 (86.5–93.0)	46.6 (41.1–52.2)	44.3 (38.4–50.1)	21.7 (16.1–27.3)
	Total	89.7 (88.1–91.3)	32.8 (29.4–36.1)	43.1 (40.0–46.2)	12.3 (10.0–14.5)
Females	15–18	84.3 (80.3–88.3)	21.8 (17.2–26.5)	56.9 (51.2–62.6)	8.0 (5.2–10.7)
	19–30	89.4 (84.8–93.9)	37.0 (29.7–44.3)	55.6 (48.6–62.5)	11.0 (6.2–15.7)
	31–50	90.3 (87.6–92.9)	40.6 (35.8–45.3)	50.4 (45.2–55.7)	14.2 (10.9–17.4)
	51–70	93.0 (90.7–95.4)	55.6 (50.4–60.7)	50.5 (44.2–56.8)	25.0 (19.3–30.6)
	71+	87.6 (85.0–90.3)	48.5 (43.7–53.3)	53.6 (48.3–58.9)	16.8 (13.4–20.2)
	Total	90.1 (88.6–91.7)	43.4 (40.7–46.1)	52.2 (48.8–55.7)	16.2 (14.0–18.4)
By NZDep2006 quintile					
Males	1	94.4 (91.4–97.4)	38.5 (30.2–46.8)	45.3 (37.1–53.5)	13.6 (8.8–18.4)
	2	88.4 (83.7–93.0)	34.6 (26.3–43.0)	40.3 (34.2–46.4)	17.1 (11.2–23.0)
	3	91.9 (87.9–96.0)	36.7 (28.7–44.7)	48.5 (40.8–56.1)	11.3 (6.6–16.0)
	4	92.3 (88.4–96.2)	27.2 (21.1–33.2)	42.1 (35.0–49.1)	8.7 (4.6–12.8)
	5	80.0 (75.1–85.0)	24.6 (18.2–30.9)	38.6 (30.7–46.6)	9.8 (5.4–14.2)
Females	1	95.4 (92.7–98.2)	50.1 (43.8–56.4)	50.3 (42.8–57.8)	16.8 (10.0–23.6)
	2	91.2 (87.6–94.8)	46.0 (39.2–52.8)	52.0 (44.6–59.4)	17.7 (12.0–23.5)
	3	91.1 (86.4–95.8)	47.0 (40.3–53.8)	52.3 (43.6–61.0)	16.0 (11.3–20.6)
	4	87.4 (84.1–90.8)	39.9 (33.3–46.5)	56.8 (51.4–62.3)	15.3 (10.9–19.7)
	5	85.8 (82.6–88.9)	33.6 (28.0–39.3)	49.2 (44.1–54.4)	15.2 (10.6–19.9)

Notes:

Results for additional response options are presented in the online data tables.

Results for Māori, Pacific and NZEO are presented in the online data tables.

Table 6.15: Use of iodised salt, by age group, NZDep2006 and sex

		Yes (prevalence), (95% CI)	No (prevalence), (95% CI)	Do not use salt (prevalence), (95% CI)
NZ population (aged 15+)		84.2 (82.5–85.9)	13.6 (12.0–15.1)	2.2 (1.5–2.9)
By age group (years)				
Males	15–18	83.1 (76.7–89.6)	16.1 (9.7–22.5)	0.8 (0.2–2.1)
	19–30	85.8 (79.9–91.7)	12.5 (6.9–18.1)	1.7 (0.3–4.8)
	31–50	84.3 (80.1–88.6)	14.0 (9.8–18.2)	1.7 (0.7–3.4)
	51–70	82.6 (77.5–87.7)	13.4 (9.3–17.4)	4.0 (1.7–7.9)
	71+	85.9 (80.2–91.6)	9.1 (4.9–13.2)	5.0 (1.3–12.5)
	Total	84.2 (81.8–86.7)	13.2 (10.9–15.5)	2.5 (1.5–3.5)
Females	15–18	80.0 (73.9–86.1)	16.5 (11.2–21.9)	3.4 (0.9–8.7)
	19–30	85.8 (80.4–91.2)	13.2 (7.8–18.6)	1.0 (0.2–3.1)
	31–50	80.2 (75.6–84.7)	18.0 (13.6–22.5)	1.8 (0.7–3.6)
	51–70	87.2 (83.4–91.0)	10.0 (6.9–13.1)	2.8 (1.1–5.7)
	71+	90.0 (87.2–92.8)	8.4 (5.9–11.0)	1.5 (0.7–2.8)
	Total	84.2 (81.7–86.6)	13.9 (11.5–16.2)	2.0 (1.1–2.8)
By NZDep2006 quintile				
Males	1	83.2 (77.3–89.2)	14.5 (9.9–19.1)	2.3 (0.5–6.3)
	2	86.3 (80.3–92.3)	11.4 (5.6–17.3)	2.3 (0.7–5.4)
	3	85.1 (80.2–90.0)	11.2 (6.2–16.2)	3.7 (1.3–7.9)
	4	82.5 (76.5–88.5)	15.9 (9.8–21.9)	1.6 (0.5–3.9)
	5	84.0 (79.3–88.8)	13.3 (8.6–17.9)	2.7 (1.1–5.6)
Females	1	83.4 (77.8–89.1)	15.0 (9.5–20.6)	1.5 (0.3–4.5)
	2	85.2 (80.1–90.4)	12.8 (7.7–17.9)	2.0 (0.4–5.6)
	3	87.2 (81.9–92.4)	12.5 (7.2–17.7)	0.3 (0.1–1.1)
	4	80.7 (74.9–86.5)	16.1 (10.7–21.6)	3.2 (1.3–6.4)
	5	84.0 (79.4–88.6)	13.0 (9.3–16.7)	3.0 (1.1–6.4)

Notes:

1152 respondents did not know if the salt used in the home was iodised.

Results for Māori, Pacific and NZEO are presented in the online data tables.

6.4 Fast foods and takeaways

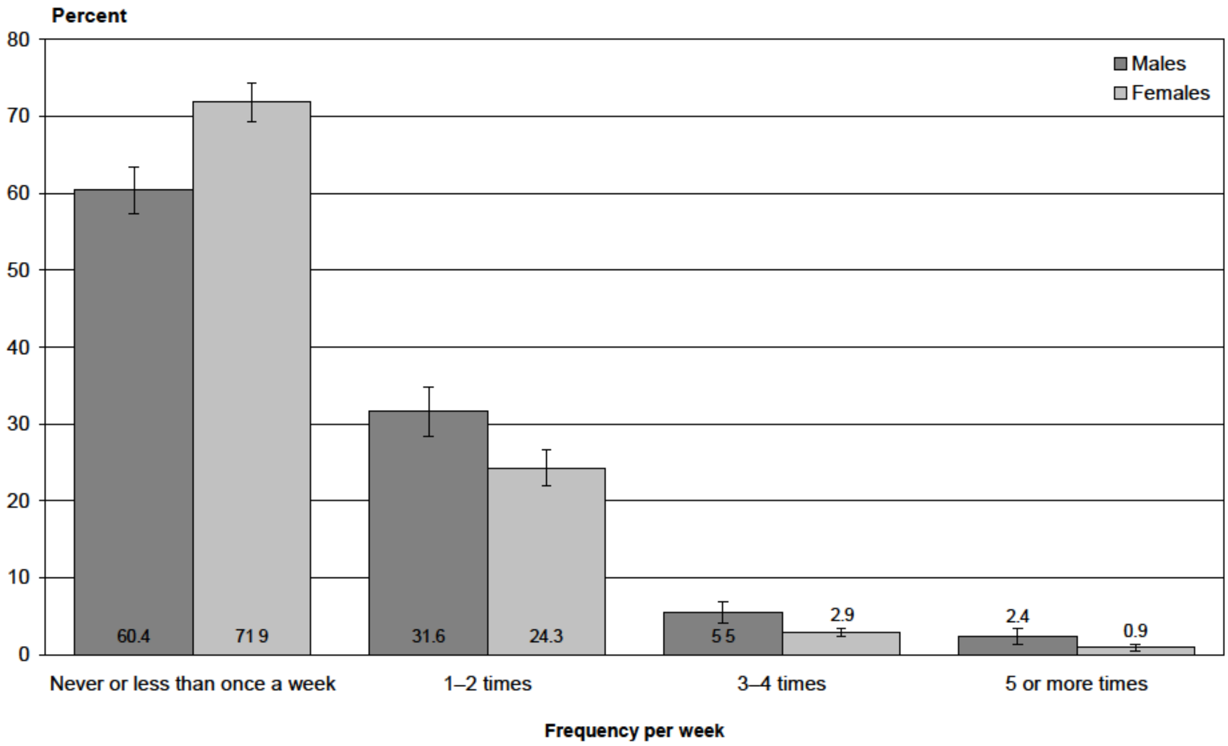
Eating fast food more than twice a week is associated with an increased risk of weight gain, overweight and obesity (World Cancer Research Fund and American Institute for Cancer Research 2007). The *Food and Nutrition Guidelines* recommend choosing pre-prepared foods and snacks that have minimal added fat, especially saturated fat, and that are low in salt.

Fast food or takeaways

> **Survey question**
>
> How often do you eat fast food or takeaways from places like McDonalds, KFC, Burger King, pizza shops or fish and chip shops?

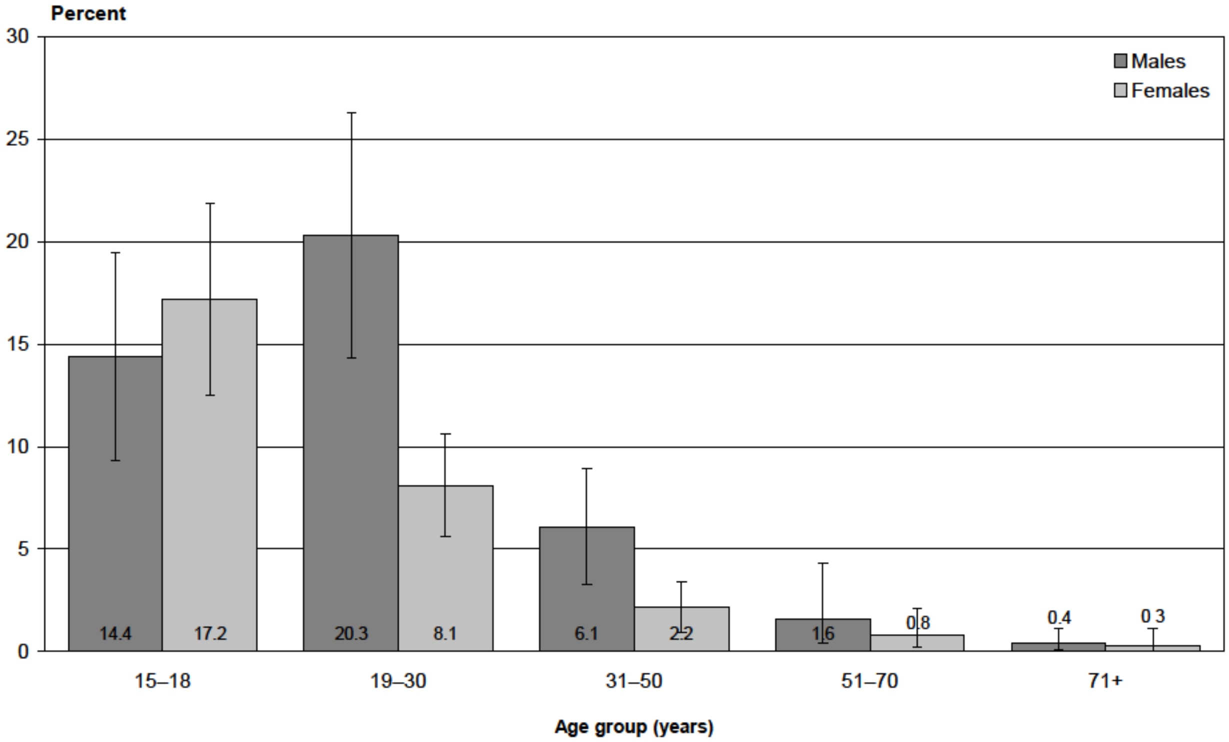
Fast food or takeaways were reported as being never eaten or eaten less than once a week by 66.4%, one or two times a week by 27.8%, and three or more times a week by 5.8% (Figure 6.17).

Figure 6.17: Frequency of eating fast food or takeaways, by sex



Adults aged 15–30 years were more likely to report eating fast food or takeaways three or more times a week compared to other age groups (Figure 6.18). Males aged 19–30 years were more likely to eat fast food or takeaways three or more times a week (20.3%) compared to females in the same age group (8.1%).

Figure 6.18: Fast food or takeaways eaten 3 or more times a week, by age group and sex



There were no differences in the frequency of eating fast food or takeaways by neighbourhood deprivation for males. Females living in the most deprived neighbourhoods were more likely to report eating fast food or takeaways three or more times a week (NZDep2006 quintile 5: 8.1%) compared to females living in the least deprived neighbourhoods (quintile 1: 2.5%). Overall, there was no gradient across NZDep2006 quintiles of those who reported eating fast food or takeaways three or more times a week, after adjusting for age, sex and ethnic group.

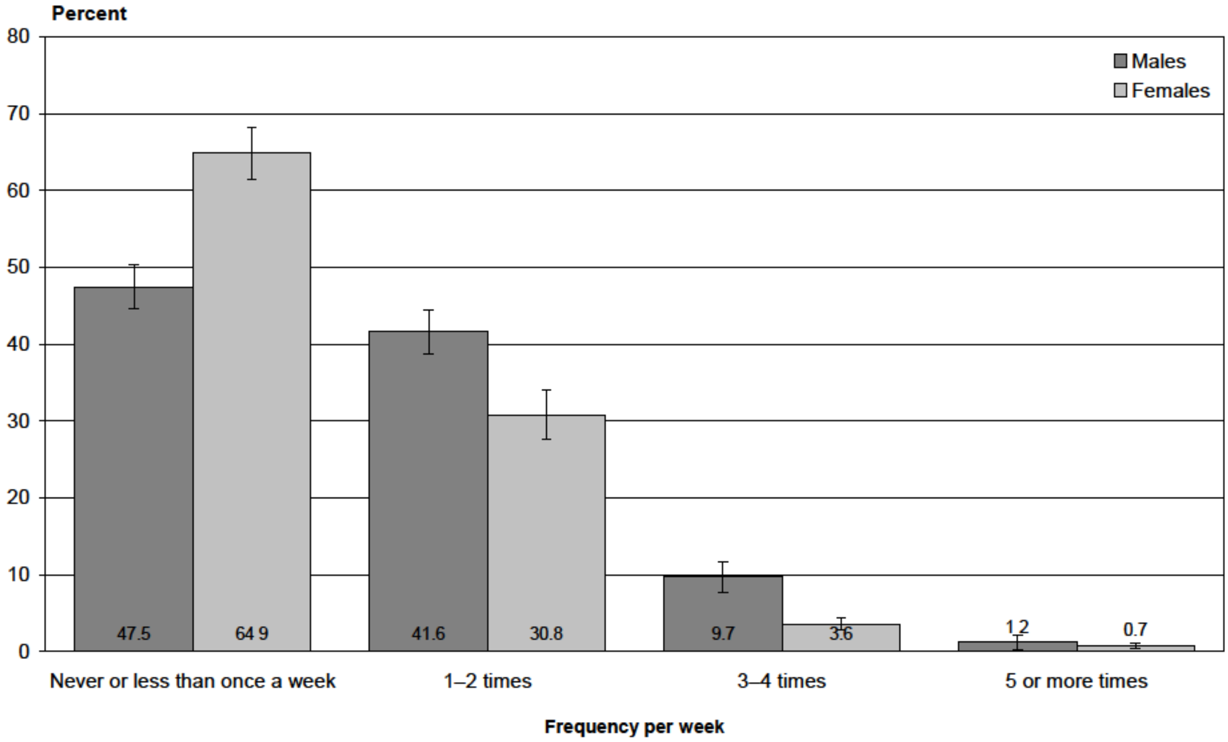
Hot chips

Survey question

How often do you eat hot chips, French fries, wedges, or kumara chips?

Hot chips, French fries, wedges or kumara chips were reported never eaten or eaten less than once a week by 56.5%, one or two times a week by over 36%, and three or more times a week by 7.5% (Figure 6.19).

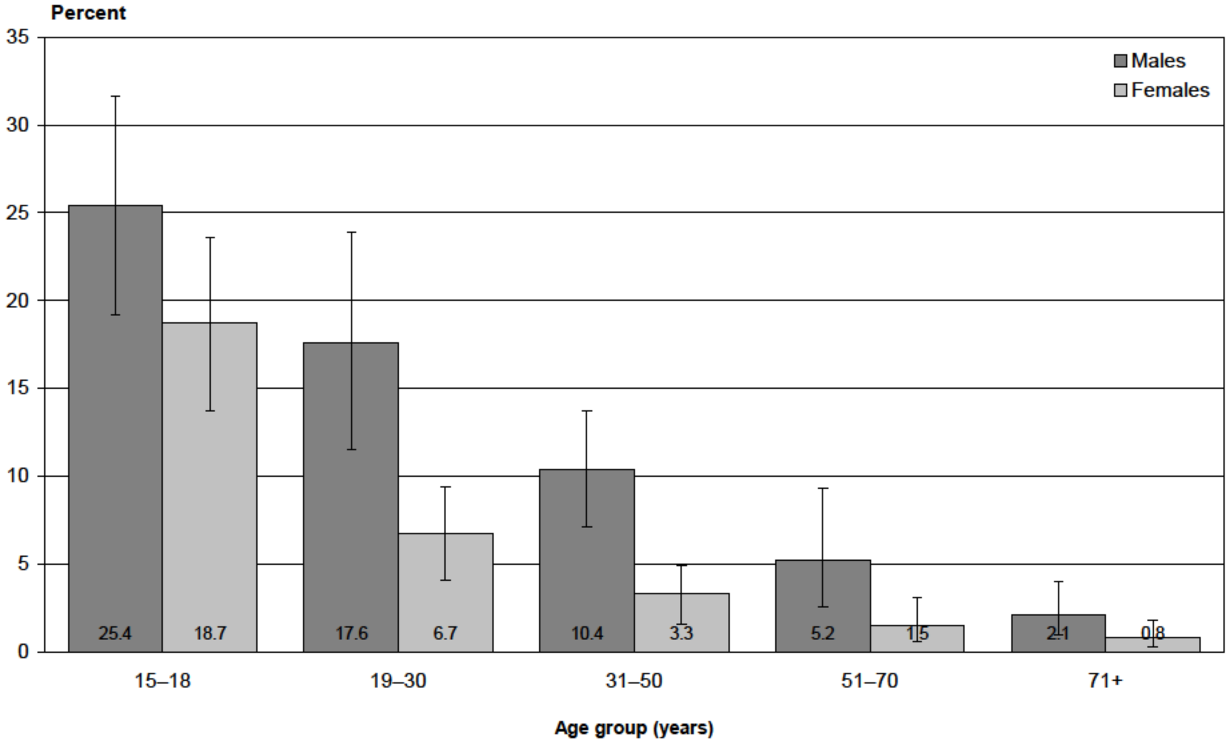
Figure 6.19: Frequency of eating hot chips, French fries, wedges or kumara chips, by sex



Males were more likely to report eating hot chips three or more times a week compared to females, for all age groups except 15–18 years and 71+ years (Figure 6.20).

Males and females aged 15–18 and 19–30 years were more likely to eat hot chips three or more times a week compared to other age groups.

Figure 6.20: Hot chips, French fries, wedges or kumara chips eaten 3 or more times a week, by age group and sex



Females living in the most deprived areas (NZDep2006 quintile 5) were more likely to report eating hot chips three or more times a week (9.2%) compared to females living in the least deprived areas (quintile 1: 1.1%). There were no differences in the proportion of those eating hot chips three or more times a week between males living in quintile 5 and males living in quintile 1. Overall, there was no gradient across NZDep2006 quintiles in those eating hot chips three or more times a week, after adjusting for age, sex and ethnic group.

6.5 Drinks

Excess energy intake from carbohydrate in the form of added sugars may contribute to overweight or obesity (World Cancer Research Fund and American Institute for Cancer Research 2007). Fruit juice and fruit drinks, soft drinks and energy drinks are high in sugar and energy. The World Cancer Research Fund has indicated that sugary drinks have independent effects on body fatness by promoting excess energy intake.

The *Food and Nutrition Guidelines* encourage adults to choose drinks that are low in sugar and to drink plenty of water every day. The *Guidelines* recommend limiting the consumption of fruit juice, cordial, energy and soft drinks because of their high sugar content.

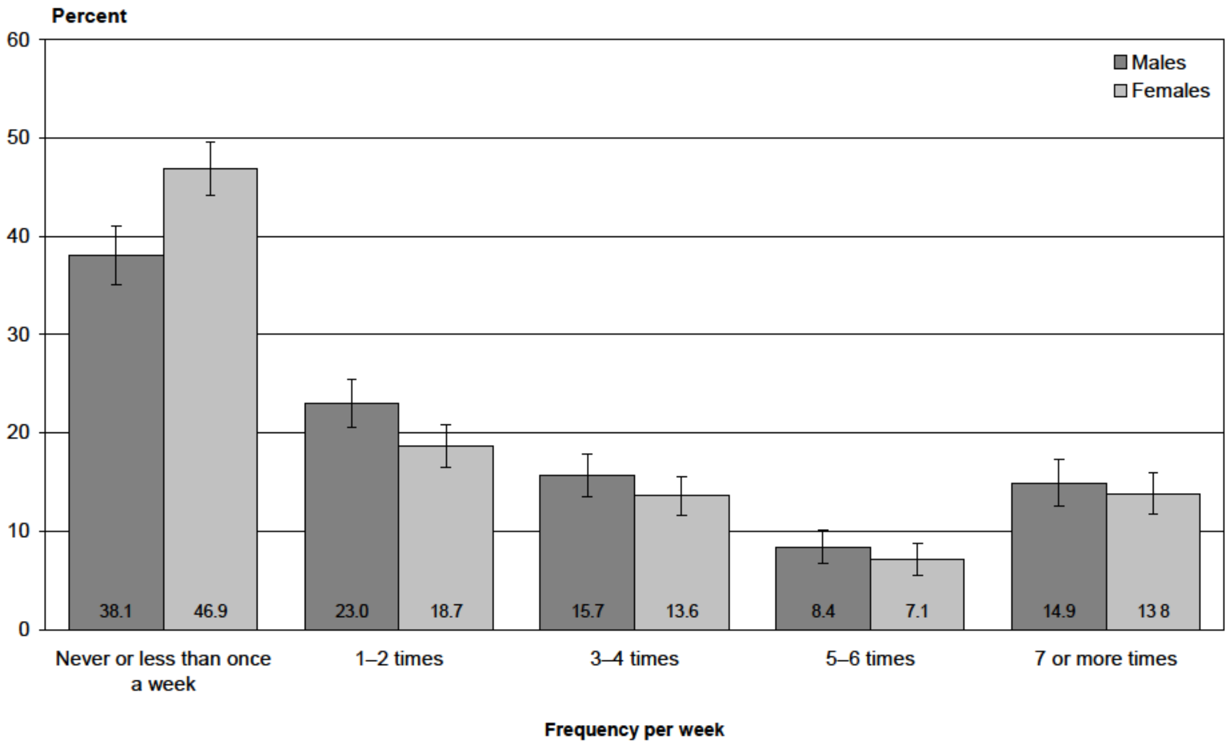
Survey questions

How often do you drink fruit juices and drinks? Do not include diet or diabetic varieties.

How often do you drink soft drinks or energy drinks? Do not include diet varieties.

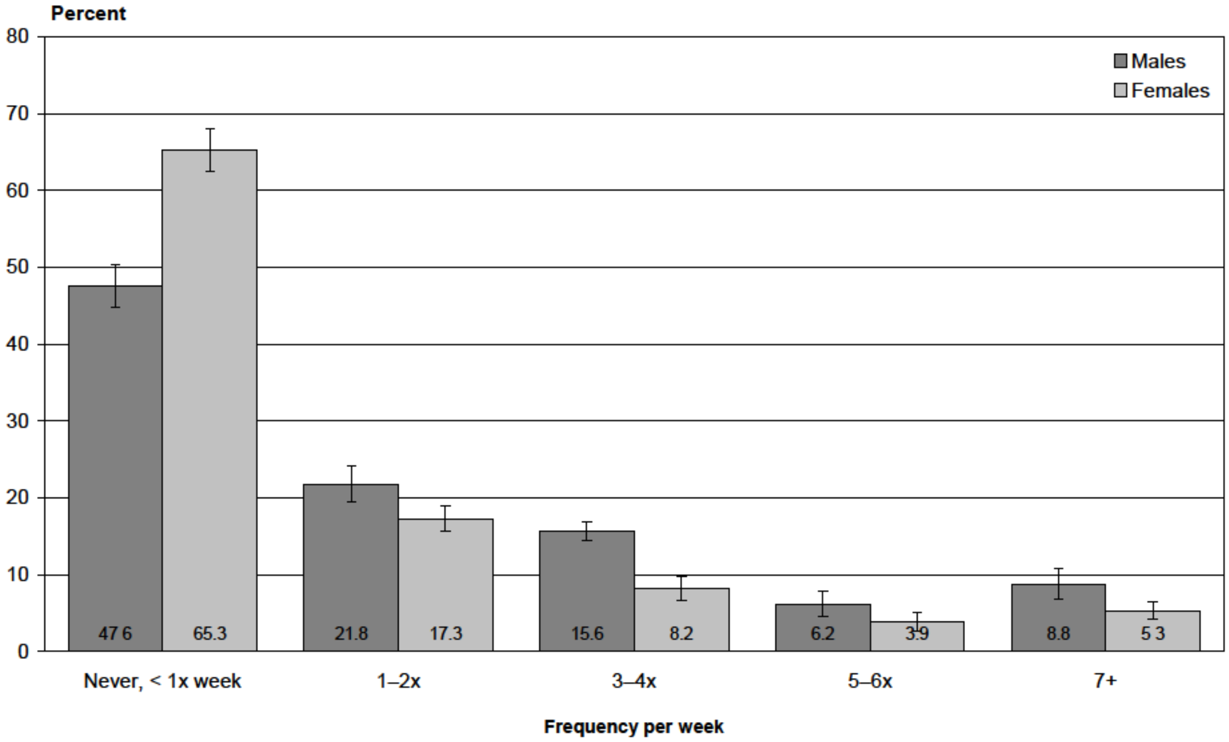
Fruit juice or fruit drinks were reported to be consumed never or less than once a week by 42.6% of the total population aged 15 years and over, consumed three or more times a week by 36.6%, and consumed daily by 14.3% (Figure 6.21).

Figure 6.21: Frequency of drinking fruit juice and fruit drinks, by sex



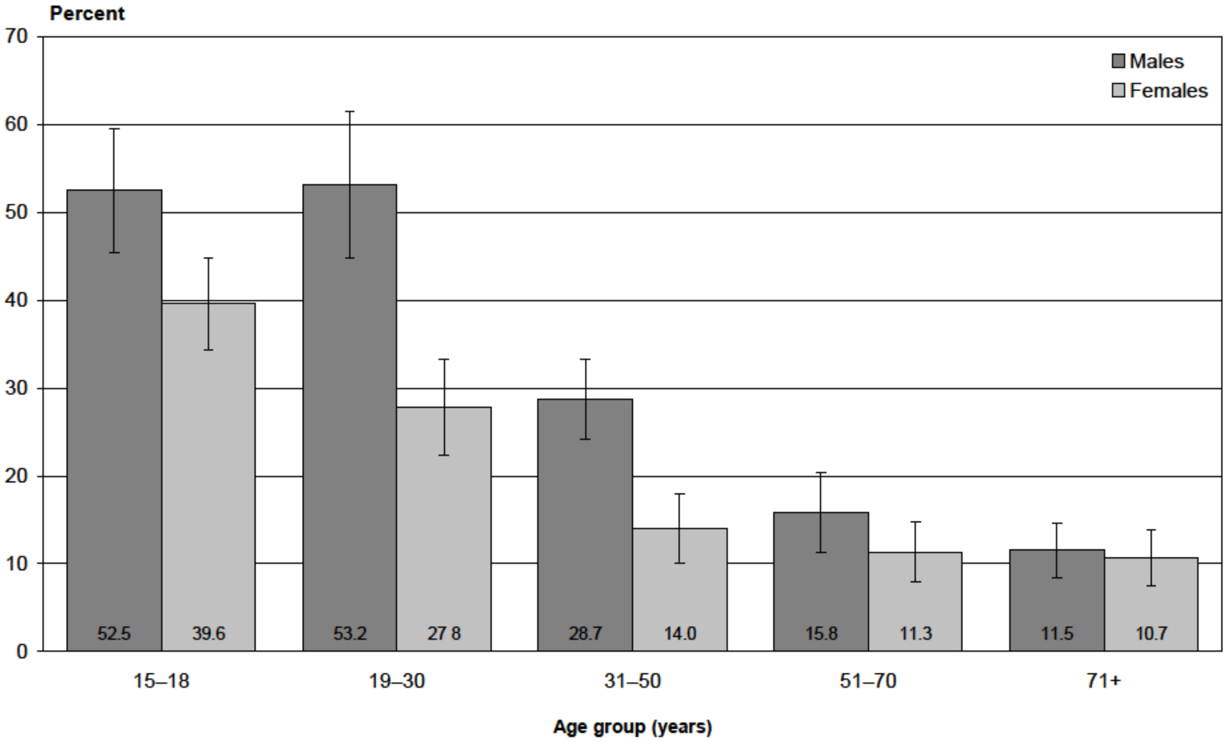
Soft drinks or energy drinks were reported to be consumed never or less than once a week by 56.8% of the total population aged 15 years and over, consumed three or more times a week by 23.7%, and consumed daily by 7.0% (Figure 6.22).

Figure 6.22: Frequency of drinking soft drinks and energy drinks, by sex



Males and females aged 15–18 and 19–30 years were more likely to drink fruit juice and fruit drinks three or more times a week compared to those in the older age groups. These patterns were also seen for soft drinks or energy drinks (Figure 6.23). The proportion of those drinking fruit juice and fruit drinks daily was similar across age groups.

Figure 6.23: Soft drink intake 3+ days a week, by age group and sex



Among females there were no differences in the reported frequency of drinking fruit juice and fruit drinks by neighbourhood deprivation. Males living in the least deprived areas (NZDep2006 quintile 1) were more likely to drink juice three or more times a week (41.9%) than males living in the most deprived areas (quintile 5: 31.0%).

Males and females living in the most deprived areas (NZDep2006 quintile 5) were more likely to drink soft drinks and energy drinks three or more times a week (males 37.2%; females 24.8%) than males and females living in the least deprived areas (quintile 1: males 25.9%; females 13.9%). Overall, there was an increase in those drinking soft drinks and energy drinks three or more times a week across increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 6.16: Frequency of fast food, hot chips, fruit juice/fruit drinks and soft drinks/energy drinks, by age group, NZDep2006 and sex

		Fast food or takeaways eaten 3+ times a week (prevalence), (95% CI)	Hot chips etc eaten 3+ times a week (prevalence), (95% CI)	Fruit juice or fruit drinks consumed 3+ times a week (prevalence), (95% CI)	Soft drinks or energy drinks consumed 3+ times a week (prevalence), (95% CI)
Total population		5.8 (4.9–6.7)	7.5 (6.3–8.6)	36.6 (34.5–38.7)	23.7 (22.1–25.4)
By age group (years)					
Males	15–18	14.4 (9.3–19.5)	25.4 (19.1–31.6)	43.9 (38.0–49.8)	52.5 (45.4–59.6)
	19–30	20.3 (14.3–26.3)	17.6 (11.5–23.8)	48.6 (40.9–56.3)	53.2 (44.9–61.5)
	31–50	6.1 (3.3–8.9)	10.4 (7.1–13.7)	37.3 (31.7–42.9)	28.7 (24.2–33.3)
	51–70	1.6 (0.4–4.3)	5.2 (2.6–9.3)	34.9 (28.7–41.2)	15.8 (11.1–20.4)
	71+	0.4 (0.1–1.1)	2.1 (1.0–4.0)	31.1 (26.7–35.5)	11.5 (8.4–14.6)
	Total	7.9 (6.2–9.6)	10.9 (8.8–13.0)	38.9 (36.1–41.7)	30.5 (27.9–33.2)
Females	15–18	17.2 (12.5–21.9)	18.7 (13.7–23.6)	48.5 (43.1–53.9)	39.6 (34.4–44.8)
	19–30	8.1 (5.6–10.6)	6.7 (4.1–9.4)	42.2 (35.0–49.4)	27.8 (22.2–33.3)
	31–50	2.2 (0.9–3.4)	3.3 (1.6–4.9)	31.2 (26.2–36.2)	14.0 (10.2–17.9)
	51–70	0.8 (0.2–2.1)	1.5 (0.6–3.1)	30.1 (24.8–35.3)	11.3 (7.9–14.7)
	71+	0.3 (0.0–1.1)	0.8 (0.3–1.8)	33.3 (29.0–37.6)	10.7 (7.4–13.9)
	Total	3.8 (3.1–4.5)	4.3 (3.4–5.2)	34.5 (31.4–37.5)	17.4 (15.4–19.4)
By NZDep2006 quintile					
Males	1	5.8 (2.3–11.6)	8.6 (4.4–14.6)	41.9 (36.0–47.7)	25.9 (19.4–32.5)
	2	10.1 (6.0–15.7)	10.6 (6.2–14.9)	42.9 (34.7–51.2)	32.1 (25.2–39.1)
	3	4.5 (2.1–8.4)	11.4 (6.3–16.6)	39.6 (31.2–48.0)	25.4 (18.4–32.4)
	4	6.8 (3.8–9.8)	11.5 (6.4–16.5)	37.5 (31.4–43.6)	33.8 (26.6–40.9)
	5	13.2 (8.9–17.5)	13.2 (9.6–16.7)	31.0 (26.2–35.9)	37.2 (32.1–42.3)
Females	1	2.5 (0.8–5.7)	1.1 (0.5–2.1)	33.7 (26.9–40.6)	13.9 (9.3–18.6)
	2	2.5 (1.4–4.2)	3.5 (1.7–6.2)	38.9 (33.0–44.8)	12.4 (8.0–16.8)
	3	2.0 (0.8–4.1)	3.5 (1.4–7.1)	31.5 (24.2–38.8)	16.8 (10.9–22.6)
	4	4.4 (2.7–6.1)	4.2 (1.9–6.5)	36.0 (29.6–42.4)	19.8 (15.5–24.2)
	5	8.1 (5.8–10.3)	9.2 (6.7–11.7)	31.5 (26.2–36.9)	24.8 (20.5–29.1)

Notes:

Hot chips includes French fries, wedges and kumara chips.

Fruit juices and drinks does not include diet or diabetic varieties.

Soft drinks and energy drinks does not include diet varieties.

7 Food Security

'Food security' is an internationally recognised term that encompasses the ready availability of nutritionally adequate and safe foods, and the assured ability to acquire personally acceptable foods in a socially acceptable way (Radimer 2002).

Participants responded to eight statements on behalf of themselves (if they lived alone) or their households. Each of these statements about food provides information on a particular facet of food security and relates to the issue of affordability; that is, the response was to be made in light of whether or not the participant felt they had enough money.

As well as presenting results for eight facets of household food security, data for three categories of food security are presented: *fully/almost food secure*, *moderately food secure* and *low food security.*

7.1 The eight facets of food security

Survey questions

I/we can afford to eat properly.

Food runs out in my/our household due to lack of money.

I/we eat less because of lack of money.

The variety of foods I am (we are) able to eat is limited by a lack of money.

I/we rely on others to provide food and/or money for food, for my/our household, when I/we don't have enough money.

I/we make use of special food grants or food banks when I/we do not have enough money for food.

I feel stressed because of not having enough money for food.

I feel stressed because I can't provide the food I want for social occasions.

For the first statement, respondents were able to choose from the options: always, sometimes, never, don't know.

For the remaining statements, respondents were able to choose from the options: often, sometimes, never, don't know.

I/we can afford to eat properly

Eighty percent of the New Zealand population aged 15 years and over reported they could *always* afford to eat properly (males 82.3%, females 78.3%) while 16.4% could only do this *sometimes* (Table 7.1). Being able to *always* afford to eat properly increased with increasing age, as reported by both males and females. Over 92% of males and females aged 71+ years said their household could *always* afford to eat properly, a higher proportion than men aged 15–50 years and all younger women.

Being able to *always* afford to eat properly was reported least often by males and females living in NZDep2006 quintile 5, less than for those living in NZDep2006 quintiles 1–3.

Food runs out in my/our household due to lack of money

Food running out in the household due to lack of money was reported to occur *often* in 2.5% of New Zealand households and *sometimes* in 11.5% of households (Table 7.1). Females aged 71+ years were less likely than females aged 15–50 years to report that their household *often* or *sometimes* ran out of food due to lack of money.

Running out of food in the household due to lack of money was reported most frequently by those living in NZDep2006 quintile 5, compared to those living in less deprived neighbourhoods. Males living in NZDep2006 quintile 5 households were more likely to report that their household *sometimes* ran out of food due to lack of money than those in other quintiles. Females living in NZDep2006 quintiles 4 and 5 were more likely than all others to report that *sometimes* their household ran out of food due to lack of money.

I/we eat less because of lack of money

Eating less because of lack of money was reported to occur *often* in 2.9% of households and *sometimes* in 12.5% of households (Table 7.1). Both older males and older females (71+ years) were less likely than males aged 15–50 years or females aged 15–70 years to report that their household *sometimes* ate less because of lack of money.

The proportion reporting *sometimes* eating less because of lack of money increased five-fold across quintiles of deprivation, and both males and females in the most deprived area (NZDep2006 quintile 5) reported that their household experienced this *sometimes* more often than males in all other areas and females living in NZDep2006 quintiles 1–3.

The variety of food I am (we are) able to eat is limited by lack of money

Having a variety of food was *sometimes* an issue for 22.8% of New Zealand households and was *often* an issue for 7.6% (Table 7.1). Males aged 51+ years and females aged 71+ years reported less frequently that this *sometimes* occurred than those aged 15–50 years.

Limiting the variety of food due to lack of money was reported *often* most frequently by males and females living in NZDep2006 quintile 5 (16.3% and 16.5%, respectively) compared to those living in NZDep2006 quintiles 1–3.

I/we rely on others to provide food and/or money for food for my/our household when I/we don't have enough money

This was reported to occur *often* in only 1.1% of New Zealand households, but *sometimes* in 7.7% of households (Table 7.1). Males and females aged 15–18 years reported more frequently that this was *often* an issue for their household compared to all other males and females aged 31+ years. However, females aged 19–30 years reported that this was *sometimes* an issue (17.2%), a more frequent occurrence than that reported by females aged 51+ years.

I/we make use of special food grants or food banks when I/we do not have enough money for food

Although less than 1% of the New Zealand population reported that this was *often* an issue for their household, 5.4% (males 5.0%; females 5.7%) said that it was *sometimes* an issue (Table 7.1). Males and females aged 19–30 years reported more frequently experiencing the need for their household to *sometimes* use food grants/banks when money ran out than those aged 51+ years.

Households in NZDep2006 quintile 5 were reported by both males and females to be more likely to use food grants/banks *sometimes* than households in NZDep2006 quintiles 1–3.

I feel stressed because of not having enough money for food

The experience of feeling stressed because of not having enough money for food was reported to occur *sometimes* in 12.4% of New Zealand households and *often* in 3.3% of households (Table 7.1). Both males and females aged 15–50 years were *sometimes* stressed about lack of money for food more frequently than older people (71+ years).

Households in NZDep2006 quintile 5 (males 19.1%; females 19.6%) were more likely to *sometimes* feel stressed because of not having enough money for food, an issue less frequently reported by males living in NZDep2006 quintiles 1–3 and by females living in NZDep2006 quintiles 1 and 2.

I feel stressed because I can't provide the food I want for social occasions

Among the New Zealand population aged 15 years and over this was reported to be an issue *sometimes* in 11.8% of households (males 8.9%; females 14.6%) (Table 7.1). Only 2.4% of households were reported to experience this *often*. Older males and females (71+ years) reported less frequently that their household experienced this *sometimes* compared to males aged 15–50 years and females aged 15–50 years.

Males living in NZDep2006 quintile 5 were *sometimes* stressed about providing food for social occasions (16.2%) more often than those in NZDep2006 quintiles 1, 3 and 4. Females living in NZDep2006 quintile 5 reported experiencing this (25.4%) more often than those in NZDep2006 quintiles 1–3.

7.2 Categories of household food security

Rasch analyses were performed using BIGSTEPS 2.82 (a DOS-based Rasch measurement program; Linacre & Wright 1998) to generate a measure of the severity of food insecurity for each participant. The statement 'I/we can afford to eat properly' was anchored at 0, with values being assigned by Rasch analysis according to the number and severity of the indices the participant responded to positively (Parnell 2005).

Based on the distribution of the respondents' tendency to affirm these statements (ability scores in the Rasch model), and considering the meanings of these scores in terms of item responses (including the item difficulty scores in the Rasch model), households were then assigned to the following three categories:

- fully/almost fully food secure–this included households providing no affirmative response to any of the eight statements and households responding to only one statement, which was most likely to be 'the variety of food is limited'
- low food security–this included households most likely to report 'relying on others for food or money for food' and 'using special food grants or food banks to acquire the food they needed'
- moderate food security–this included households likely to respond positively to the remaining five statements.

Fully/almost food secure

In the New Zealand population 59.1% of households were classified as being *fully/almost food secure* (males 61.7%; females 56.6%) (Table 7.2; Figure 7.1). Households with those aged 71+ years were more frequently classified as *fully/almost food secure* than households of males aged 15–50 years and females aged 15–70 years.

For Māori households, older males and females (51+ years) were classified more frequently as being *fully/almost food secure* than those aged 19–30 years. There were no differences across age groups for Pacific households.

Across quintiles of NZDep2006, the proportion of households classified as *fully/almost food secure* decreased, with households in NZDep2006 quintile 5 having the lowest proportion (males 41.4%; females 39.9%). Overall, the proportion of households classified as *fully/almost food secure* decreased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Moderately food secure

In the New Zealand population, 33.7% of households were classified as being *moderately food secure* (males 32.6%; females 34.6%) (Table 7.2; Figure 7.1). Males and females aged 71+ years were less frequently classified as *moderately food secure* than those aged 15–50 years.

Low food security

In the New Zealand population, 7.3% of households were classified as having *low food security* (males 5.6%; females 8.8%) (Table 7.2; Figure 7.1). Households with those aged 71+ years were less frequently classified as having *low food security* than households of males aged
15–50 years and females aged 15–70 years.

For Māori households, males aged 51+ years reported *low food security* less frequently than males aged 31–50 years (4.5% versus 18.2%). Among Pacific households, 28.3% of females aged 31–50 years reported *low food security* compared to 8.8% of females aged 15–18 years.

The proportion of households classified as having *low food security* was highest in NZDep2006 quintile 5 (males 14.9%; females 21.4%), higher than males living in NZDep2006 quintiles 1–3 and females in NZDep2006 quintiles 1–4. Overall, the proportion of households classified as having *low food security* increased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Figure 7.1: Food security categories, by sex

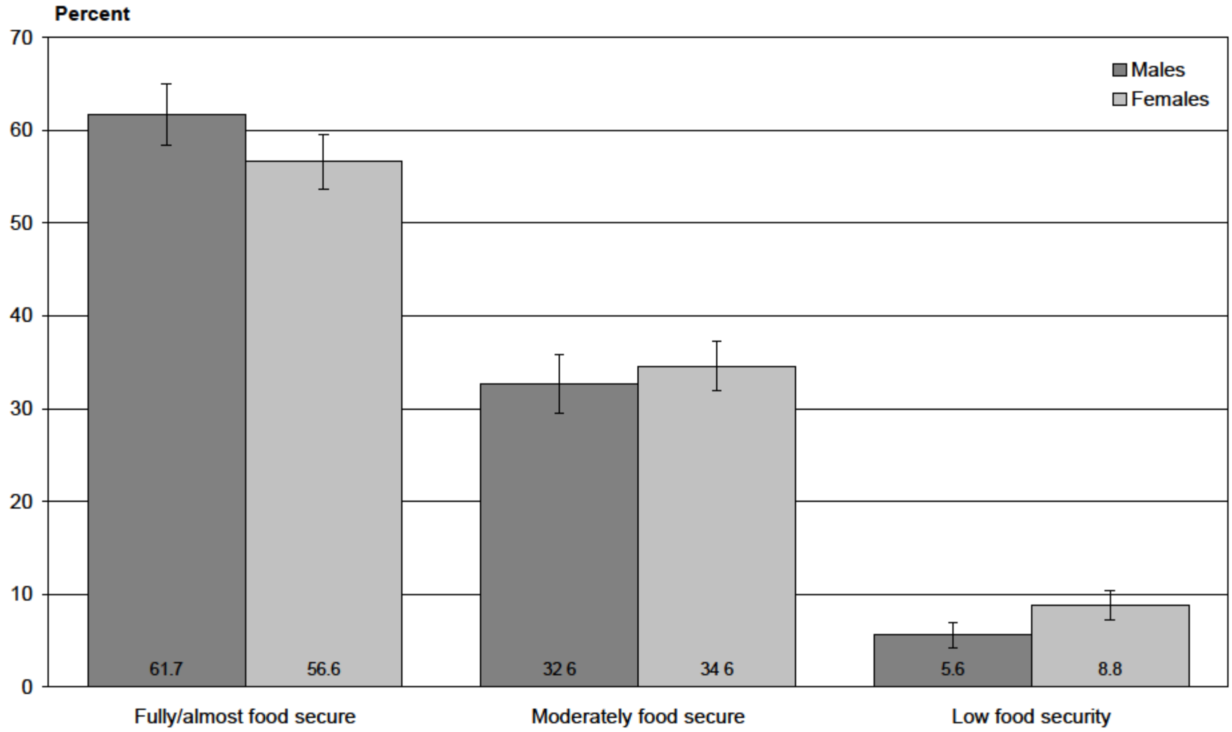


Table 7.1: Household food security over the last year, by age group, ethnic group, NZDep2006 and sex

		The household:[1]			Because of lack of money, the household:[1]								
		Can afford to eat properly			Runs out of food			Eats less			Has a limited variety of foods		
		Always	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never
Total population		80.2 (78.3–82.1)	16.4 (14.6–18.1)	3.4 (2.3–4.5)	2.5 (1.9–3.2)	11.5 (10.3–12.8)	85.9 (84.5–87.4)	2.9 (2.2–3.5)	12.5 (10.9–14.1)	84.7 (82.9–86.4)	7.6 (6.4–8.8)	22.8 (20.7–24.9)	69.6 (67.3–71.9)
By age group (years)													
Males	15–18	73.1 (66.7–79.4)	21.4 (14.5–28.4)	5.5 (3.1–8.9)	3.0 (1.1–6.4)	18.8 (12.9–24.8)	78.2 (72.1–84.2)	5.2 (1.3–13.3)	12.1 (7.9–16.4)	82.7 (76.9–88.5)	7.3 (4.1–11.9)	21.7 (14.5–28.8)	71.0 (63.5–78.5)
	19–30	73.1 (66.0–80.2)	21.7 (15.2–28.3)	5.2 (1.5–12.6)	1.9 (0.6–4.5)	18.7 (11.9–25.5)	79.5 (72.7–86.2)	3.8 (1.1–9.4)	17.4 (11.5–23.4)	78.8 (72.2–85.3)	9.9 (4.8–14.9)	33.7 (25.8–41.7)	56.4 (48.2–64.6)
	31–50	83.4 (79.8–87.0)	14.4 (11.0–17.8)	2.2 (1.0–4.3)	3.1 (1.6–5.4)	9.0 (6.6–11.3)	88.0 (85.0–90.9)	2.4 (1.1–4.5)	14.0 (10.1–17.8)	83.6 (79.5–87.7)	7.3 (4.7–9.9)	23.1 (18.6–27.7)	69.6 (64.8–74.4)
	51–70	86.8 (82.5–91.2)	10.3 (6.7–13.9)	2.9 (1.1–6.2)	0.9 (0.3–2.2)	7.8 (4.8–10.7)	91.3 (88.1–94.5)	0.7 (0.2–2.0)	8.5 (5.0–12.0)	90.8 (87.2–94.4)	5.2 (2.8–8.7)	11.5 (8.1–14.9)	83.3 (78.7–87.8)
	71+	92.6 (90.3–95.0)	4.5 (2.8–6.1)	2.9 (1.4–5.3)	0.8 (0.3–1.9)	3.2 (2.0–4.9)	95.9 (94.4–97.4)	1.0 (0.4–2.0)	3.8 (2.4–5.6)	95.2 (93.6–96.9)	2.5 (1.5–4.0)	10.1 (7.3–13.0)	87.3 (84.2–90.5)
	Total	82.3 (80.2–84.5)	14.4 (12.2–16.5)	3.3 (2.0–4.6)	2.0 (1.3–2.8)	10.8 (8.8–12.8)	87.1 (85.1–89.2)	2.3 (1.3–3.4)	12.1 (10.0–14.2)	85.6 (83.3–87.8)	6.8 (5.2–8.5)	20.8 (18.0–23.7)	72.3 (69.3–75.4)
Females	15–18	73.1 (67.7–78.6)	20.7 (15.8–25.6)	6.2 (2.9–11.2)	2.7 (1.4–4.8)	16.9 (11.7–22.1)	80.4 (75.1–85.7)	1.3 (0.5–2.9)	16.5 (11.9–21.0)	82.2 (77.7–86.7)	6.0 (3.3–9.9)	30.2 (24.6–35.8)	63.9 (57.8–70.0)
	19–30	67.3 (60.7–73.9)	29.4 (23.3–35.6)	3.2 (1.2–6.9)	3.8 (2.1–5.4)	18.2 (13.0–23.4)	78.0 (72.4–83.7)	3.8 (1.7–7.1)	18.4 (13.0–23.9)	77.8 (72.0–83.6)	12.3 (7.7–16.9)	29.1 (23.2–35.0)	58.6 (52.0–65.2)
	31–50	76.0 (71.7–80.3)	20.8 (16.7–24.9)	3.2 (1.6–5.6)	4.2 (2.3–6.1)	13.6 (10.4–16.8)	82.2 (78.5–85.9)	5.3 (3.0–7.6)	14.1 (10.8–17.4)	80.6 (76.8–84.3)	10.7 (7.9–13.5)	29.3 (24.6–33.9)	60.0 (54.7–65.3)
	51–70	85.2 (82.1–88.3)	11.0 (8.3–13.7)	3.7 (1.9–6.6)	1.9 (0.6–4.5)	8.5 (5.8–11.2)	89.6 (86.6–92.6)	2.0 (0.9–4.0)	9.4 (6.3–12.5)	88.6 (85.1– 92.0)	5.2 (2.9–7.4)	18.9 (14.9–22.8)	76.0 (71.7–80.2)
	71+	92.1 (89.2–94.9)	4.8 (2.7–6.8)	3.2 (1.8–5.2)	0.4 (0.1–1.1)	2.8 (1.7–4.3)	96.8 (95.5–98.1)	0.4 (0.1–1.1)	4.1 (2.5–6.3)	95.4 (93.5–97.4)	1.5 (0.6–3.0)	10.6 (8.0–13.2)	87.9 (85.1–90.7)
	Total	78.3 (75.7–80.8)	18.2 (15.9–20.5)	3.5 (2.3–4.8)	3.0 (2.2–3.9)	12.2 (10.5–14.0)	84.8 (82.7–86.8)	3.4 (2.4–4.3)	12.8 (11.0–14.7)	83.8 (81.7–85.9)	8.3 (6.7–9.9)	24.6 (22.1–27.1)	67.1 (64.2–70.0)

		The household:[1]			Because of lack of money, the household:[1]								
		Can afford to eat properly			**Runs out of food**			**Eats less**			**Has a limited variety of foods**		
		Always	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**
Māori													
Males	15–18	65.0 (47.4–82.6)	25.8 (9.7–48.9)	9.2 (2.3–22.7)	11.3 (2.7–28.2)	28.0 (14.6–45.1)	60.7 (40.6–78.4)	11.4 (2.7–28.3)	25.6 (10.2–47.3)	63.1 (45.6–80.5)	25.0 (10.8–44.7)	26.6 (8.9–52.4)	48.3 (29.3–67.8)
	19–30	56.2 (42.8–69.7)	36.4 (23.0–49.8)	7.3 (2.1–17.4)	4.1 (1.0–10.8)	36.2 (21.5–50.9)	59.6 (44.7–74.6)	4.8 (1.2–12.1)	34.6 (21.7–49.4)	60.6 (46.6–74.6)	22.4 (10.0–39.8)	31.7 (19.3–44.1)	45.9 (30.7–61.1)
	31–50	66.9 (58.6–75.1)	29.4 (20.6–38.1)	3.8 (1.2–8.9)	6.3 (2.4–12.9)	23.5 (15.6–31.4)	70.2 (60.5–79.9)	4.5 (2.1–8.2)	24.1 (17.0–31.3)	71.4 (63.5–79.3)	16.5 (9.0–24.0)	36.8 (24.1–49.6)	46.7 (33.9–59.5)
	51+	75.8 (67.8–83.8)	22.0 (14.3–31.4)	2.2 (0.6–5.6)	1.7 (0.3–5.0)	13.1 (5.6–24.6)	85.3 (76.5–94.1)	1.9 (0.4–5.5)	17.5 (9.7–28.0)	80.6 (71.4–89.8)	1.2 (0.1–4.4)	27.2 (16.8–37.7)	71.5 (61.0–82.0)
	Total	65.6 (60.3–70.9)	29.3 (23.8–34.8)	5.0 (2.7–8.5)	5.2 (2.9–8.6)	25.3 (19.8–30.8)	69.5 (63.4–75.5)	4.8 (2.8–7.6)	25.8 (20.4–31.2)	69.4 (63.5–75.4)	15.7 (9.8–21.7)	32.1 (25.3–38.9)	52.2 (45.0–59.3)
Females	15–18	61.3 (44.2–76.5)	30.9 (17.7–46.8)	7.9 (1.9–20.2)	5.0 (1.2–13.1)	27.1 (13.1–45.3)	67.9 (52.3–83.6)	3.0 (0.6–8.8)	23.7 (11.1–40.8)	73.3 (58.8–87.7)	8.6 (3.0–18.7)	40.2 (24.9–57.1)	51.2 (33.6–68.6)
	19–30	46.2 (36.9–55.5)	52.3 (42.6–61.9)	1.6 (0.4–4.0)	9.2 (5.2–14.9)	26.4 (18.5–34.2)	64.4 (55.4–73.4)	4.3 (2.3–7.3)	24.0 (16.7–31.4)	71.7 (64.6–78.8)	16.6 (10.5–22.7)	33.7 (26.9–40.4)	49.7 (41.4–58.1)
	31–50	62.3 (54.5–70.1)	35.4 (27.7–43.0)	2.3 (0.9–5.0)	9.5 (5.1–14.0)	23.0 (15.6–30.4)	67.5 (58.9–76.1)	9.8 (5.4–16.0)	21.8 (13.3–30.3)	68.5 (60.2–76.7)	20.0 (13.3–26.8)	30.2 (23.8–36.6)	49.8 (42.3–57.3)
	51+	61.1 (50.5–71.7)	34.9 (24.3–45.4)	4.1 (0.6–12.7)	4.2 (0.7–12.7)	21.6 (13.3–30.0)	74.2 (66.0–82.3)	4.0 (0.6–12.9)	20.6 (13.1–29.8)	75.4 (67.0–83.9)	11.1 (5.6–19.1)	33.0 (24.1–41.9)	56.0 (46.6–65.4)
	Total	57.4 (52.6–62.2)	39.5 (34.8–44.2)	3.1 (1.6–5.3)	7.8 (5.5–10.1)	24.1 (19.4–28.8)	68.1 (63.4–72.8)	6.2 (4.0–8.5)	22.4 (18.2–26.6)	71.4 (67.1–75.7)	15.9 (12.5–19.4)	32.9 (28.5–37.2)	51.2 (46.3–56.2)
Pacific													
Males	15–18	47.7 (27.5–68.0)	52.3 (32.0–72.5)	0.0	4.7 (0.1–23.4)	48.8 (28.8–68.8)	46.5 (25.1–69.0)	0.0	34.3 (15.2–53.3)	65.7 (44.4–83.2)	7.2 (0.5–24.9)	45.2 (25.0–65.4)	47.6 (25.8–70.1)
	19–30	62.4 (48.9–75.9)	35.7 (22.1–49.3)	1.9 (0.2–7.1)	1.8 (0.0–9.6)	35.5 (23.6–47.4)	62.7 (51.6–73.8)	2.3 (0.1–10.1)	39.5 (24.1–54.9)	58.2 (42.6–73.8)	12.1 (5.1–23.2)	27.4 (15.9–41.7)	60.5 (45.4–75.5)
	31–50	55.3 (44.5–66.2)	42.2 (31.6–52.9)	2.4 (0.6–6.3)	4.8 (2.0–9.6)	34.2 (24.9–43.5)	61.0 (51.1–70.9)	2.8 (1.1–5.9)	39.6 (26.3–53.0)	57.5 (44.1–71.0)	10.9 (6.6–16.7)	53.3 (41.5–65.0)	35.8 (25.4–46.2)
	51+	52.2 (37.2–67.3)	38.2 (25.6–52.1)	9.6 (3.5–19.9)	9.0 (1.5–26.6)	39.8 (27.5–53.1)	51.2 (35.9–66.5)	3.9 (0.4–13.8)	37.4 (21.7–55.2)	58.7 (42.6–74.8)	18.2 (6.1–37.7)	37.7 (25.1–51.7)	44.1 (31.2–57.0)
	Total	55.9 (48.6–63.3)	40.7 (33.5–47.9)	3.4 (1.7–5.8)	4.7 (2.0–9.0)	37.5 (31.1–44.0)	57.8 (51.0–64.6)	2.5 (1.0–5.0)	38.5 (31.2–45.8)	59.0 (51.6–66.4)	12.2 (7.9–16.5)	41.4 (34.1–48.7)	46.4 (39.2–53.7)

		The household:[1]			Because of lack of money, the household:[1]								
		Can afford to eat properly			Runs out of food			Eats less			Has a limited variety of foods		
		Always	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**
Females	15–18	48.4 (27.7–69.5)	51.6 (30.5–72.3)	0.0	2.0 (0.0–10.6)	36.1 (20.4–54.2)	62.0 (44.0–77.8)	4.7 (0.5–16.7)	29.2 (14.3–48.3)	66.1 (47.1–81.9)	11.5 (2.0–32.5)	40.1 (22.4–60.0)	48.4 (26.9–70.3)
	19–30	49.3 (39.5–59.1)	47.6 (37.5–57.6)	3.1 (0.3–12.3)	6.5 (2.6–13.1)	28.7 (19.8–37.5)	64.8 (54.8–74.8)	8.5 (3.9–15.9)	27.9 (17.6–38.2)	63.6 (53.0–74.1)	10.7 (5.7–17.8)	54.4 (43.2–65.6)	34.9 (24.4–45.4)
	31–50	53.1 (43.7–62.6)	42.5 (33.5–51.4)	4.4 (1.8–8.7)	5.7 (3.0–9.7)	48.5 (39.2–57.8)	45.8 (36.4–55.1)	8.9 (4.6–15.1)	35.1 (27.3–43.0)	56.0 (47.5–64.5)	15.0 (9.7–21.7)	46.1 (37.0–55.1)	38.9 (30.7–47.2)
	51+	50.8 (40.0–61.6)	46.8 (36.0–57.7)	2.3 (0.3–8.5)	7.2 (2.8–14.6)	52.5 (38.5–66.4)	40.3 (26.5–55.3)	7.3 (2.7–15.0)	43.6 (31.0–56.2)	49.1 (36.6–61.7)	9.8 (4.5–17.9)	53.0 (41.5–64.6)	37.2 (25.4–50.2)
	Total	51.0 (45.8–56.2)	45.9 (40.7–51.2)	3.1 (1.4–5.7)	5.8 (3.7–8.8)	42.0 (36.5–47.5)	52.1 (46.4–57.9)	8.0 (5.2–10.7)	34.0 (27.9–40.0)	58.1 (52.3–63.9)	12.2 (9.1–15.4)	49.3 (44.1–54.6)	38.4 (33.4–43.4)
NZEO													
Males	15–18	75.8 (68.7–82.8)	19.5 (12.1–27.0)	4.7 (2.4–8.2)	1.9 (0.4–5.4)	14.2 (7.7–20.7)	83.9 (77.3–90.6)	5.0 (0.8–15.4)	9.2 (5.1–15.0)	85.9 (79.0–92.7)	4.5 (2.2–8.2)	20.4 (12.1–28.6)	75.1 (66.4–83.8)
	19–30	75.3 (67.4–83.2)	19.7 (12.4–27.1)	4.9 (1.3–12.5)	1.6 (0.3–4.8)	15.8 (8.9–25.2)	82.5 (74.9–90.2)	4.0 (1.0–10.8)	13.8 (7.8–22.0)	82.2 (74.8–89.6)	8.4 (3.6–16.1)	34.4 (25.3–43.6)	57.2 (47.9–66.4)
	31–50	86.7 (82.9–90.4)	11.2 (7.7–14.8)	2.1 (0.8–4.6)	2.6 (1.0–5.2)	6.0 (3.5–8.5)	91.5 (88.5–94.4)	2.1 (0.7–4.5)	11.3 (7.2–15.5)	86.6 (82.2–91.0)	5.7 (3.4–9.0)	20.6 (15.8–25.4)	73.7 (68.6–78.7)
	51+	89.9 (86.4–93.5)	7.4 (4.5–10.3)	2.7 (1.0–5.6)	0.6 (0.1–1.7)	5.2 (2.9–7.5)	94.2 (91.8–96.6)	0.7 (0.2–1.8)	5.8 (3.2–8.4)	93.5 (90.8–96.2)	4.3 (2.1–6.5)	9.4 (6.7–12.1)	86.3 (82.7–89.9)
	Total	84.9 (82.5–87.3)	12.0 (9.6–14.4)	3.1 (1.7–4.4)	1.6 (0.9–2.7)	8.2 (6.0–10.3)	90.2 (88.0–92.5)	2.1 (0.9–3.3)	9.6 (7.3–11.8)	88.3 (85.9–90.7)	5.6 (3.9–7.4)	19.1 (16.0–22.1)	75.3 (72.1–78.6)
Females	15–18	78.3 (72.5–84.1)	16.0 (10.8–21.2)	5.7 (2.5–10.9)	2.6 (1.2–5.0)	13.4 (8.6–18.1)	84.0 (79.1–88.9)	1.0 (0.3–2.6)	13.5 (9.2–17.8)	85.5 (81.1–89.8)	5.1 (2.5–9.0)	27.6 (21.7–33.4)	67.4 (61.0–73.7)
	19–30	72.2 (64.2–80.3)	24.5 (17.0–32.0)	3.3 (0.9–7.9)	2.2 (0.7–4.9)	15.8 (10.0–21.7)	82.0 (75.4–88.5)	3.3 (1.0–7.8)	16.2 (9.8–22.6)	80.4 (73.6–87.2)	11.6 (6.8–18.0)	26.4 (19.2–33.5)	62.0 (54.2–69.9)
	31–50	79.0 (74.2–83.9)	17.8 (13.2–22.4)	3.2 (1.4–6.1)	3.4 (1.6–6.1)	10.9 (7.4–14.4)	85.7 (81.6–89.8)	4.7 (2.5–7.9)	12.2 (8.6–15.8)	83.2 (79.0–87.3)	9.5 (6.3–12.7)	28.0 (22.7–33.3)	62.5 (56.5–68.5)
	51+	89.7 (87.1–92.2)	6.6 (4.6–8.6)	3.7 (2.0–5.4)	1.3 (0.3–3.4)	4.5 (2.5–6.4)	94.2 (91.9–96.5)	1.4 (0.5–3.0)	6.0 (3.5–8.5)	92.6 (89.8–95.4)	3.6 (2.1–5.7)	14.5 (11.6–17.5)	81.9 (78.5–85.2)
	Total	81.9 (79.0–84.7)	14.6 (12.0–17.2)	3.6 (2.2–4.9)	2.3 (1.4–3.2)	9.5 (7.7–11.3)	88.2 (86.1–90.4)	2.9 (1.9–4.0)	10.6 (8.5–12.7)	86.5 (84.1–88.8)	7.3 (5.6–9.1)	22.5 (19.6–25.3)	70.2 (67.0–73.4)

		The household:[1]			Because of lack of money, the household:[1]								
		Can afford to eat properly			Runs out of food			Eats less			Has a limited variety of foods		
		Always	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**	**Often**	**Sometimes**	**Never**
By NZDep2006 quintile													
Males	1	88.9 (84.6–93.3)	6.4 (3.3–10.9)	4.7 (1.9–9.5)	0.6 (0.0–3.3)	5.5 (2.7–9.6)	94.0 (90.7–97.3)	1.7 (0.2–5.5)	4.8 (2.3–8.5)	93.6 (90.3–96.8)	4.0 (1.6–8.1)	16.0 (9.7–22.2)	80.0 (73.9–86.2)
	2	84.5 (79.5–89.6)	14.5 (9.5–19.5)	1.0 (0.2–2.8)	1.1 (0.1–4.3)	7.7 (3.9–13.2)	91.2 (86.6–95.7)	1.1 (0.1–4.3)	9.8 (5.7–15.5)	89.1 (84.3–93.8)	2.7 (0.9–6.1)	20.0 (14.4–25.5)	77.4 (71.1–83.6)
	3	89.6 (84.9–94.3)	9.0 (4.8–13.3)	1.4 (0.4–3.2)	0.6 (0.0–2.6)	6.6 (2.5–10.7)	92.8 (88.6–96.9)	1.1 (0.1–3.9)	10.1 (5.5–14.7)	88.8 (83.9–93.8)	4.6 (1.7–9.8)	19.1 (12.2–26.0)	76.3 (68.4–84.1)
	4	77.7 (70.7–84.7)	17.5 (11.8–23.2)	4.8 (0.9–13.9)	3.3 (1.2–7.3)	12.1 (6.8–17.4)	84.6 (78.6–90.6)	2.7 (0.7–7.0)	13.2 (7.9–18.5)	84.1 (78.3–89.9)	8.4 (4.1–12.6)	21.8 (15.9–27.8)	69.8 (62.7–76.8)
	5	67.5 (61.2–73.9)	27.6 (21.7–33.6)	4.8 (2.1–7.6)	5.3 (3.2–7.4)	24.9 (19.2–30.6)	69.8 (63.3–76.3)	5.7 (3.5–7.8)	25.5 (19.9–31.2)	68.8 (62.6–75.0)	16.3 (11.0–21.5)	29.2 (24.0–34.4)	54.5 (47.4–61.7)
Females	1	87.1 (80.0–94.2)	8.0 (2.8–17.3)	4.9 (1.8–10.5)	1.0 (0.0–5.3)	5.2 (1.8–11.1)	93.9 (89.6–98.2)	1.1 (0.0–5.2)	4.5 (1.2–11.5)	94.4 (89.8–99.1)	1.9 (0.4–5.2)	18.6 (10.5–26.7)	79.5 (71.2–87.8)
	2	85.8 (81.9–89.8)	9.9 (6.5–13.3)	4.3 (2.0–7.9)	2.5 (0.8–6.0)	4.6 (2.7–7.4)	92.9 (90.0–95.8)	3.8 (1.4–7.9)	6.1 (3.7–8.4)	90.2 (86.8–93.6)	6.6 (4.0–10.2)	16.1 (11.8–20.4)	77.3 (72.4–82.2)
	3	84.2 (79.4–89.1)	14.2 (9.5–18.8)	1.6 (0.3–4.6)	2.4 (0.8–5.6)	7.6 (3.9–11.3)	90.0 (85.7–94.3)	1.0 (0.3–2.7)	11.7 (6.9–16.6)	87.3 (82.4–92.1)	6.6 (3.4–9.8)	27.6 (20.9–34.3)	65.8 (58.9–72.6)
	4	70.6 (65.2–76.0)	25.4 (20.5–30.4)	4.0 (2.0–7.0)	2.6 (1.0–5.4)	18.3 (13.2–23.5)	79.0 (73.7–84.4)	3.3 (1.5–6.2)	19.4 (15.0–23.8)	77.3 (72.4–82.3)	9.8 (5.6–13.9)	29.2 (23.7–34.8)	61.0 (55.7–66.4)
	5	62.5 (57.3–67.7)	34.3 (29.4–39.1)	3.2 (1.9–5.2)	6.7 (4.7–8.7)	26.7 (23.0–30.4)	66.6 (62.4–70.9)	7.8 (4.9–10.8)	22.6 (19.2–26.0)	69.6 (65.6–73.6)	16.5 (12.5–20.4)	31.8 (27.1–36.6)	51.7 (46.1–57.3)

1 Option ‘Don’t know’ is not included in the analysis.

		Because of lack of money, the household:[1]						The household:[1]					
		Relies on others for food			Uses food grants/banks			Is stressed about lack of money for food			Is stressed when no food for social occasions		
		Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never
Total population		1.1 (0.8–1.5)	7.7 (6.6–8.8)	91.2 (90.0–92.4)	0.4 (0.3–0.6)	5.4 (4.5–6.2)	94.2 (93.3–95.1)	3.3 (2.6–4.0)	12.4 (10.8–14.0)	84.3 (82.5–86.0)	2.4 (1.9–3.0)	11.8 (10.5–13.2)	85.7 (84.3–87.2)
By age group (years)													
Males	15–18	6.7 (2.5–14.1)	6.2 (3.8–9.5)	87.1 (81.0–93.1)	1.0 (0.1–3.6)	5.8 (3.5–9.0)	93.1 (89.8–96.5)	2.0 (0.6–5.0)	13.0 (8.5–17.5)	85.0 (80.6–89.4)	3.3 (1.3–6.6)	8.8 (5.6–13.1)	87.9 (83.9–92.0)
	19–30	0.2 (0.0–0.7)	10.5 (5.4–15.7)	89.2 (84.1–94.3)	0.0	6.9 (3.2–10.5)	93.1 (89.5–96.8)	2.1 (0.9–4.2)	12.6 (7.8–17.5)	85.2 (80.2–90.3)	2.7 (0.9–6.1)	11.7 (6.1–17.3)	85.6 (79.7–91.5)
	31–50	0.6 (0.2–1.5)	8.0 (5.4–10.6)	91.4 (88.8–94.0)	0.6 (0.2–1.4)	6.7 (4.5–8.9)	92.6 (90.4–94.9)	3.6 (1.8–5.5)	13.5 (9.9–17.2)	82.8 (78.7–86.9)	1.9 (0.9–3.0)	11.9 (8.6–15.2)	86.2 (82.9–89.5)
	51–70	0.3 (0.0–1.0)	2.3 (1.2–4.0)	97.4 (96.0–98.7)	0.0	1.9 (0.8–3.8)	98.1 (96.7–99.4)	1.6 (0.6–3.6)	5.8 (3.2–8.5)	92.6 (89.4–95.7)	0.4 (0.0–1.8)	5.2 (2.8–7.6)	94.4 (91.9–96.8)
	71+	0.2 (0.0–1.2)	2.0 (1.1–3.2)	97.8 (96.7–98.9)	0.4 (0.1–1.3)	2.2 (1.0–4.3)	97.4 (95.9–98.8)	0.7 (0.2–1.7)	3.1 (1.7–5.2)	96.2 (94.5–97.8)	1.1 (0.4–2.3)	1.6 (0.8–3.0)	97.3 (96.1–98.5)
	Total	0.8 (0.4–1.3)	6.3 (4.9–7.6)	92.9 (91.5–94.3)	0.3 (0.2–0.6)	5.0 (3.8–6.2)	94.7 (93.5–95.9)	2.4 (1.5–3.3)	10.3 (8.5–12.0)	87.3 (85.4–89.3)	1.7 (1.0–2.4)	8.9 (7.2–10.6)	89.4 (87.7–91.2)
Females	15–18	5.5 (3.2–8.9)	7.4 (4.5–11.2)	87.1 (83.0–91.2)	0.9 (0.1–3.3)	8.4 (5.3–12.3)	90.8 (87.3–94.3)	3.2 (1.5–5.9)	14.0 (9.8–18.1)	82.8 (78.5–87.2)	2.5 (0.9–5.2)	11.4 (8.0–14.9)	86.1 (82.2–90.0)
	19–30	2.7 (1.1–5.6)	17.2 (12.5–22.0)	80.0 (74.8–85.3)	1.0 (0.4–2.2)	9.3 (6.0–12.5)	89.7 (86.4–93.0)	5.5 (2.7–8.4)	22.4 (16.7–28.1)	72.1 (66.0–78.1)	3.1 (1.6–5.5)	17.1 (11.8–22.5)	79.8 (74.2–85.4)
	31–50	1.1 (0.6–1.9)	9.9 (6.7–13.1)	89.0 (85.7–92.3)	0.7 (0.4–1.3)	6.1 (4.4–7.7)	93.2 (91.5–94.9)	5.0 (3.3–6.8)	18.4 (14.5–22.4)	76.5 (72.3–80.7)	4.3 (2.6–6.0)	20.1 (16.0–24.2)	75.6 (71.3–79.9)
	51–70	0.5 (0.1–1.3)	5.1 (2.6–7.5)	94.5 (92.1–96.9)	0 (0.0–0.3)	4.0 (2.1–5.9)	96.0 (94.1–97.9)	3.6 (1.8–6.5)	7.5 (4.9–10.1)	88.8 (85.7–92.0)	2.6 (1.3–4.7)	9.4 (6.7–12.2)	87.9 (84.9–91.0)
	71+	0.1 (0.0–0.7)	1.5 (0.7–2.8)	98.4 (97.5–99.4)	0.0	0.5 (0.1–1.3)	99.5 (98.7–99.9)	0.6 (0.1–1.5)	3.2 (1.8–5.1)	96.3 (94.7–97.9)	0.3 (0.1–1.0)	4.9 (3.2–7.2)	94.8 (92.8–96.7)
	Total	1.4 (0.9–1.9)	9.0 (7.4–10.6)	89.6 (87.9–91.3)	0.5 (0.3–0.8)	5.7 (4.6–6.9)	93.8 (92.5–95.0)	4.2 (3.0–5.4)	14.4 (12.2–16.6)	81.4 (79.0–83.8)	3.1 (2.2–4.0)	14.6 (12.7–16.5)	82.3 (80.2–84.5)

		Because of lack of money, the household:[1]						The household:[1]					
		Relies on others for food			Uses food grants/banks			Is stressed about lack of money for food			Is stressed when no food for social occasions		
		Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never
Māori													
Males	15–18	9.0 (2.2–22.7)	8.1 (2.4–18.9)	82.8 (71.5–94.2)	3.8 (0.1–19.7)	11.3 (3.7–24.7)	84.9 (62.3–96.6)	8.0 (1.6–22.4)	34.2 (16.6–55.8)	57.8 (38.8–75.1)	15.5 (5.2–32.5)	11.4 (3.9–24.2)	73.1 (55.8–86.5)
	19–30	0.6 (0.0–3.5)	18.8 (10.0–30.6)	80.6 (70.7–90.5)	0.0	15.3 (7.7–26.2)	84.7 (76.0–93.4)	6.3 (2.2–13.7)	19.9 (10.8–32.1)	73.8 (62.7–84.9)	3.8 (0.8–10.8)	22.2 (13.3–33.6)	74.0 (62.4–85.5)
	31–50	4.2 (1.0–11.2)	18.5 (11.1–26.0)	77.2 (69.1–85.4)	2.2 (0.7–5.5)	19.1 (12.1–26.0)	78.7 (71.5–85.9)	7.2 (3.8–12.2)	27.2 (17.1–37.2)	65.7 (55.2–76.2)	5.8 (2.6–11.0)	19.5 (11.4–27.6)	74.7 (66.3–83.2)
	51+	0.5 (0.0–2.7)	6.7 (2.8–12.9)	92.9 (88.2–97.5)	0.0	3.3 (1.2–7.3)	96.7 (94.0–99.4)	1.7 (0.3–4.9)	13.4 (6.7–23.1)	84.9 (77.1–92.7)	2.5 (0.5–7.4)	5.0 (1.7–11.4)	92.4 (87.2–97.6)
	Total	2.9 (1.4–5.4)	14.8 (10.5–19.1)	82.3 (77.9–86.7)	1.3 (0.4–3.0)	13.6 (10.0–17.3)	85.1 (81.3–88.9)	5.8 (3.4–8.2)	22.8 (17.4–28.3)	71.4 (66.2–76.6)	5.6 (3.1–9.2)	16.1 (12.7–19.5)	78.3 (74.5–82.1)
Females	15–18	3.2 (0.3–12.7)	14.3 (5.3–29.0)	82.4 (70.4–94.5)	2.7 (0.1–14.4)	11.4 (3.5–25.4)	86.0 (74.8–97.1)	5.7 (1.6–14.0)	16.5 (6.8–31.1)	77.8 (65.8–89.8)	4.3 (0.9–11.9)	18.8 (9.6–31.4)	76.9 (65.3–88.6)
	19–30	3.5 (1.5–6.7)	30.7 (20.7–40.7)	65.8 (55.9–75.8)	1.3 (0.3–3.8)	24.2 (16.6–31.7)	74.5 (67.0–82.0)	10.4 (6.1–16.5)	31.0 (20.9–41.2)	58.5 (47.8–69.3)	6.9 (3.5–12.0)	31.3 (23.1–39.5)	61.8 (53.6–70.1)
	31–50	4.2 (1.7–8.5)	19.7 (13.5–25.8)	76.1 (68.9–83.3)	3.5 (1.7–6.3)	17.3 (11.2–23.5)	79.2 (72.5–85.9)	13.6 (8.0–19.3)	21.3 (14.7–27.8)	65.1 (56.5–73.7)	9.5 (5.3–15.5)	23.3 (15.9–30.6)	67.2 (58.2–76.2)
	51+	1.4 (0.3–4.4)	12.8 (6.6–21.5)	85.8 (78.5–93.1)	0.0	16.9 (10.0–26.0)	83.1 (75.5–90.6)	6.3 (1.9–14.6)	16.2 (9.2–25.5)	77.6 (68.3–86.8)	6.3 (1.9–14.6)	17.9 (11.3–26.4)	75.8 (68.1–83.4)
	Total	3.3 (1.9–5.4)	20.7 (16.7–24.6)	76.0 (71.6–80.4)	2.0 (1.1–3.6)	18.5 (15.1–21.9)	79.5 (75.7–83.2)	10.3 (7.4–13.3)	22.3 (17.6–27.1)	67.3 (62.2–72.4)	7.5 (5.0–10.1)	23.9 (19.5–28.2)	68.6 (63.8–73.4)
Pacific													
Males	15–18	7.5 (0.5–26.1)	18.8 (3.3–34.3)	73.7 (52.4–89.2)	0.0	4.4 (0.1–22.3)	95.6 (77.9–99.9)	5 (0.1–24.7)	27 (9.0–44.9)	68.0 (43.5–86.9)	3.1 (0.0–17.8)	36.1 (16.2–56.0)	60.8 (38.0–80.6)
	19–30	2.0 (0.2–7.1)	20.3 (9.8–34.9)	77.8 (65.7–89.9)	0.0	14.4 (7.1–24.9)	85.6 (77.2–94.1)	7.8 (2.9–16.0)	33.0 (20.0–46.0)	59.2 (44.7–73.7)	3.3 (1.0–7.8)	26.2 (14.1–41.7)	70.5 (57.1–83.9)
	31–50	2.7 (0.8–6.4)	25.1 (12.2–38.0)	72.2 (59.3–85.0)	1.0 (0.1–3.5)	23.3 (10.1–36.4)	75.8 (62.8–88.7)	4.9 (2.2–9.2)	39.5 (25.5–53.5)	55.7 (42.6–68.8)	7.0 (3.1–13.4)	32.7 (24.0–41.4)	60.3 (50.1–70.5)
	51+	7.3 (0.7–25.8)	23.4 (15.2–33.3)	69.3 (53.5–85.1)	2.0 (0.0–11.3)	24.0 (13.6–37.4)	74.0 (59.9–88.1)	10.1 (1.5–30.5)	32.0 (20.1–46.0)	57.9 (41.6–74.2)	8.0 (0.6–29.9)	33.1 (21.3–46.7)	58.9 (42.8–75.0)
	Total	4.0 (1.6–7.9)	22.5 (15.6–29.5)	73.5 (66.0–81.0)	0.8 (0.1–2.4)	18.5 (12.4–24.7)	80.7 (74.5–87.0)	6.8 (3.7–11.2)	34.5 (27.9–41.1)	58.7 (51.9–65.6)	5.6 (2.9–9.5)	31.2 (25.0–37.3)	63.3 (56.4–70.2)

		Because of lack of money, the household:[1]						The household:[1]					
		Relies on others for food			Uses food grants/banks			Is stressed about lack of money for food			Is stressed when no food for social occasions		
		Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never
Females	15–18	10.2 (3.0–23.7)	7.7 (1.5–21.2)	82.1 (65.5–93.0)	6.4 (0.1–31.9)	11.8 (2.9–28.8)	81.8 (59.8–94.8)	5.7 (0.8–18.8)	24.1 (12.6–39.2)	70.2 (55.6–82.3)	5.4 (0.6–18.6)	15.5 (5.7–31.2)	79.1 (62.6–90.7)
	19–30	2.9 (0.8–7.1)	20.3 (13.4–28.8)	76.8 (68.9–84.8)	1.5 (0.2–5.3)	18.6 (10.9–28.6)	80.0 (71.6–88.3)	10.6 (6.1–16.9)	25.5 (18.6–32.4)	63.9 (56.0–71.7)	7.6 (3.5–14.0)	30.1 (21.6–38.5)	62.3 (53.1–71.6)
	31–50	4.4 (1.9–8.5)	22.2 (14.2–30.2)	73.4 (64.8–82.1)	3.1 (0.9–7.7)	19.9 (13.5–26.4)	77.0 (70.2–83.8)	13.4 (7.6–21.4)	29.7 (22.2–37.1)	56.9 (48.1–65.7)	11.5 (6.6–18.3)	27.5 (20.2–34.7)	61.0 (52.8–69.2)
	51+	3.5 (0.7–10.0)	23.1 (14.1–34.3)	73.3 (63.1–83.6)	1.2 (0.0–6.7)	16.8 (9.3–27.1)	81.9 (73.0–90.9)	10.8 (5.3–19.0)	46.7 (35.0–58.5)	42.4 (30.3–54.6)	8.5 (3.6–16.5)	48.8 (34.5–63.2)	42.6 (28.0–57.3)
	Total	4.4 (2.8–6.5)	20.2 (15.5–25.0)	75.4 (70.0–80.7)	2.6 (1.0–5.4)	18.0 (13.9–22.1)	79.4 (75.1–83.7)	11.2 (7.9–14.4)	31.3 (26.5–36.1)	57.6 (52.7–62.4)	9.0 (6.1–12.0)	31.3 (26.3–36.2)	59.7 (54.3–65.1)
NZEO													
Males	15–18	5.6 (1.2–15.2)	4.1 (2.1–7.0)	90.4 (83.8–96.9)	0.5 (0.1–1.7)	4.4 (2.2–7.8)	95.1 (92.5–97.8)	0.6 (0.1–2.5)	10.5 (6.1–16.5)	88.9 (84.0–93.8)	1.7 (0.3–5.3)	6.5 (3.7–10.5)	91.9 (88.1–95.6)
	19–30	0.0	8.3 (3.5–16.1)	91.7 (85.9–97.4)	0.0	4.9 (1.8–10.5)	95.1 (91.2–99.0)	1.3 (0.3–3.8)	10.2 (5.6–16.7)	88.5 (83.1–93.9)	2.5 (0.6–6.6)	9.3 (4.0–17.8)	88.2 (81.6–94.8)
	31–50	0.0	5.9 (3.5–9.2)	94.1 (91.4–96.8)	0.4 (0.0–1.3)	4.5 (2.5–7.2)	95.2 (93.0–97.4)	3.1 (1.4–5.8)	11.1 (7.2–15.1)	85.8 (81.4–90.2)	1.1 (0.3–2.7)	10.1 (6.6–13.6)	88.9 (85.3–92.4)
	51+	0.1 (0.0–0.3)	1.3 (0.5–2.7)	98.7 (97.7–99.6)	0.1 (0.0–0.3)	1.2 (0.4–2.7)	98.7 (97.7–99.8)	1.1 (0.3–2.6)	3.8 (1.8–5.7)	95.1 (92.7–97.6)	0.2 (0.1–0.5)	3.4 (1.8–5.8)	96.4 (94.5–98.2)
	Total	0.4 (0.1–1.0)	4.5 (3.0–5.9)	95.1 (93.6–96.7)	0.2 (0.0–0.5)	3.3 (2.1–4.5)	96.5 (95.3–97.7)	1.8 (1.0–2.9)	8.1 (6.3–10.0)	90.1 (88.0–92.2)	1.1 (0.5–1.9)	7.2 (5.3–9.0)	91.8 (89.9–93.6)
Females	15–18	5.1 (2.7–8.8)	5.7 (3.4–9.0)	89.1 (85.0–93.2)	0.4 (0.0–2.3)	6.0 (3.4–9.7)	93.6 (90.6–96.7)	2.9 (1.1–6.1)	12.2 (8.2–16.2)	84.9 (80.4–89.3)	2.0 (0.5–5.2)	10.2 (6.5–14.0)	87.8 (83.5–92.1)
	19–30	2.4 (0.6–6.3)	15.6 (9.8–21.3)	82.1 (75.8–88.3)	1.0 (0.3–2.4)	5.9 (2.9–10.4)	93.1 (89.6–96.7)	4.0 (1.4–8.7)	21.2 (14.6–27.8)	74.8 (67.7–81.9)	2.1 (0.6–5.2)	13.7 (7.8–19.6)	84.2 (78.0–90.4)
	31–50	0.5 (0.1–1.4)	8.2 (4.6–11.8)	91.3 (87.7–95.0)	0.3 (0.0–1.0)	4.4 (2.5–6.2)	95.4 (93.5–97.2)	3.7 (2.1–6.1)	17.5 (13.0–22.0)	78.8 (74.2–83.4)	3.4 (1.7–6.0)	19.3 (14.7–23.9)	77.3 (72.7–82.0)
	51+	0.2 (0.0–1.0)	2.9 (1.4–5.2)	96.9 (95.1–98.8)	0.0	1.7 (0.7–3.5)	98.3 (97.0–99.6)	2.4 (1.0–4.7)	4.5 (2.4–6.6)	93.1 (90.5–95.7)	1.7 (0.7–3.4)	6.1 (4.0–8.3)	92.2 (89.7–94.6)
	Total	1.0 (0.5–1.7)	7.3 (5.6–9.1)	91.7 (89.9–93.5)	0.3 (0.1–0.6)	3.7 (2.5–4.9)	96.0 (94.8–97.2)	3.2 (1.9–4.5)	12.8 (10.4–15.2)	84.0 (81.4–86.6)	2.4 (1.4–3.4)	12.6 (10.6–14.7)	85 (82.6–87.3)

		Because of lack of money, the household:[1]						The household:[1]					
		Relies on others for food			Uses food grants/banks			Is stressed about lack of money for food			Is stressed when no food for social occasions		
		Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never	Often	Sometimes	Never
By NZDep2006 quintile													
Males	1	0.9 (0.1–4.0)	5.0 (2.2–9.4)	94.1 (90.6–97.6)	0.1 (0.0–0.3)	1.2 (0.1–4.6)	98.8 (95.5–99.9)	1.2 (0.2–3.9)	4.9 (2.4–8.8)	93.9 (90.5–97.4)	0.7 (0.0–3.1)	6.4 (3.2–11.1)	93.0 (89.2–96.7)
	2	0.3 (0.0–1.1)	2.6 (0.8–6.4)	97.1 (94.6–99.5)	0.1 (0.0–0.5)	0.7 (0.1–2.6)	99.2 (97.4–99.9)	1.7 (0.2–5.6)	10.1 (6.1–15.4)	88.3 (83.5–93.0)	0.0	10.1 (6.2–15.3)	89.9 (85.6–94.2)
	3	0.2 (0.0–0.6)	4.8 (2.4–8.4)	95.0 (92.2–97.8)	0.3 (0.0–1.7)	3.7 (1.7–7.1)	96.0 (93.4–98.6)	1.1 (0.1–3.8)	7.1 (3.5–10.7)	91.8 (87.7–95.9)	0.7 (0.0–3.0)	5.9 (3.0–10.1)	93.4 (90.0–96.9)
	4	0.3 (0.0–1.0)	5.7 (2.7–8.8)	94.0 (91.0–96.9)	0.5 (0.1–1.7)	7.8 (3.5–12.0)	91.8 (87.4–96.1)	2.3 (0.6–5.9)	12.3 (7.4–17.1)	85.5 (80.0–91.0)	2.8 (0.9–6.4)	7.1 (3.4–10.7)	90.2 (86.0–94.4)
	5	2.7 (1.5–4.4)	14.4 (10.8–18.1)	82.9 (79.3–86.5)	0.9 (0.3–2.0)	13.4 (9.6–17.2)	85.7 (81.6–89.8)	6.5 (3.9–9.1)	19.1 (14.6–23.6)	74.4 (69.4–79.4)	4.9 (2.7–7.2)	16.2 (12.2–20.3)	78.8 (74.1–83.5)
Females	1	1.1 (0.0–5.7)	3.7 (1.1–8.8)	95.2 (91.4–99.0)	0.0	0.2 (0.0–0.7)	99.8 (99.3–100.0)	0.2 (0.0–0.8)	7.0 (3.8–11.7)	92.8 (89.0–96.5)	0.1 (0.0–0.5)	8.9 (4.5–15.5)	91.0 (85.9–96.1)
	2	0.3 (0.1–0.7)	3.5 (1.7–6.5)	96.1 (93.9–98.4)	0.1 (0.0–0.4)	0.5 (0.2–1.1)	99.4 (98.9–99.8)	2.4 (0.9–5.0)	10.0 (6.1–13.9)	87.6 (83.6–91.7)	2.6 (0.9–5.9)	8.4 (4.7–12.1)	89.0 (84.5–93.5)
	3	1.1 (0.4–2.4)	6.4 (2.6–10.3)	92.5 (88.6–96.4)	0.2 (0.0–1.3)	3.8 (1.8–6.9)	96.0 (93.6–98.4)	3.2 (1.4–6.4)	16.4 (10.5–22.2)	80.4 (74.2–86.6)	2.8 (0.9–6.7)	11.3 (6.7–15.9)	85.9 (80.5–91.2)
	4	1.3 (0.6–2.5)	11.8 (7.8–15.8)	86.9 (82.6–91.1)	0.9 (0.3–2.0)	8.3 (5.6–11.1)	90.8 (88.1–93.6)	4.6 (2.5–7.6)	18.7 (13.3–24.1)	76.7 (70.8–82.6)	4.0 (2.1–6.8)	19.7 (15.0–24.3)	76.4 (71.2–81.6)
	5	3.6 (2.2–4.9)	20.3 (16.1–24.5)	76.1 (72.0–80.2)	1.6 (0.9–2.7)	16.4 (12.1–20.6)	82.0 (77.5–86.5)	10.6 (7.1–14.0)	19.6 (15.5–23.7)	69.8 (65.8–73.8)	5.8 (4.1–7.6)	25.4 (21.0–29.7)	68.8 (64.2–73.4)

1 Option 'Don't know' is not included in the analysis.

Table 7.2: Categories of household food security,[1] by age group, ethnic group, NZDep2006 and sex

		Fully/almost food secure (%, 95% CI)	Moderately food secure (%, 95% CI)	Low food security (%, 95% CI)
Total population		59.1 (56.7–61.5)	33.7 (31.5–35.8)	7.3 (6.1–8.4)
By age group (years)				
Males	15–18	52.4 (45.4–59.5)	38.5 (31.9–45.2)	9.0 (3.8–14.3)
	19–30	40.6 (32.6–48.6)	53.3 (45.2–61.3)	6.1 (3.0–9.2)
	31–50	60.4 (55.0–65.8)	32.1 (27.0–37.3)	7.5 (5.0–9.9)
	51–70	74.7 (69.2–80.2)	22.3 (17.0–27.6)	3.0 (1.3–4.8)
	71+	83.4 (79.6–87.3)	14.4 (10.8–18.0)	2.2 (1.0–3.3)
	Total	61.7 (58.4–65.1)	32.6 (29.5–35.8)	5.6 (4.3–6.9)
Females	15–18	45.9 (39.6–52.3)	47.3 (41.0–53.5)	6.8 (3.8–9.8)
	19–30	42.2 (34.9–49.6)	44.7 (37.3–52.1)	13.1 (8.8–17.3)
	31–50	50.5 (45.4–55.6)	38.3 (33.2–43.3)	11.2 (8.2–14.3)
	51–70	69.2 (64.1–74.2)	25.0 (20.3–29.7)	5.8 (3.3–8.4)
	71+	80.2 (76.6–83.8)	19.0 (15.5–22.5)	0.8 (0.1–1.4)
	Total	56.6 (53.7–59.5)	34.6 (31.9–37.3)	8.8 (7.2–10.4)
Māori				
Male	15–18	34.5 (17.7–51.2)	45.6 (27.6–63.6)	19.9 (7.3–32.5)
	19–30	26.8 (12.4–41.2)	60.4 (46.2–74.6)	12.8 (5.2–20.4)
	31–50	34.0 (23.3–44.6)	47.8 (37.9–57.7)	18.2 (11.3–25.1)
	51+	59.5 (48.0–71.0)	36.0 (24.5–47.5)	4.5 (1.4–7.6)
	Total	37.6 (31.0–44.2)	48.5 (42.0–55.0)	13.9 (10.5–17.3)
Female	15–18	33.9 (18.6–49.1)	50.1 (34.2–66.1)	16.0 (5.7–26.3)
	19–30	20.8 (14.2–27.5)	58.3 (48.8–67.8)	20.9 (14.1–27.6)
	31–50	35.0 (26.8–43.2)	44.0 (36.0–52.0)	21.0 (14.3–27.8)
	51+	46.1 (36.3–56.0)	42.2 (33.4–51.0)	11.7 (4.9–18.4)
	Total	33.3 (28.9–37.7)	48.3 (43.7–52.9)	18.4 (14.8–22)
Pacific				
Males	15–18	22.0 (5.9–38.2)	66.1 (47.5–84.6)	11.9 (2.1–32.0)
	19–30	38.1 (22.0–54.1)	43.0 (29.9–56.0)	19.0 (10.3–27.7)
	31–50	24.6 (16.1–33.1)	55.5 (45.0–65.9)	20.0 (13.4–26.6)
	51+	30.9 (18.0–43.8)	41.2 (27.9–54.4)	27.9 (13.6–42.3)
	Total	29.6 (22.5–36.7)	50.2 (43.2–57.2)	20.2 (15.0–25.4)
Females	15–18	28.0 (10.9–45.1)	63.2 (45.6–80.7)	8.8 (0.3–17.3)
	19–30	19.1 (11.5–26.8)	61.2 (51.7–70.6)	19.7 (12.2–27.3)
	31–50	20.3 (13.8–26.8)	51.4 (42.8–59.9)	28.3 (20.9–35.8)
	51+	20.8 (10.2–31.5)	55.6 (44.0–67.1)	23.6 (14.0–33.2)
	Total	21.0 (16.4–25.6)	56.6 (51.1–62.0)	22.4 (18.0–26.8)

		Fully/almost food secure (%, 95% CI)	Moderately food secure (%, 95% CI)	Low food security (%, 95% CI)
NZEO				
Males	15–18	57.4 (49.6–65.1)	36.1 (28.9–43.3)	6.6 (0.6–12.5)
	19–30	42.3 (33.3–51.3)	53.3 (44.3–62.4)	4.4 (1.0–7.8)
	31–50	64.7 (58.9–70.5)	29.7 (24.2–35.3)	5.6 (3.0–8.1)
	51+	79.4 (74.9–83.8)	18.7 (14.5–23.0)	1.9 (0.6–3.2)
	Total	65.4 (61.8–68.9)	30.6 (27.2–34.0)	4.0 (2.7–5.3)
Females	15–18	50.3 (43.4–57.1)	44.6 (37.8–51.5)	5.1 (2.4–7.8)
	19–30	47.6 (38.9–56.3)	41.9 (33.2–50.7)	10.5 (5.6–15.4)
	31–50	53.9 (48.2–59.7)	36.8 (31.1–42.5)	9.2 (5.8–12.7)
	51+	75.4 (71.4–79.3)	21.2 (17.5–24.9)	3.4 (1.5–5.3)
	Total	60.8 (57.6–64.0)	32.2 (29.2–35.2)	7.0 (5.3–8.7)
By NZDep2006 quintile				
Males	1	71.2 (64.9–77.6)	26.4 (20.0–32.8)	2.3 (0.2–4.5)
	2	65.3 (58.5–72.1)	31.9 (25.3–38.6)	2.7 (0.3–5.2)
	3	66.4 (58.9–73.9)	31.3 (24.0–38.6)	2.3 (0.6–4.0)
	4	60.4 (52.2–68.5)	32.0 (24.4–39.7)	7.6 (3.4–11.7)
	5	41.4 (34.0–48.8)	43.7 (36.9–50.6)	14.9 (11.4–18.4)
Females	1	67.3 (59.4–75.2)	31.6 (23.7–39.6)	1.0 (0.0–5.2)
	2	68.5 (63.3–73.6)	26.2 (21.4–31.0)	5.3 (2.3–8.4)
	3	59.4 (52.4–66.5)	35.5 (28.5–42.6)	5.1 (2.2–7.9)
	4	47.1 (41.6–52.5)	41.5 (36.6–46.5)	11.4 (7.7–15.2)
	5	39.9 (34.6–45.1)	38.8 (33.9–43.6)	21.4 (17.6–25.2)

1 Categories derived from Rasch analysis (see Chapter 7.2).

8 Nutrition-related Health Outcomes

Nutrition-related health status was also assessed using a range of anthropometric, clinical and biochemical measures. These objective measures are not influenced by self-report and provide valuable information on nutritional status. While some of the indicators (eg, blood pressure and cholesterol) are influenced by a range of lifestyle factors, they have been included here because diet is a key modifiable determinant.

At the end of the 24-hour dietary recall and questionnaires, participants (excluding pregnant women) had their blood pressure measured and their height, weight and waist measured (see the Methodology Report for details). Overall, 4407 and 4503 participants had valid blood pressure and anthropometric measurements taken, respectively.

Participants were also asked to provide a blood and urine sample. Consenting participants were provided with a specimen collection kit and asked to visit a Canterbury Health Laboratory affiliated laboratory in their area within two weeks of the interview. Overall, 70% of participants (44% of those sampled) provided a blood and urine sample (see the Methodology Report for more information). Overall 3359 and 3315 participants had valid blood and urine samples, respectively

8.1 Body size

A healthy body size is important for good health and wellbeing. Obesity is associated with a long list of health conditions, including: cardiovascular disease (ischaemic heart disease, high blood pressure and stroke), various types of cancer, type 2 diabetes, osteoarthritis, sleep apnoea, and psychological and social problems (World Health Organization 2000; World Cancer Research Fund and American Institute for Cancer Research 2007).

Body measurements were made in the home, with the participant wearing light clothing and no 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).

Body mass index (BMI) is a measure of weight, adjusted for height, and is calculated by dividing weight in kilograms by height in metres squared (kg/m^2). BMI is used internationally to classify underweight, normal, overweight and obesity. Since BMI does not distinguish between weight associated with muscle and weight associated with fat, it provides only a crude measure of body fatness in individuals. However, it does provide a good estimate of the proportion of the population with increased risk of health conditions associated with obesity (World Health Organization 2000).

The following World Health Organization (2007) BMI cut-off points were used to define weight status for adults aged 19 years and over:

- underweight: BMI < 18.50 kg/m^2
- normal weight: BMI 18.50–24.99 kg/m^2
- overweight: BMI 25–29.99 kg/m^2
- obese: BMI ≥ 30.00 kg/m^2.

For participants aged 15–18 years, the sex and age-specific BMI cut-off points developed by the International Obesity Taskforce (IOTF) were used to define underweight, normal range, overweight and obesity (Cole et al 2000; Cole et al 2007). The IOTF BMI cut-off points coincide with the World Health Organization BMI cut-off points for adults at age 18 years.

Height and weight

Males on average were 13.5 cm taller and 12.5 kg heavier than females. Males and females aged 71+ years had the lowest mean height (males 170.9 cm; females 157.5 cm) (Table 8.1).

Younger males (15–30 years) were lighter than males aged 31–50 years. Females aged 15–18 years and females aged 71+ years were lighter than females aged 31–70 years.

Body mass index

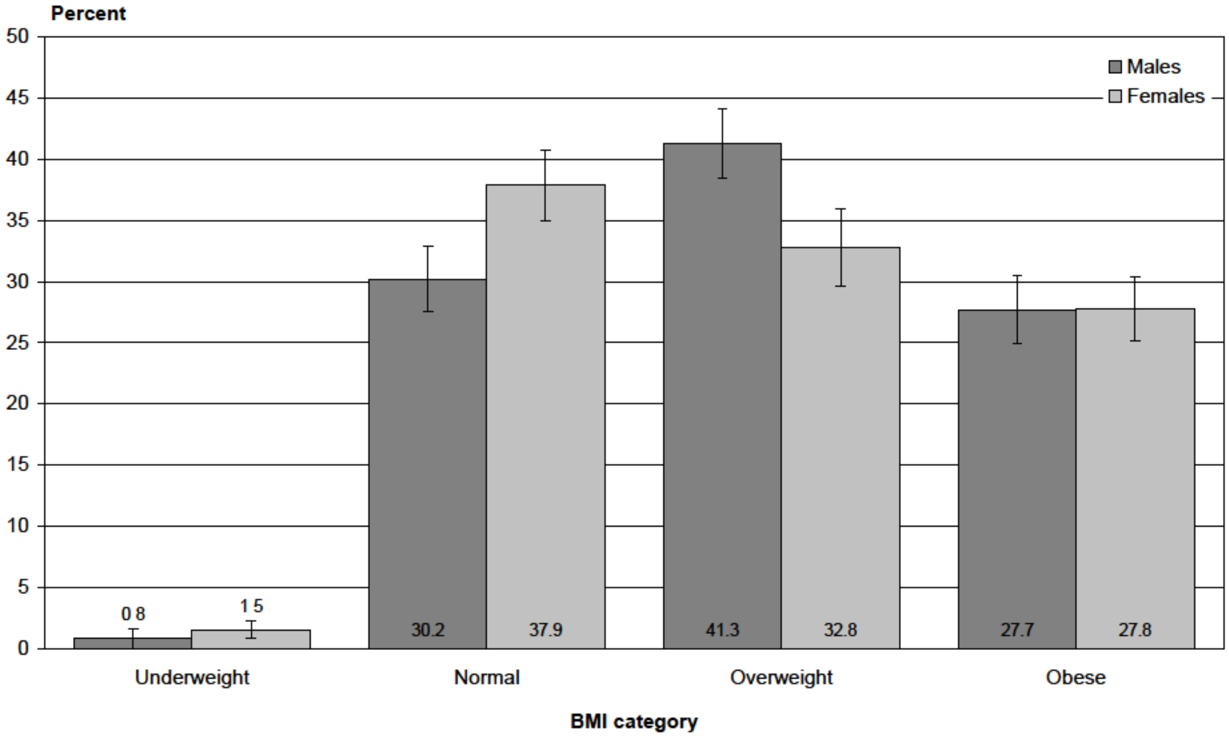
Mean BMI was 27.6 kg/m^2 for both males and females (Table 8.1). For males, those aged 15–18 years had the lowest mean BMI (23.4 kg/m^2). Males aged 19–30 years had a lower mean BMI than males in all older age groups. Among females, those aged 15–18 years also had the lowest mean BMI (24.6 kg/m^2).

Mean BMI was higher in males and females living in NZDep2006 quintile 5 than those living in quintile 1. Overall, mean BMI increased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

BMI category

Among New Zealanders aged 15 years and over, 1.2% were classified as underweight (males 0.8%; females 1.5%), 34.1% were classified as normal weight (males 30.2%; females 37.9%), 37.0% were classified as overweight (males 41.3%; females 32.8%), and 27.8% were classified as obese (males 27.7%; females 27.8%) (Table 8.1; Figure 8.1).

Figure 8.1: BMI category, by sex

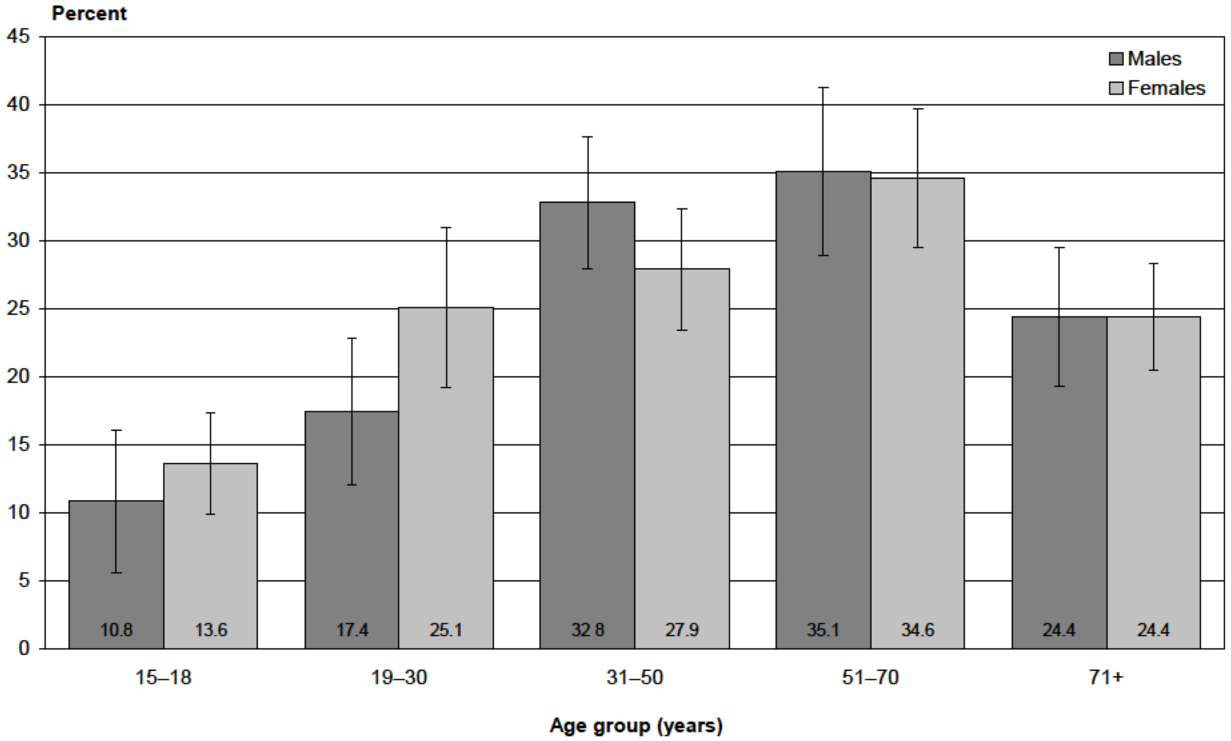


The prevalence of overweight and obesity varied across age groups for both males and females.

Males aged 15–18 years had the lowest prevalence of overweight (23.2%), rising to 51.9% among those aged 71+ years. Females aged 19–30 years had a lower prevalence of overweight than those aged 31+ years.

The prevalence of obesity was lower for males aged 15–30 years than for males aged 31+ years (Figure 8.2). The prevalence of obesity was lower for females aged 15–18 years than for all other females, and lower for females aged 71+ years compared to females aged 51–70 years.

Figure 8.2: Prevalence of obesity, by age group and sex



There was no gradient across NZDep2006 quintiles in the prevalence of overweight, after adjusting for age, sex and ethnic group. The prevalence of obesity was higher in females living in NZDep2006 quintile 5 than in quintile 1. Overall, the prevalence of obesity increased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Table 8.1: Body size, by age group, ethnic group, NZDep2006 and sex

		Height (cm)	Weight (kg)	BMI (kg/m^2)	Weight status[1]			
		Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Under-weight % (95% CI)	Normal % (95% CI)	Over-weight% (95% CI)	Obese% (95% CI)
Total population		168.8 (168.4–169.2)	78.7 (77.9–79.5)	27.6 (27.3–27.8)	1.2 (0.7–1.6)	34.1 (31.8–36.4)	37.0 (34.8–39.2)	27.8 (25.7–29.8)
Age group (years)								
Males	15–18	176.7 (175.7–177.7)	73.3 (70.8–75.7)	23.4 (22.8–24.0)	2.5 (0.5–4.5)	63.5 (56.9–70.2)	23.2 (18.2–28.1)	10.8 (5.6–15.9)
	19–30	177.6 (176.6–178.6)	81.9 (79.6–84.1)	25.9 (25.3–26.6)	0.1 (0.0–0.7)	46.8 (38.8–54.7)	35.7 (28.2–43.2)	17.4 (12.0–22.8)
	31–50	177.3 (176.5–178.0)	89.4 (87.5–91.2)	28.4 (27.9–29.0)	1.0 (0.2–3.4)	24.2 (19.2–29.2)	42.0 (36.5–47.6)	32.8 (27.6–37.9)
	51–70	173.4 (172.6–174.3)	86.8 (84.8–88.7)	28.8 (28.2–29.4)	0.4 (0.0–2.3)	17.9 (12.6–23.2)	46.6 (39.7–53.5)	35.1 (28.7–41.4)
	71+	170.9 (170.1–171.6)	80.8 (79.6–82.0)	27.7 (27.3–28.1)	0.5 (0.1–1.7)	23.2 (18.4–28.1)	51.9 (46.2–57.5)	24.4 (19.7–29.1)
	Total	175.7 (175.3–176.1)	85.1 (84.1–86.1)	27.6 (27.2–27.9)	0.8 (0.2–1.3)	30.2 (27.2–33.1)	41.3 (38.2–44.5)	27.7 (24.9–30.6)
Females	15–18	164.4 (163.7–165.2)	66.6 (64.7–68.4)	24.6 (23.9–25.2)	1.4 (0.4–2.4)	58.1 (52.1–64.1)	26.9 (21.5–32.3)	13.6 (9.7–17.4)
	19–30	164.0 (163.0–164.9)	71.4 (68.4–74.4)	26.4 (25.5–27.4)	4.1 (1.0–7.2)	48.4 (41.0–55.9)	22.4 (16.6–28.1)	25.1 (18.8–31.4)
	31–50	163.6 (162.9–164.2)	74.7 (73.0–76.4)	27.9 (27.3–28.6)	0.4 (0.1–1.2)	36.4 (31.0–41.7)	35.3 (29.8–40.8)	27.9 (23.2–32.6)
	51–70	160.4 (159.7–161.2)	73.9 (72.4–75.4)	28.8 (28.1–29.4)	0.8 (0.1–2.7)	28.4 (23.0–33.9)	36.1 (30.5–41.8)	34.6 (29.3–39.9)
	71+	157.5 (156.8–158.2)	67.7 (66.4–69.0)	27.2 (26.7–27.7)	2.6 (1.2–4.0)	34.0 (29.1–38.9)	39.1 (34.1–44.1)	24.4 (20.3–28.5)
	Total	162.2 (161.8–162.6)	72.6 (71.6–73.5)	27.6 (27.2–27.9)	1.5 (0.8–2.3)	37.9 (34.9–40.8)	32.8 (29.8–35.9)	27.8 (25.1–30.4)
Māori								
Male	15–18	175.5 (173.8–177.2)	75.2 (70.6–79.8)	24.4 (23.0–25.8)	0.0	62.4 (41.6–79.2)	28.2 (13.8–42.5)	9.4 (0.5–18.3)
	19–30	175.9 (174.7–177.0)	89.3 (85.0–93.5)	28.8 (27.5–30.0)	0.0	24.1 (10.9–37.4)	44.0 (29.9–58.0)	31.9 (20.6–43.1)
	31–50	176.3 (174.8–177.8)	99.9 (94.8–105.0)	32.2 (30.6–33.9)	0.0	10.3 (2.3–18.4)	36.6 (27.6–45.6)	53.0 (42.3–63.8)
	51+	171.7 (170.1–173.3)	91.4 (85.0–97.8)	30.9 (28.9–32.9)	0.0	23.7 (10.1–37.3)	24.5 (14.9–34.1)	51.8 (39.0–64.6)
	Total	175.1 (174.3–175.9)	91.6 (88.7–94.6)	29.9 (28.9–30.8)	0.0	24.4 (17.6–31.2)	34.9 (28.6–41.1)	40.7 (34.5–46.9)
Female	15–18	165.1 (163.0–167.2)	69.5 (65.9–73.1)	25.5 (24.4–26.6)	0.9 (0.0–4.8)	46.2 (31.2–61.2)	35.7 (19.5–51.9)	17.2 (7.9–26.4)
	19–30	165.5 (164.3–166.6)	82.0 (77.5–86.5)	30.0 (28.3–31.7)	0.0	26.6 (16.7–36.4)	30.0 (20.7–39.3)	43.4 (32.4–54.5)
	31–50	163.9 (163.1–164.7)	85.3 (82.1–88.6)	31.8 (30.5–33.1)	0.5 (0.1–1.9)	15.0 (9.1–20.9)	32.1 (22.3–41.9)	52.4 (41.8–62.9)
	51+	159.2 (158.1–160.2)	81.7 (78.4–85.1)	32.3 (31.0–33.6)	1.0 (0.1–3.6)	14.5 (5.1–23.8)	21.2 (14.2–28.3)	63.3 (53.0–73.6)
	Total	163.4 (162.8–164.1)	81.8 (79.7–83.9)	30.7 (29.8–31.5)	0.5 (0.1–1.0)	21.7 (16.7–26.7)	29.7 (24.5–34.8)	48.1 (41.9–54.4)

		Height (cm)	Weight (kg)	BMI (kg/m^2)	Weight status[1]			
		Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Under-weight % (95% CI)	Normal % (95% CI)	Over-weight% (95% CI)	Obese% (95% CI)
Pacific								
Males	15–18	177.5 (175.1–179.8)	83.7 (78.1–89.3)	26.5 (24.9–28.0)	0.0	42.1 (20.8–63.5)	35.3 (17.8–52.8)	22.6 (8.3–36.8)
	19–30	178.8 (177.2–180.4)	99.7 (94.8–104.6)	31.3 (29.6–32.9)	0.0	12.9 (1.4–24.4)	29.9 (17.0–42.8)	57.2 (42.5–71.8)
	31–50	175.5 (174.2–176.8)	102.2 (97.3–107.2)	33.1 (31.6–34.5)	0.5 (0.0–2.6)	8.1 (0.8–15.4)	26.3 (13.9–38.6)	65.2 (53.0–77.4)
	51+	172.7 (171.0–174.5)	96.7 (90.6–102.8)	32.3 (30.7–33.9)	0.0	2.5 (0.2–9.8)	36.6 (22.9–50.2)	60.9 (47.3–74.6)
	Total	176.3 (175.3–177.2)	98.0 (95.2–100.7)	31.5 (30.6–32.3)	0.2 (0.0–1.0)	13.1 (7.7–18.5)	30.5 (23.6–37.4)	56.2 (49.4–63.1)
Females	15–18	166.7 (164.4–169.0)	77.3 (71.6–83.1)	27.8 (25.8–29.9)	0.0	34.3 (18.9–49.8)	37.4 (20.5–54.3)	28.3 (12.7–43.9)
	19–30	166.0 (164.6–167.3)	88.5 (84.1–92.9)	32.1 (30.6–33.6)	0.8 (0.0–4.4)	15.3 (8.2–22.3)	25.7 (16.4–34.9)	58.3 (47.6–68.9)
	31–50	163.3 (162.3–164.4)	91.9 (88.1–95.6)	34.4 (33.1–35.8)	0.0	10.3 (4.0–16.7)	23.6 (16.0–31.2)	66.1 (57.4–74.7)
	51+	160.4 (159.0–161.8)	89.3 (85.2–93.3)	34.7 (33.2–36.2)	0.0	5.3 (0.1–10.6)	26.7 (15.8–37.6)	68.0 (56.3–79.6)
	Total	163.9 (163.2–164.6)	88.6 (86.3–90.8)	33.0 (32.2–33.8)	0.2 (0.0–1.3)	13.7 (9.8–17.6)	26.5 (21.5–31.6)	59.5 (53.9–65.1)
NZEO								
Males	15–18	177.0 (175.8–178.2)	72.0 (69.2–74.7)	22.9 (22.2–23.6)	3.1 (0.7–5.6)	66.1 (59.1–73.2)	21.2 (16.0–26.4)	9.5 (3.6–15.4)
	19–30	177.8 (176.7–179.0)	79.9 (77.5–82.4)	25.3 (24.5–26.0)	0.1 (0.0–0.8)	51.4 (42.3–60.5)	35.6 (27.0–44.1)	12.9 (7.0–18.7)
	31–50	177.5 (176.7–178.3)	87.7 (85.7–89.7)	27.8 (27.2–28.4)	1.1 (0.2–3.9)	26.5 (20.9–32.1)	43.8 (37.6–49.9)	28.6 (22.9–34.3)
	51+	172.9 (172.2–173.7)	84.6 (83.0–86.2)	28.2 (27.8–28.7)	0.5 (0.0–1.8)	19.8 (15.2–24.3)	49.4 (43.6–55.2)	30.3 (25.1–35.6)
	Total	175.8 (175.3–176.3)	83.9 (82. 8–85.0)	27.1 (26.8–27.4)	0.8 (0.2–1.5)	31.7 (28.5–35.0)	42.6 (39.1–46.1)	24.8 (21.6–27.9)
Females	15–18	164.3 (163.4–165.1)	65.1 (63.2–66.9)	24.1 (23.4–24.8)	1.7 (0.5–2.9)	61.1 (54.6–67.6)	26.3 (20.5–32.1)	10.9 (6.9–14.8)
	19–30	163.7 (162.5–164.8)	68.5 (65.2–71.7)	25.4 (24.4–26.5)	4.8 (1.2–8.5)	54.2 (45.7–62.8)	21.4 (14.7–28.2)	19.5 (12.6–26.5)
	31–50	163.6 (162.8–164.4)	72.4 (70.5–74.2)	27.0 (26.4–27.7)	0.4 (0.1–1.4)	40.4 (34.3–46.4)	36.7 (30.5–43.0)	22.5 (17.5–27.4)
	51+	159.6 (159.0–160.2)	71.2 (70.0–72.3)	27.9 (27.5–28.4)	1.4 (0.5–2.3)	31.6 (27.1–36.1)	38.0 (33.2–42.8)	29.0 (24.9–33.1)
	Total	162.1 (161.7–162.6)	70.7 (69.7–71.7)	26.9 (26.5–27.3)	1.7 (0.9–2.5)	41.0 (37.7–44.2)	33.7 (30.3–37.1)	23.7 (20.9–26.4)

		Height (cm)	Weight (kg)	BMI (kg/m^2)	Weight status[1]			
		Mean (95% CI)	**Mean (95% CI)**	**Mean (95% CI)**	**Under-weight % (95% CI)**	**Normal % (95% CI)**	**Over-weight% (95% CI)**	**Obese% (95% CI)**
By NZDep2006 quintile								
Males	1	176.5 (175.7–177.4)	84.8 (83.0–86.5)	27.2 (26.7–27.7)	0.4 (0.1–1.2)	31.5 (25.5–37.4)	40.8 (34.5–47.2)	27.3 (20.4–34.2)
	2	175.7 (174.7–176.7)	83.5 (81.4–85.6)	27.0 (26.4–27.7)	0.5 (0.1–1.5)	32.9 (26.5–39.3)	42.6 (35.5–49.6)	24.1 (18.3–29.9)
	3	175.4 (174.4–176.4)	83.2 (80.9–85.4)	27.0 (26.3–27.7)	0.0	33.4 (25.3–41.5)	42.9 (34.1–51.7)	23.7 (17.5–29.9)
	4	176.0 (175.0–176.9)	86.6 (83.7–89.6)	27.9 (27.1–28.8)	1.9 (0.2–6.9)	27.5 (20.4–34.5)	39.2 (32.6–45.7)	31.4 (24.7–38.2)
	5	174.7 (173.8–175.7)	88.1 (85.7–90.5)	28.8 (28.1–29.5)	1.3 (0.2–4.2)	24.3 (19.2–29.4	41.0 (35.1–46.9)	33.4 (27.0–39.8)
Females	1	163.0 (162.0–164.0)	68.3 (66.4–70.3)	25.7 (25.0–26.4)	1.6 (0.3–5.1)	48.5 (41.1–55.8)	33.5 (26.4–40.5)	16.5 (11.8–21.1)
	2	162.0 (161.1–162.9)	70.0 (68.3–71.7)	26.7 (26.0–27.4)	2.4 (0.5–4.3)	39.6 (33.7–45.5)	39.7 (32.9–46.5)	18.3 (13.8–22.8)
	3	161.8 (160.9–162.7)	73.3 (70.8–75.7)	27.9 (27.1–28.8)	0.4 (0.1–0.6)	37.3 (30.0–44.7)	31.7 (24.4–39.1)	30.6 (23.9–37.2)
	4	162.3 (161.5–163.2)	73.2 (70.9–75.5)	27.8 (26.9–28.6)	2.3 (0.1–4.5)	37.7 (31.8–43.6)	27.4 (21.4–33.5)	32.5 (26.5–38.5)
	5	162.3 (161.5–163.0)	78.0 (75.9–80.0)	29.6 (28.8–30.4)	1.0 (0.2–1.9)	26.8 (20.5–33.1)	31.0 (25.3–36.7)	41.2 (35.6–46.8)

1 15–18 years: Cole et al 2007 BMI cut-offs. 19+ years: underweight BMI < 18.50 kg/m^2; normal BMI 18.50–24.99 kg/m^2; overweight BMI 25.00–29.99 kg/m^2; obese BMI ≥ 30 kg/m^2 (World Health Organization 2000).

8.2 Blood pressure

High blood pressure is an important risk factor for heart disease, as well as for stroke and renal failure. The relationship between blood pressure and cardiovascular disease is continuous, with the risk increasing as blood pressure increases even among those within the 'normal' range. Systolic blood pressure is a better predictor of cardiovascular disease risk than diastolic blood pressure (Prospective Studies Collaboration 2002; Neaton and Wentworth 1992).

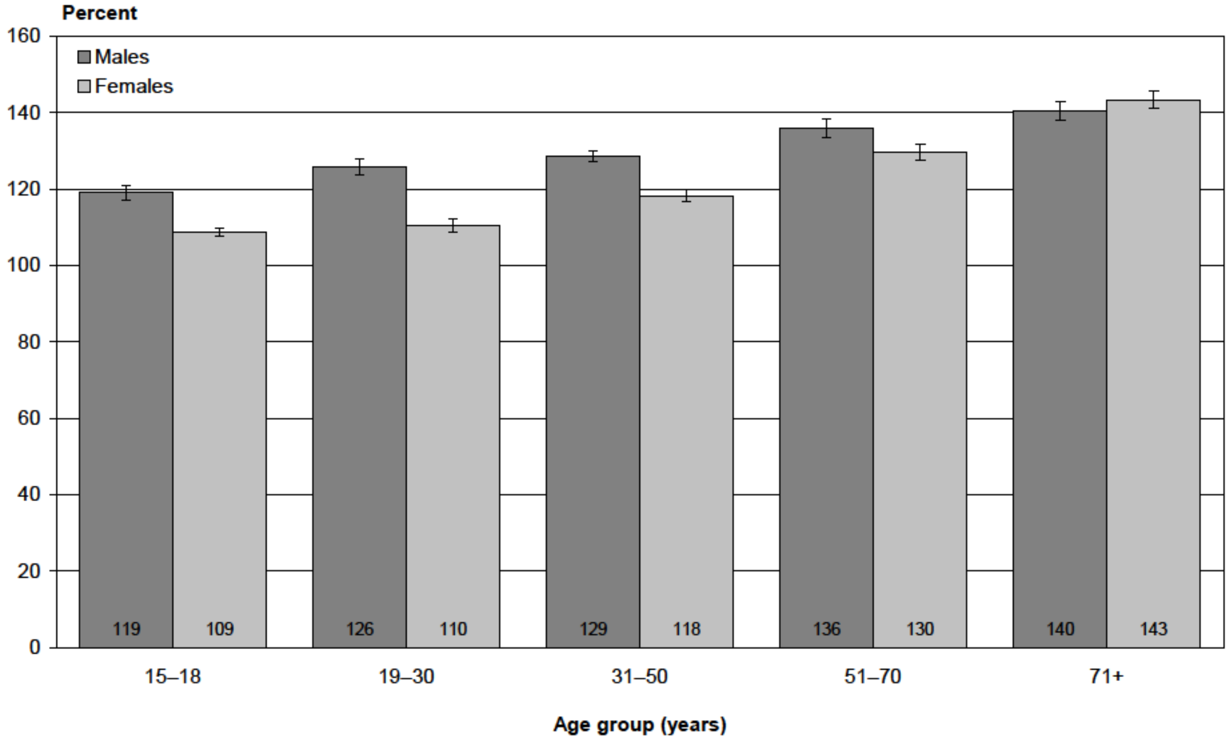
Blood pressure was measured using an OMRON HEM 907 instrument. Blood pressure was not measured in pregnant women because pregnancy alters a woman's blood pressure. Three measurements were taken for each participant, with the mean of the second and third measurements used to calculate diastolic and systolic blood pressure. Note that the results presented below are for all participants, regardless of whether or not they were taking prescribed blood pressure medication.

Systolic blood pressure

Mean systolic blood pressure was 126 mmHg (males 130 mmHg; females 122 mmHg) (Table 8.2). Systolic blood pressure increased with age and was highest for males and females aged 71+ years (141 mmHg and 143 mmHg, respectively) (Figure 8.3). This pattern was similar for Māori and Pacific males and females, with those aged 51+ years having higher systolic blood pressure than younger age groups.

There were no differences in mean systolic blood pressure by NZDep2006 quintile for either males or females. Overall, there was no gradient in mean systolic blood pressure across NZDep2006 quintiles after adjusting for age, sex and ethnic group.

Figure 8.3: Mean systolic blood pressure (mmHg), by age group and sex



Diastolic blood pressure

Mean diastolic blood pressure was 74 mmHg (males 75 mmHg; females 73 mmHg) (Table 8.2). Diastolic blood pressure was highest for males and females aged 51–70 years (79 mmHg and 76 mmHg, respectively). There were no differences in mean diastolic blood pressure by NZDep2006 quintile for either males or females. Overall, there was no gradient in mean diastolic blood pressure across NZDep2006 quintiles after adjusting for age, sex and ethnic group.

Table 8.2: Blood pressure, by age group, ethnic group, NZDep2006 and sex

		Systolic (mmHg) Mean[1] (95% CI)	Diastolic (mmHg) Mean[1] (95% CI)
Total population		126 (125–127)	74 (73–75)
By age group (years)			
Males	15–18	119 (117–121)	64 (62–65)
	19–30	126 (124–128)	71 (69–72)
	31–50	129 (127–130)	78 (76–79)
	51–70	136 (134–138)	79 (77–80)
	71+	140 (138–143)	71 (70–73)
	Total	130 (129–131)	75 (74–76)
Females	15–18	109 (108–110)	65 (64–66)
	19–30	110 (109–112)	70 (69–72)
	31–50	118 (117–120)	74 (73–76)
	51–70	130 (128–132)	76 (75–77)
	71+	143 (141–146)	73 (72–75)
	Total	122 (120–123)	73 (73–74)
Māori			
Male	15–18	122 (117–126)	66 (62–70)
	19–30	128 (123–133)	74 (71–77)
	31–50	130 (127–133)	81 (78–84)
	51+	142 (137–147)	83 (79–87)
	Total	131 (129–133)	77 (76–79)
Female	15–18	109 (106–111)	67 (65–69)
	19–30	112 (110–114)	71 (69–73)
	31–50	122 (119–126)	79 (76–81)
	51+	134 (129–139)	81 (77–84)
	Total	120 (118–123)	76 (74–77)
Pacific			
Males	15–18	114 (111–118)	62 (59–66)
	19–30	124 (122–126)	71 (69–73)
	31–50	129 (127–131)	80 (77–82)
	51+	136 (130–141)	79 (76–82)
	Total	127 (125–129)	75 (73–76)
Females	15–18	106 (103–109)	65 (62–68)
	19–30	110 (108–112)	71 (69–74)
	31–50	119 (116–122)	76 (73–78)
	51+	132 (127–137)	77 (74–80)
	Total	117 (116–119)	73 (72–75)

		Systolic (mmHg) Mean[1] (95% CI)	Diastolic (mmHg) Mean[1] (95% CI)
NZEO			
Males	15–18	120 (117–122)	63 (62–65)
	19–30	126 (123–128)	70 (68–72)
	31–50	128 (127–130)	77 (76–78)
	51+	137 (135–139)	76 (75–78)
	Total	130 (129–132)	74 (74–75)
Females	15–18	109 (108–110)	65 (64–67)
	19–30	110 (108–112)	70 (68–72)
	31–50	118 (116–119)	74 (73–75)
	51+	133 (132–135)	75 (74–76)
	Total	122 (121–123)	73 (72–74)
By NZDep2006 quintile			
Males	1	130 (128–132)	74 (72–76)
	2	130 (127–132)	74 (72–76)
	3	133 (130–135)	76 (74–78)
	4	129 (127–131)	74 (72–76)
	5	130 (127–133)	75 (73–77)
Females	1	123 (120–125)	73 (71–75)
	2	121 (119–123)	72 (70–73)
	3	121 (118–123)	73 (72–75)
	4	120 (118–122)	73 (72–75)
	5	123 (121–125)	75 (74–76)

1 Systolic and diastolic pressures are the means of the participants' second and third readings.

8.3 Iron status

Iron is an essential component of haemoglobin, the part of red blood cells that transports oxygen. Iron also has an important role in cognitive development. Iron needs are higher in women of child-bearing age (to replace iron lost during menstruation) and during pregnancy (to replace iron lost to the developing foetus and during delivery) (Mann and Truswell 2007).

Iron deficiency is the most frequently encountered nutritional deficiency world-wide (Mann and Truswell 2007). There are three stages of iron deficiency. In the first stage, body iron stores start to become depleted but red cell production is not affected. In the second stage (iron deficiency without anaemia), body iron stores are depleted and levels of circulating iron start to fall, although blood haemoglobin concentrations are maintained. In the final stage (iron deficiency anaemia), body iron stores are severely depleted and the amount of iron circulating is very low, which results in reduced red cell production and low haemoglobin concentrations.

Iron-deficiency anaemia is associated with decreased work capacity, fatigue, and some specific cognitive learning effects (Mann and Truswell 2007).

A range of biochemical indices are needed to assess all stages of iron deficiency. The cut-offs used to indicate iron status are shown in Table 8.3. Note that iron-deficiency anaemia is a subset of iron deficiency.

Table 8.3: Iron status measures

Status	Measures and cut-offs
Low serum ferritin	Serum ferritin < 12 µg/L
Low haemoglobin	Haemoglobin: < 136 g/L (15–19 years male) < 137 g/L (20–49 years male) < 133 g/L (50–69 years male) < 124 g/L (70+ years male) < 120 g/L (15–69 years female) < 118 g/L (70+ years female)
Iron deficiency (with or without anaemia)	Serum ferritin < 12 µg/L *and* zinc protoporphyrin > 60 µmol/mol
Iron-deficiency anaemia	Serum ferritin < 12 µg/L *and* zinc protoporphyrin > 60 µmol/mol *and* low haemoglobin

Notes:

References for cut-offs are as follows: serum ferritin (Looker et al 1997); zinc protoporphyrin (Hastka et al 1996); haemoglobin (Looker et al 1997).

Participants with a serum C-reactive protein > 8 mg/L were not included in calculations of mean serum ferritin, low serum ferritin or iron deficiency (Martinez and Coli 1987).

Ferritin

Serum ferritin is an indicator of iron stores. Mean serum ferritin concentration was 177 µg/L for males and 80 µg/L for females (Table 8.4). There was a marked upward trend in mean serum ferritin concentrations in both males and females, from 15–18 years (61 µg/L and 39 µg/L, respectively) to 51–70 years (216 µg/L and 129 µg/L, respectively). Five percent of the New Zealand population had low iron stores, as indicated by serum ferritin concentrations of < 12 µg/L (males 1.5%; females 8.4%).

Haemoglobin

Mean haemoglobin concentration was 149 g/L for males and 133 g/L for females (Table 8.4). Among males, those aged 71+ years (139 g/L) had lower concentrations of haemoglobin than all other age groups. Among females, those aged 71+ years (131 g/L) and 31–50 years (also 131 g/L) had lower concentrations than those aged 51–70 years (135 g/L).

Iron deficiency

Overall, the prevalence of iron deficiency was 4.2% and the prevalence of iron-deficiency anaemia was 2.0% (Table 8.5). Iron deficiency was more common in females (7.2% and 3.5% for iron deficiency and iron-deficiency anaemia, respectively) than males (1.1%; 0.6%). Across age groups, the prevalence of iron deficiency and iron-deficiency anaemia was greatest in females aged 15–18 years (10.6% and 4.9%, respectively) and 31–50 years (12.1% and 6.0%, respectively).

The prevalence of iron deficiency among Māori reflected that among the whole population, with the highest prevalence in females aged 15–18 years and 31–50 years.

Overall, there was no gradient across NZDep2006 quintiles in the prevalence of iron deficiency or the prevalence of iron-deficiency anaemia, after adjusting for age, sex and ethnic group.

Table 8.4: Ferritin and haemoglobin, by age group, ethnic group, NZDep2006 and sex

		Ferritin (µg/L)		Haemoglobin (g/L)	
		Mean (95% CI)	% Low iron stores[1] (95% CI)	Mean (95% CI) (95% CI)	% Low[2] (95% CI)
Total population		127 (120–134)	5.0 (4.0–6.1)	141 (140–141)	7.6 (6.4–8.9)
By age group (years)					
Males	15–18	61 (55–68)	0.6 (0.0–3.2)	150 (149–151)	6.0 (2.2–9.8)
	19–30	135 (121–150)	2.0 (0.1–7.3)	152 (151–154)	3.8 (0.6–6.9)
	31–50	198 (180–215)	1.9 (0.0–3.8)	151 (150–152)	4.7 (2.0–7.5)
	51–70	216 (180–251)	1.3 (0.3–3.6)	148 (146–149)	6.7 (3.3–10.0)
	71+	179 (161–197)	0.4 (0.0–1.7)	139 (137–141)	26.0 (20.6–31.4)
	Total	177 (165–189)	1.5 (0.5–2.5)	149 (148–150)	7.1 (5.5–8.7)
Females	15–18	39 (34–43)	12.2 (7.0–17.4)	133 (131–134)	6.9 (2.6–11.2)
	19–30	52 (46–58)	7.7 (3.4–11.9)	134 (132–135)	4.8 (1.6–7.9)
	31–50	59 (53–66)	13.4 (9.4–17.5)	131 (130–132)	10.2 (6.5–13.9)
	51–70	129 (118–139)	2.9 (0.4–5.4)	135 (134–136)	7.0 (4.0–9.9)
	71+	117 (108–126)	1.7 (0.5–2.9)	131 (130–132)	10.8 (7.2–14.4)
	Total	79 (75–84)	8.4 (6.5–10.3)	133 (132–133)	8.1 (6.4–9.9)
Māori					
Male	15–18	66 (54–78)	0.0	151 (148–155)	5.7 (0.0–30.2)
	19–30	154 (126–182)	0.0	149 (144–153)	19.1 (4.5–33.7)
	31–50	229 (186–271)	0.7 (0.0–4.1)	151 (149–154)	2.6 (0.2–5.1)
	51+	240 (194–287)	0.0	148 (145–151)	7.2 (1.4–13.1)
	Total	187 (168–207)	0.2 (0.0–1.5)	150 (148–152)	8.6 (4.3–12.9)
Female	15–18	39 (28–49)	14.6 (3.1–36.9)	131 (126–136)	15.2 (0.2–30.1)
	19–30	51 (43–60)	10.8 (2.5–19.1)	133 (131–135)	5.3 (0.9–15.7)
	31–50	72 (59–85)	12.9 (6.9–18.9)	134 (131–136)	6.0 (2.1–9.9)
	51+	145 (117–174)	1.3 (0.1–5.0)	133 (131–136)	10.9 (2.6–19.2)
	Total	77 (66–88)	10.1 (6.1–14.1)	133 (132–134)	7.9 (4.6–11.3)

		Ferritin (µg/L)		Haemoglobin (g/L)	
		Mean (95% CI)	**% Low iron stores[1] (95% CI)**	**Mean (95% CI) (95% CI)**	**% Low[2] (95% CI)**
Pacific					
Males	15–18	[3]	[3]	[3]	[3]
	19–30	226 (186–266)	0.0	155 (151–158)	0.0
	31–50	323 (278–369)	0.0	154 (152–156)	4.7 (0.9–8.5)
	51+	333 (270–396)	0.0	154 (149–160)	5.4 (0.9–16.0)
	Total	255 (225–284)	0.0	154 (153–156)	2.3 (0.6–4.0)
Females	15–18	[3]	[3]	[3]	[3]
	19–30	59 (43–74)	10.2 (2.8–17.6)	131 (128–133)	15.5 (6.9–24.0)
	31–50	85 (58–112)	12.6 (4.5–20.7)	131 (128–133)	14.6 (6.9–22.3)
	51+	207 (167–247)	0.0	132 (129–136)	15.9 (4.9–27.0)
	Total	94 (78–109)	9.8 (5.2–14.5)	131 (130–133)	14.5 (9.5–19.5)
NZEO					
Males	15–18	59 (52–66)	0.7 (0.0–4.0)	149 (148–151)	7.3 (2.8–11.9)
	19–30	120 (105–135)	2.4 (0.2–9.0)	153 (151–155)	2.2 (0.2–8.2)
	31–50	186 (168–205)	2.0 (0.4–5.6)	151 (149–152)	4.9 (1.8–8.0)
	51+	200 (171–229)	1.2 (0.0–2.3)	145 (144–146)	11.8 (8.7–14.8)
	Total	169 (156–183)	1.7 (0.6–2.8)	149 (148–150)	7.2 (5.5–8.9)
Females	15–18	37 (33–42)	12.9 (7.2–18.6)	133 (131–134)	6.9 (2.1–11.7)
	19–30	52 (46–59)	6.7 (2.0–11.5)	134 (133–135)	3.4 (0.8–8.9)
	31–50	57 (49–64)	13.6 (9.0–18.2)	131 (130–132)	10.3 (6.1–14.5)
	51+	122 (114–131)	2.7 (0.7–4.6)	134 (133–135)	7.8 (5.3–10.3)
	Total	78 (73–83)	8.2 (6.1–10.3)	133 (132–133)	7.8 (5.9–9.8)
By NZDep2006 quintile					
Males	1	177 (154–201)	0.2 (0.0–1.2)	149 (147–150)	6.9 (3.5–10.4)
	2	179 (155–203)	0.2 (0.0–1.1)	150 (149–152)	4.6 (2.1–7.2)
	3	189 (148–231)	0.6 (0.1–2.0)	149 (148–151)	6.5 (3.8–9.2)
	4	175 (151–199)	3.7 (0.3–7.1)	149 (146–151)	10.0 (5.1–14.9)
	5	164 (147–181)	3.2 (0.7–9.1)	149 (148–151)	7.5 (3.9–11.1)
Females	1	83 (70–97)	12.7 (6.5–18.9)	132 (130–134)	8.2 (2.7–13.8)
	2	86 (76–97)	5.6 (2.2–9.0)	132 (131–133)	7.7 (4.2–11.2)
	3	72 (63–81)	8.8 (4.4–13.3)	133 (132–134)	8.5 (4.8–12.1)
	4	75 (67–84)	8.0 (4.4–11.6)	133 (132–134)	8.1 (4.2–11.9)
	5	81 (72–90)	7.7 (4.2–11.2)	133 (132–135)	8.3 (5.2–11.3)

1 Serum ferritin < 12 µg/L. Serum ferritin concentration data for participants with serum C-reactive protein > 8 mg/L were not included in calculations of either serum ferritin or iron status.

2 < 136 g/L males 15–19 years; < 137g/L males 20–49 years; < 133g/L males 50–69 years; < 124 g/L males 70+ years; < 120 g/L females 15–69 years; < 118 g/L females 70+ years.

3 Results not reported due to small sample size.

Table 8.5: Prevalence of iron deficiency, by age group, ethnic group, NZDep2006 and sex

		With or without anaemia[1] (%), (95% CI)	With anaemia[2] (%), (95% CI)
Total population		4.2 (3.2–5.2)	2.1 (1.4–2.8)
By age group (years)			
Males	15–18	0.0	0.0
	19–30	1.0 (0.0–6.0)	0.0
	31–50	1.9 (0.5–4.9)	1.3 (0.2–4.1)
	51–70	0.7 (0.1–2.1)	0.3 (0.0–1.6)
	71+	0.4 (0.0–1.7)	0.4 (0.0–1.7)
	Total	1.1 (0.3–1.9)	0.6 (0.0–1.2)
Females	15–18	10.6 (5.5–15.7)	5.2 (0.8–9.7)
	19–30	5.2 (1.7–8.7)	1.2 (0.0–2.4)
	31–50	12.1 (8.1–16.0)	6.3 (3.2–9.4)
	51–70	2.9 (0.4–5.4)	2.1 (0.1–4.1)
	71+	1.6 (0.4–2.7)	0.4 (0.1–1.3)
	Total	7.2 (5.4–9.0)	3.5 (2.2–4.8)
Māori			
Males	15–18	0.0	0.0
	19–30	0.0	0.0
	31–50	0.7 (0.0–3.9)	0.7 (0.0–4.1)
	51+	0.0	0.0
	Total	0.2 (0.0–1.4)	0.2 (0.0–1.5)
Females	15–18	14.6 (3.0–37.7)	10.9 (0.8–36.6)
	19–30	10.8 (2.5–19.1)	5.1 (0.6–17.0)
	31–50	11.1 (5.3–16.8)	4.9 (0.7–9.0)
	51+	1.3 (0.1–5.0)	0.7 (0.0–4.0)
	Total	9.4 (5.4–13.3)	4.8 (1.6–8.0)
Pacific			
Males	15–18	[3]	[3]
	19–30	0.0	0.0
	31–50	0.0	0.0
	51+	0.0	0.0
	Total	0.0	0.0
Females	15–18	[3]	[3]
	19–30	8.9 (2.0–15.8)	4.7 (1.0–13.1)
	31–50	12.6 (4.5–20.7)	11.1 (3.0–19.1)
	51+	0.0	0.0
	Total	9.4 (4.8–14.1)	6.9 (2.6–11.2)

		With or without anaemia[1] (%), (95% CI)	With anaemia[2] (%), (95% CI)
NZEO			
Males	15–18	0.0	0.0
	19–30	1.2 (0.0–6.7)	0.0
	31–50	2.0 (0.4–5.6)	1.4 (0.2–4.7)
	51+	0.7 (0.0–1.3)	0.3 (0.0–1.1)
	Total	1.2 (0.3–2.2)	0.6 (0.0–1.3)
Females	15–18	11.0 (5.4–16.7)	5.3 (0.3–10.3)
	19–30	3.8 (0.1–7.5)	0.0
	31–50	12.1 (7.7–16.6)	6.2 (2.7–9.7)
	51+	2.6 (0.7–4.6)	1.7 (0.2–3.3)
	Total	6.9 (5.0–8.9)	3.2 (1.8–4.7)
By NZDep2006 quintile			
Males	1	0.0	0.0
	2	0.2 (0.0–1.1)	0.0
	3	0.6 (0.1–2.0)	0.6 (0.1–2.0)
	4	2.9 (0.6–7.9)	2.5 (0.3–8.0)
	5	2.2 (0.2–8.1)	0.0
Females	1	12.4 (6.2–18.6)	7.1 (2.0–12.3)
	2	4.6 (1.6–7.6)	2.2 (0.1–4.4)
	3	6.8 (3.0–10.6)	3.1 (0.3–5.8)
	4	7.4 (3.9–10.9)	3.1 (0.7–5.5)
	5	5.9 (2.8–9.0)	2.8 (1.1–4.5)

1 Serum ferritin < 12 µg/L and zinc protoporphyrin > 60 µmol/mol.

2 Serum ferritin < 12 µg/L and zinc protoporphyrin > 60 µmol/mol and haemoglobin < 136 g/L males 15–19 years; < 137 g/L males 20–49 years; < 133g/L males 50–69 years; < 124 g/L males 70+ years; < 120 g/L females 15–69 years; < 118 g/L females 70+ years.

3 Results not reported due to small sample size.

8.4 Cholesterol

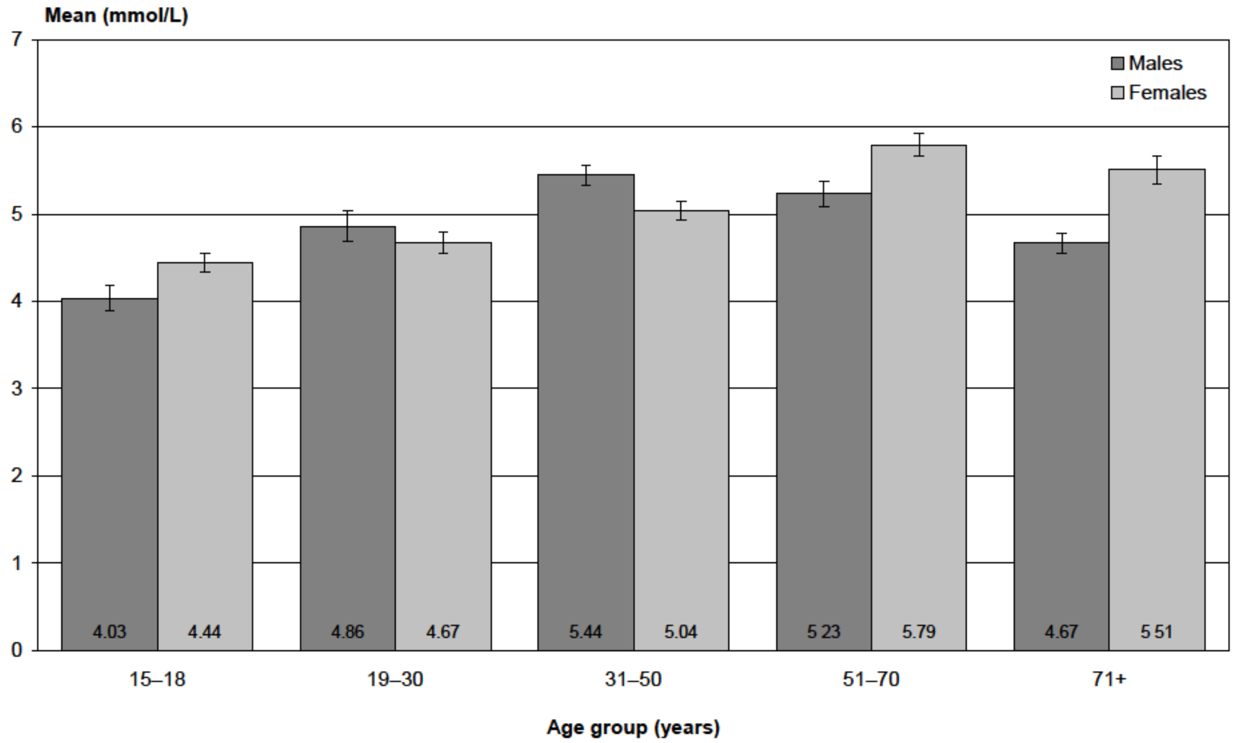
Blood cholesterol is an important risk factor for cardiovascular disease, particularly ischaemic heart disease. The relationship between cholesterol and cardiovascular disease is continuous, with the risk increasing as cholesterol increases, even among those within the 'normal' range. Modifiable determinants of blood cholesterol include diet (in particular dietary fat intake), body weight and physical activity levels. Blood cholesterol concentrations can also be influenced by lipid-lowering medications.

Total cholesterol consists largely of the cholesterol in low-density lipoprotein particles (LDL cholesterol) plus the cholesterol in high-density lipoprotein (HDL cholesterol). LDL cholesterol is associated with a higher risk of cardiovascular disease and HDL with a lower risk (Mann and Truswell 2007). The ratio of total:HDL cholesterol is also a strong predictor of vascular disease mortality (Prospective Studies Collaboration et al 2007; Erqou et al 2009), with the optimum ratio < 4.5 (New Zealand Guidelines Group 2003). Because blood samples in the 2008/09 NZANS were non-fasting, LDL cholesterol could not be measured.

Serum total cholesterol

The mean serum total cholesterol concentration was 5.13 mmol/L, with similar levels for males (5.09 mmol/L) and females (5.17 mmol/L) (Table 8.6). Serum total cholesterol peaked in males aged 31–50 years (5.44 mmol/L) and females aged 51–70 years (5.79 mmol/L), and declined in older age groups (Figure 8.4).

Figure 8.4: Mean total blood cholesterol (mmol/L), by age group and sex



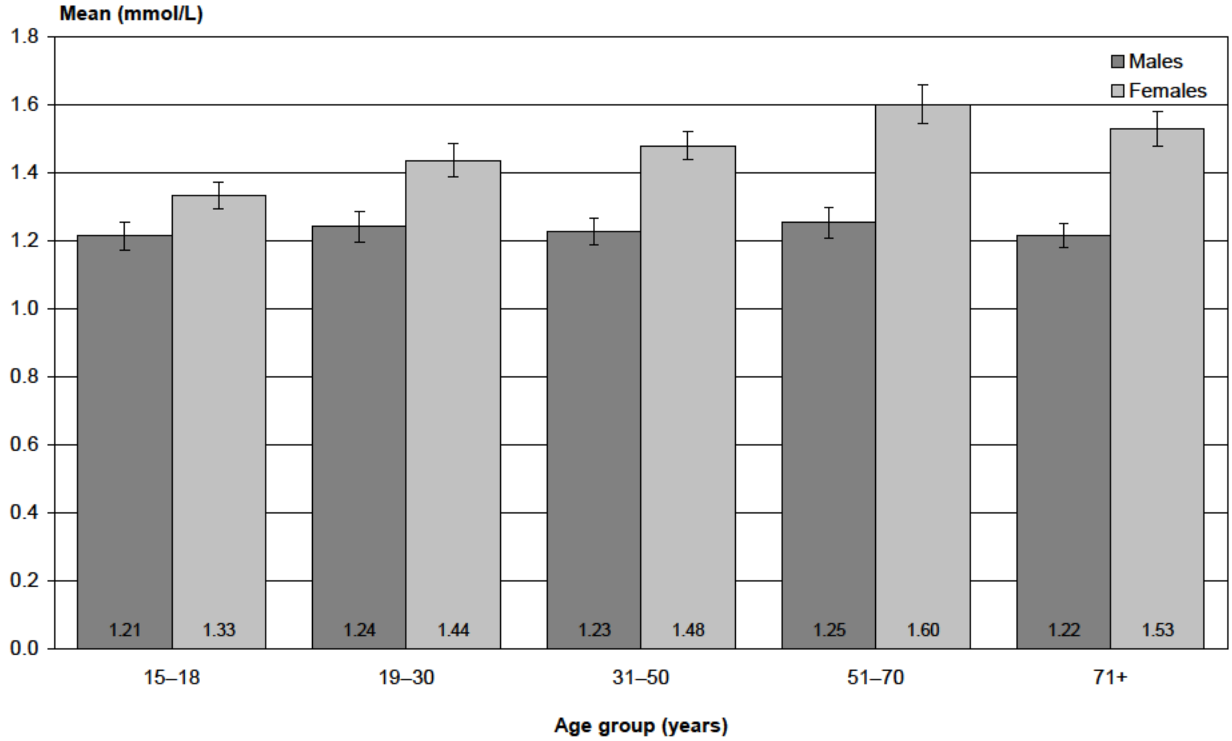
Mean serum total cholesterol was higher in Māori males aged 31–50 years (5.44 mmol/L) and in Māori females aged 51+ years (5.79 mmol/L) than in other Māori male and female age groups. Pacific males and females aged 31–50 years (5.21 mmol/L and 4.99 mmol/L, respectively) had the highest mean total serum cholesterol concentration of all other Pacific age groups.

Overall, there was no gradient across NZDep2006 quintiles in serum total cholesterol concentrations, after adjusting for age, sex and ethnic group.

Serum HDL cholesterol

The mean serum HDL cholesterol concentration was 1.37 mmol/L and was greater in females (1.50 mmol/L) than males (1.23 mmol/L) (Table 8.6). Serum HDL cholesterol increased across the age groups in females but not in males. Females aged 15–18 years had lower HDL cholesterol (1.33 mmol/L) than females in other age groups (Figure 8.5).

Figure 8.5: Mean HDL cholesterol (mmol/L), by age group and sex



Mean HDL cholesterol was lower in males and females living in NZDep2006 quintile 5 than in those living in quintile 1. Overall, mean HDL cholesterol decreased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Total:HDL cholesterol ratio

The mean total:HDL cholesterol ratio of New Zealand adults was 3.95 (males 4.32; females 3.61) (Table 8.6). Among females the group aged 51–70 years had a higher ratio than those aged 15–50 years.

Māori males aged 51+ years had a lower ratio (4.19) than those aged 31–50 years (5.00). Māori females aged 31+ years had a higher ratio than those aged 15–30 years.

The total:HDL cholesterol ratio was higher in males and females living in NZDep2006 quintile 5 than in those living in quintile 1.

Table 8.6: Cholesterol, by age group, ethnic group, NZDep2006 and sex

		Total cholesterol (mmol/L) Mean (95% CI)	HDL cholesterol (mmol/L) Mean (95% CI)	Total:HDL ratio Mean (95% CI)
Total population		5.13 (5.08–5.18)	1.37 (1.35–1.39)	3.95 (3.89–4.01)
By age group (years)				
Males	15–18	4.03 (3.89–4.18)	1.21 (1.17–1.26)	3.44 (3.28–3.59)
	19–30	4.86 (4.68–5.04)	1.24 (1.20–1.29)	4.07 (3.85–4.29)
	31–50	5.44 (5.33–5.56)	1.23 (1.19–1.27)	4.65 (4.51–4.80)
	51–70	5.23 (5.09–5.37)	1.25 (1.21–1.30)	4.41 (4.21–4.61)
	71+	4.67 (4.56–4.78)	1.22 (1.18–1.25)	4.05 (3.86–4.24)
	Total	5.09 (5.01–5.16)	1.23 (1.21–1.26)	4.32 (4.22–4.41)
Females	15–18	4.44 (4.33–4.56)	1.33 (1.29–1.37)	3.43 (3.32–3.53)
	19–30	4.67 (4.54–4.80)	1.44 (1.39–1.49)	3.39 (3.25–3.53)
	31–50	5.04 (4.94–5.14)	1.48 (1.44–1.52)	3.56 (3.45–3.67)
	51–70	5.79 (5.66–5.93)	1.60 (1.55–1.66)	3.85 (3.71–4.00)
	71+	5.51 (5.34–5.67)	1.53 (1.48–1.58)	3.74 (3.63–3.86)
	Total	5.17 (5.10–5.24)	1.50 (1.47–1.52)	3.61 (3.55–3.68)
Māori				
Male	15–18	4.32 (3.87–4.78)	1.24 (1.11–1.37)	3.63 (3.15–4.10)
	19–30	4.97 (4.66–5.29)	1.19 (1.14–1.24)	4.36 (3.83–4.88)
	31–50	5.54 (5.34–5.74)	1.17 (1.11–1.23)	5.00 (4.69–5.30)
	51+	5.30 (4.91–5.70)	1.32 (1.18–1.46)	4.19 (3.89–4.48)
	Total	5.17 (4.99–5.35)	1.22 (1.17–1.26)	4.47 (4.24–4.69)
Female	15–18	4.18 (3.92–4.43)	1.33 (1.23–1.43)	3.21 (3.03–3.39)
	19–30	4.38 (4.20–4.57)	1.39 (1.30–1.48)	3.30 (3.08–3.52)
	31–50	4.91 (4.76–5.07)	1.34 (1.29–1.39)	3.80 (3.66–3.95)
	51+	5.53 (5.20–5.86)	1.41 (1.35–1.47)	4.08 (3.78–4.39)
	Total	4.81 (4.67–4.94)	1.37 (1.33–1.40)	3.65 (3.52–3.78)
Pacific				
Males	15–18	[1]	[1]	[1]
	19–30	5.06 (4.70–5.42)	1.13 (1.05–1.21)	4.70 (4.17–5.22)
	31–50	5.21 (4.98–5.44)	1.29 (1.15–1.44)	4.30 (3.84–4.76)
	51+	5.06 (4.73–5.39)	1.16 (1.07–1.25)	4.53 (4.21–4.86)
	Total	4.97 (4.77–5.17)	1.20 (1.13–1.26)	4.38 (4.09–4.67)
Females	15–18	[1]	[1]	[1]
	19–30	4.43 (4.17–4.68)	1.24 (1.16–1.31)	3.75 (3.47–4.02)
	31–50	4.99 (4.76–5.21)	1.24 (1.19–1.28)	4.16 (3.93–4.39)
	51+	4.84 (4.54–5.15)	1.32 (1.21–1.42)	3.84 (3.54–4.14)
	Total	4.68 (4.52–4.84)	1.27 (1.22–1.31)	3.84 (3.69–3.99)

		Total cholesterol (mmol/L) Mean (95% CI)	HDL cholesterol (mmol/L) Mean (95% CI)	Total:HDL ratio Mean (95% CI)
NZEO				
Males	15–18	4.07 (3.90–4.24)	1.22 (1.17–1.27)	3.45 (3.27–3.62)
	19–30	4.81 (4.60–5.02)	1.25 (1.20–1.31)	3.96 (3.72–4.20)
	31–50	5.45 (5.32–5.58)	1.23 (1.19–1.27)	4.63 (4.47–4.79)
	51+	5.09 (4.98–5.21)	1.24 (1.21–1.28)	4.32 (4.15–4.49)
	Total	5.09 (5.01–5.18)	1.24 (1.22–1.26)	4.30 (4.20–4.41)
Females	15–18	4.49 (4.37–4.61)	1.34 (1.30–1.38)	3.46 (3.34–3.57)
	19–30	4.74 (4.59–4.88)	1.46 (1.40–1.52)	3.38 (3.22–3.55)
	31–50	5.06 (4.95–5.18)	1.51 (1.47–1.56)	3.50 (3.37–3.62)
	51+	5.75 (5.64–5.86)	1.60 (1.55–1.65)	3.81 (3.69–3.93)
	Total	5.22 (5.15–5.30)	1.52 (1.50–1.55)	3.59 (3.52–3.67)
By NZDep2006 quintile				
Males	1	5.10 (4.93–5.27)	1.26 (1.22–1.30)	4.19 (4.00–4.38)
	2	5.06 (4.89–5.23)	1.24 (1.18–1.29)	4.33 (4.08–4.57)
	3	5.12 (4.93–5.31)	1.29 (1.23–1.34)	4.18 (3.99–4.38)
	4	5.02 (4.85–5.18)	1.22 (1.17–1.26)	4.31 (4.10–4.52)
	5	5.14 (4.97–5.31)	1.16 (1.13–1.20)	4.60 (4.39–4.82)
Females	1	5.30 (5.11–5.49)	1.62 (1.56–1.68)	3.38 (3.22–3.55)
	2	5.26 (5.09–5.42)	1.54 (1.47–1.60)	3.61 (3.45–3.77)
	3	5.22 (5.09–5.35)	1.52 (1.47–1.58)	3.61 (3.46–3.76)
	4	5.07 (4.95–5.20)	1.43 (1.40–1.47)	3.68 (3.55–3.81)
	5	5.00 (4.87–5.14)	1.39 (1.34–1.44)	3.75 (3.62–3.88)

1 Results not reported due to small sample size.

8.5 Folate status

Folate[1] is essential for DNA synthesis, and is especially important during periods of increased cell replication and growth. Folate has a role in erythropoiesis (red blood cell formation/production), and therefore a deficiency in this vitamin can result in megaloblastic anaemia (Mann and Truswell 2007).

In addition, inadequate folic acid levels during pregnancy have been associated with an increased risk of neural tube defects (NTDs), a major group of birth defects in the developing foetus (MRC Vitamin Study Research Group 1991). To reduce the incidence of NTDs, the Ministry of Health recommends that women of child-bearing age who plan to become pregnant take 800 µg of folic acid daily for at least four weeks prior to conception and for 12 weeks after conceiving.

[1] 'Folate' is a generic term for compounds that have a common vitamin activity (COMA 2000) and includes both folic acid (a synthetic compound) and naturally occurring compounds in food.

Since 1996 voluntary fortification of selected foods (eg, breakfast cereals, flour, breads) with folic acid has been permitted. A standard for the mandatory fortification of bread with folic acid was to come into effect in September 2009, but the implementation of the standard was deferred for review in May 2012. In the interim, the bread industry has agreed to increase the fortification of bread with folic acid voluntarily. Because the 2008/09 NZANS took place before any increase in uptake of voluntary folic acid fortification, the results presented in this report will provide a baseline to which the effects of this increased voluntary fortification can be compared.

Reliable data on intake of naturally occurring folate and of folic acid (from fortified foods) are not available due to limitations in analytical techniques and because data for folic acid is largely based on the manufacturer's information on product labels, which is often higher than analytical values. However, folate status can be assessed by direct measurement of folate in serum and red blood cells. Red blood folate concentration is an indicator of long-term status, while serum folate indicates folate status at the time the blood sample was drawn.

Red blood folate concentration was calculated using measurements of whole blood folate, serum folate and haematocrit, as follows (Senti and Pilch 1985):

$$\text{RBC folate (units)} = \frac{\text{WB folate (units)} - (\text{serum folate (units)} \times (1 - \text{Hct}))}{\text{Hct}}$$

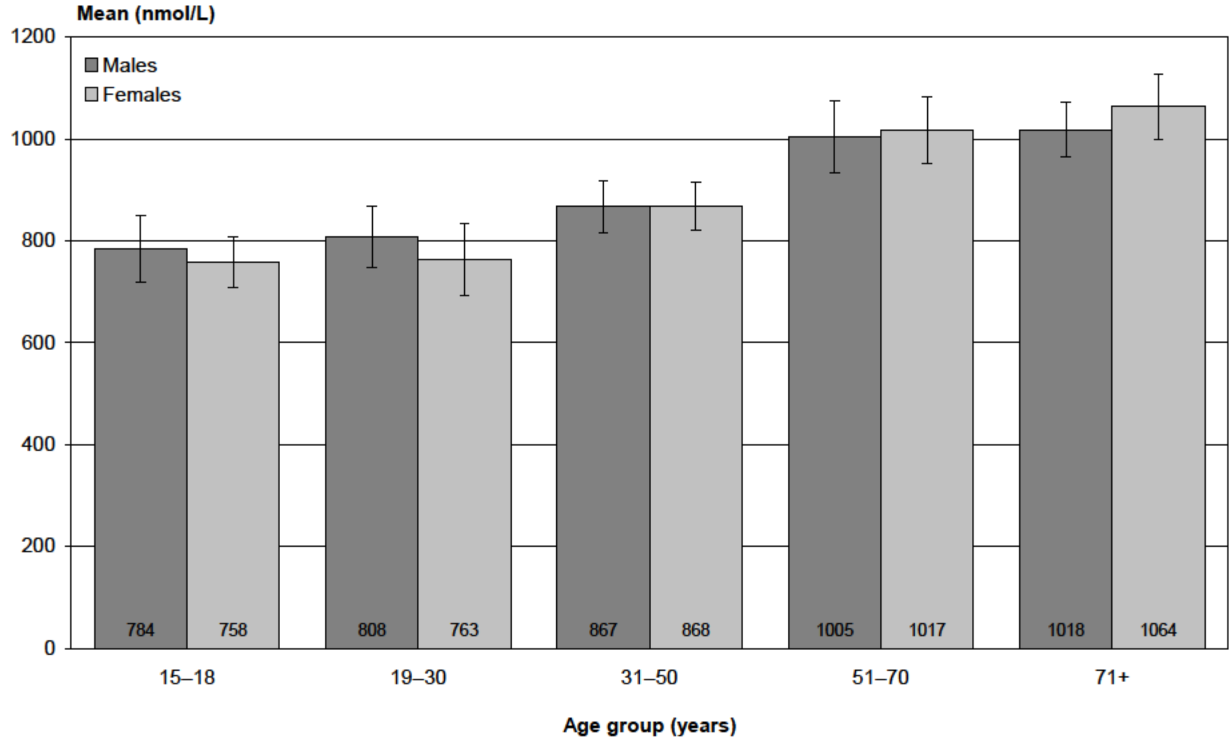
Measures of low folate status were defined as follows (Wright et al 1998):

- low red blood folate: < 317 nmol/L
- low serum folate: < 6.8 mmol/L.

Red blood folate

The mean red blood folate concentration in the New Zealand population was 900 nmol/L, with similar levels in males (899 nmol/L) and females (901 nmol/L) (Table 8.7). Mean red blood folate increased in males from 784 nmol/L (15–18 years) to 1018 nmol/L (71+ years), and in females from 758 nmol/L (15–18 years) to 1064 nmol/L (71+ years) (Figure 8.6).

Figure 8.6: Mean red blood cell folate (nmol/L), by age group and sex



Mean red blood folate concentrations did not differ between males and females or across age groups in Māori or Pacific people.

Males living in NZDep2006 quintile 5 had a lower mean red blood folate (794 nmol/L) than those in NZDep2006 quintile 1 (957 nmol/L). Overall, mean red blood folate decreased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Only 2.2% of the New Zealand population aged 15 years and over had low red blood folate (< 317 nmol/L).

The prevalence of low red blood folate was 7.6% in males living in NZDep2006 quintile 5, while all other quintiles were 1.0% or less. Overall, there was no gradient in the prevalence of low red blood folate across NZDep2006 quintiles after adjusting for age, sex and ethnic group.

Serum folate

The mean serum folate concentration was 29.0 nmol/L (Table 8.7). Females had a higher serum folate (31.1 nmol/L) than males (26.7 nmol/L).

Mean serum folate increased in females from 24.4 nmol/L (15–18 years) to 39.7 nmol/L (71+ years). Mean serum folate concentrations did not differ between males and females or across age groups in Māori or Pacific people.

Females living in NZDep2006 quintile 1 had a mean serum folate of 36.0 nmol/L compared to 26.0 nmol/L among those living in NZDep2006 quintile 5. Overall, mean serum folate concentrations decreased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Overall, 1.6% of the population had low serum folate (< 6.8 nmol/L).

In quintile 5, 2.9% of females had low serum folate. Overall, the prevalence of low serum folate increased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Folate status among women of child-bearing age (16–44 years)

Low serum folate and red blood levels have been associated with increasing risk of NTDs in a continuous dose–response relationship (Daly et al 1995). Red blood folate levels are presented here because they represent long-term folate status and are not influenced by recent dietary intake. Red blood folate levels ≥ 906 nmol/L are associated with a very low risk of NTDs, and levels ≤ 339 nmol/L are associated with a high risk.

Among women of child-bearing age, 27% had levels associated with a low risk of NTDs (≥ 906 nmol/L) and 4% had red blood folate levels associated with a high risk of NTDs (≤ 339 nmol/L).

Table 8.7: Folate, by age group, ethnic group, NZDep2006 and sex

		Red blood cell folate (nmol/L)		Serum folate (nmol/L)	
		Mean (95% CI)	**% low[1] (95% CI)**	**Mean (95% CI)**	**% low[2] (95% CI)**
Total population		900 (877–922)	2.2 (1.4–2.9)	29.0 (27.9–30.1)	1.6 (1.1–2.2)
By age group (years)					
Males	15–18	784 (720–849)	1.0 (0.2–3.0)	26.4 (23.5–29.4)	2.3 (0.4–4.2)
	19–30	808 (747–869)	4.5 (0.2–8.0)	24.0 (21.7–26.3)	2.9 (0.5–8.5)
	31–50	867 (817–918)	1.6 (0.1–3.1)	24.7 (22.8–26.7)	1.8 (0.2–3.5)
	51–70	1005 (934–1076)	0.4 (0.1–1.1)	29.9 (25.8–33.9)	0.5 (0.0–1.1)
	71+	1018 (964–1072)	2.0 (0.6–3.3)	31.6 (27.8–35.4)	1.8 (0.6–3.0)
	Total	899 (866–931)	1.8 (0.8–2.9)	26.7 (25.2–28.2)	1.7 (0.8–2.7)
Females	15–18	758 (708–808)	3.3 (0.8–5.7)	24.4 (22.4–26.4)	1.8 (0.1–3.5)
	19–30	763 (692–834)	5.3 (1.1–9.6)	29.2 (25.2–33.2)	1.8 (0.4–5.0)
	31–50	868 (821–915)	2.4 (0.7–4.1)	29.1 (26.2–32.0)	1.8 (0.4–3.1)
	51–70	1017 (952–1083)	1.0 (0.0–2.0)	33.8 (30.8–36.8)	1.3 (0.0–2.6)
	71+	1064 (999–1128)	1.1 (0.1–2.1)	39.7 (34.2–45.1)	0.8 (0.1–1.5)
	Total	901 (870–932)	2.5 (1.4–3.6)	31.1 (29.4–32.8)	1.6 (0.8–2.3)
Māori					
Male	15–18	741 (576–906)	0.0	25.6 (17.1–34.2)	0.0
	19–30	727 (637–817)	6.4 (0.2–30.6)	22.1 (17.6–26.7)	0.0
	31–50	850 (717–982)	0.5 (0.0–3.0)	26.7 (23.3–30.2)	1.3 (0.0–7.9)
	51+	860 (735–986)	1.4 (0.0–8.3)	28.7 (23.0–34.5)	1.2 (0 .0- 7.0)
	Total	804 (737–872)	2.2 (0.2–8.6)	25.7 (23.5–27.9)	0.7 (0.1–2.9)

		Red blood cell folate (nmol/L)		Serum folate (nmol/L)	
		Mean (95% CI)	% low[1] (95% CI)	Mean (95% CI)	% low[2] (95% CI)
Female	15–18	742 (637–847)	7.6 (1.3–21.8)	20.4 (17.1–23.6)	1.3 (0.0–7.7)
	19–30	751 (672–830)	0.9 (0.0–5.7)	34.0 (19.0–49.0)	4.3 (0.7–12.8)
	31–50	763 (690–837)	3.0 (0.1–5.8)	24.2 (21.4–27.0)	2.4 (0.5–6.6)
	51+	901 (803–998)	2.2 (0.2–8.5)	29.1 (25.3–32.9)	1.4 (0.2–4.4)
	Total	785 (739–830)	2.8 (1.0–4.5)	27.5 (23.1–32.0)	2.6 (0.7–4.5)
Pacific					
Males	15–18	[3]	[3]	[3]	[3]
	19–30	753 (668–837)	0.0	20.1 (16.0–24.3)	0.0
	31–50	691 (617–765)	5.4 (0.4–19.3)	19.1 (16.0–22.3)	2.3 (0.5–6.6)
	51+	822 (691–953)	9.1 (1.5–25.2)	22.0 (17.7–26.2)	7.1 (1.2–20.8)
	Total	739 (690–787)	3.2 (0.2–6.3)	20.9 (18.6–23.1)	2.0 (0.3–5.7)
Females	15–18	[3]	[3]	[3]	[3]
	19–30	709 (629–789)	4.6 (0.3–16.7)	19.5 (16.0–23.0)	4.5 (0.3–16.8)
	31–50	711 (647–774)	0.9 (0.0–5.2)	21.5 (19.2–23.9)	1.0 (0.0–6.2)
	51+	789 (688–890)	0.0	27.0 (22.9–31.1)	0.0
	Total	734 (693–774)	2.4 (0.0–4.8)	22.3 (20.2–24.4)	1.7 (0.3–5.2)
NZEO					
Males	15–18	808 (735–880)	1.2 (0.2–3.6)	26.6 (23.4–29.8)	2.8 (0.5–5.2)
	19–30	829 (755–903)	4.4 (0.9–12.4)	24.4 (21.7–27.1)	3.5 (0.6–10.3)
	31–50	878 (822–934)	1.4 (0.2–4.2)	24.7 (22.6–26.9)	1.9 (0.1–3.8)
	51+	1025 (966–1084)	0.5 (0.1–0.8)	30.7 (27.3–34.1)	0.6 (0.2–1.1)
	Total	919 (882–955)	1.6 (0.5–2.6)	27.0 (25.4–28.7)	1.8 (0.8–2.8)
Females	15–18	749 (692–805)	3.1 (0.5–5.7)	24.8 (22.7–27.0)	2.1 (0.2–4.1)
	19–30	771 (688–854)	5.7 (0.7–10.7)	29.5 (25.7–33.2)	1.1 (0.0–5.5)
	31–50	889 (836–942)	2.3 (0.4–4.3)	30.1 (26.8–33.3)	1.8 (0.3–3.4)
	51+	1043 (988–1099)	1.0 (0.2–1.7)	36.1 (33.2–39.0)	1.3 (0.2–2.3)
	Total	918 (884–953)	2.5 (1.3–3.7)	31.9 (30.1–33.7)	1.5 (0.7–2.3)
By NZDep2006 quintile					
Males	1	957 (882–1032)	0.2 (0.0–0.8)	29.2 (24.8–33.7)	0.1 (0.0–0.4)
	2	890 (838–943)	0.3 (0.1–1.0)	26.2 (23.1–29.3)	1.6 (0.2–5.2)
	3	983 (887–1078)	0.4 (0.1–1.2)	27.5 (24.6–30.3)	0.8 (0.0–1.5)
	4	863 (802–924)	1.0 (0.1–1.9)	25.7 (23.0–28.4)	2.3 (0.4–7.0)
	5	794 (733–856)	7.6 (2.5–12.6)	24.6 (21.9–27.4)	4.3 (1.0–7.5)
Females	1	957 (867–1048)	3.5 (0.8–9.1)	36.0 (30.5–41.5)	1.2 (0.0–5.7)
	2	954 (897–1011)	0.2 (0.0–0.9)	34.7 (30.6–38.8)	0.7 (0.1–2.1)
	3	914 (831–998)	4.6 (1.1–8.1)	31.7 (28.0–35.4)	1.7 (0.3–5.1)
	4	831 (780–881)	2.8 (0.5–5.2)	27.3 (24.9–29.7)	1.4 (0.4–2.3)
	5	846 (792–900)	1.9 (0.7–3.1)	26.0 (23.5–28.5)	2.9 (0.7–5.1)

1 < 317 nmol/L (Senti and Pilch 1985).

2 < 68 nmol/L (Senti and Pilch 1985).

3 Results not reported due to small sample size.

8.6 Diabetes and HbA1c

Diabetes is a metabolic condition which results in raised blood glucose. It is an important cause of morbidity and mortality in New Zealand. The presence of diabetes can lead to cardiovascular disease, blindness, kidney disease and vascular insufficiency. These vascular problems may lead to nerve damage in the feet, or amputation of the lower leg (Powers 2005).

Measurement of glycated haemoglobin (HbA1c) is the standard method for assessing long-term glycaemic (blood glucose level) control (over the previous 6–8 weeks) in people with diabetes (Powers 2005). It is the primary predictor of long-term complications of diabetes, with an HbA1c < 7.0% being the target for most people with diabetes (Powers 2011). HbA1c can also be used as a diagnostic test for diabetes, with the diagnosis of diabetes made if HbA1c ≥ 6.5% (International Expert Committee 2009; World Health Organization 2011).

In the 2008/09 NZANS participants were asked if they had ever been told by a doctor that they have diabetes (other than during pregnancy) and HbA1c levels were measured in blood.

Mean HbA1c

The mean HbA1c level was 5.57%, with similar levels for males (5.62%) and females (5.52%) (Table 8.8). Males and females aged 71+ years (6.01% and 5.52% respectively) had the highest levels of HbA1c, and there was a consistent upward trend from 19–30 years through to 71+ years for both males and females.

Mean HbA1c levels were highest in those aged 51+ years for Māori and Pacific males and females. There was a marked upward trend in HbA1c in both Māori and Pacific males and in females from 19–30 years to 51+ years.

Females living in NZDep2006 quintile 5 had higher mean levels of HbA1c than females living in NZDep2006 quintile 1. Overall, mean HbA1c levels increased with increasing neighbourhood deprivation, after adjusting for age, sex and ethnic group.

Prevalence of diabetes

The prevalence of total diabetes has been calculated by combining the prevalence of diabetes diagnosed by a doctor and the prevalence of undiagnosed diabetes (not diagnosed by a doctor and HbA1c ≥ 6.5%). The denominator for diagnosed diabetes includes all participants, whereas the denominator for undiagnosed diabetes only includes participants who reported they had not been diagnosed with diabetes and provided a blood sample. Therefore, total diabetes is not equal to the sum of diagnosed and undiagnosed because the denominators differ.

The survey revealed that 4.9% of the population 15 years and over had doctor-diagnosed diabetes (excluding diabetes during pregnancy) (males 6.0%; females 4.0%) (Table 8.8). Among the population not diagnosed with diabetes and who provided a blood sample, 2.0% had HbA1c levels ≥ 6.5%, which is indicative of undiagnosed diabetes (males 2.4%; females 1.6%). The total prevalence of diabetes in the population 15 years and over (both doctor-diagnosed and undiagnosed) was 7.1% (males 8.4%; females 5.9%).

The prevalence of diabetes may be underestimated as undiagnosed diabetes could not be determined for participants who did not provide a blood sample.

Diabetes management

Measurement of glycated haemoglobin (HbA1c) is the standard method for assessing long-term glycaemic (blood glucose level) control (over the previous 6–8 weeks) in people with diabetes. Just under half (48.5%) of the total population 15 years and over had HbA1c levels < 7.0%, indicating good control of blood glucose levels (males 48.1%; females 48.9%) (Table 8.8).

Table 8.8: HbA1c, by age group, ethnic group, NZDep2006 and sex

		HbA1c (%)	Prevalence of diabetes			Diabetes management
		Mean (95% CI)	**Diagnosed by a doctor**	**Undiagnosed diabetes (not diagnosed by a doctor and HbA1c ≥ 6.5%)**	**Total[1]**	**Good management among those diagnosed with diabetes (HbA1c < 7.0%)**
Total population		5.57 (5.54–5.60)	4.9 (4.2–5.7)	2.0 (1.4–2.6)	7.1 (6.0–8.1)	48.5 (39.9–57.0)
By age group (years)						
Males	15–18	5.28 (5.22–5.33)	0.2[#]	0.4 (0.0–2.3)	0.7 (0.1–2.5)	[1]
	19–30	5.28 (5.21–5.36)	0.1[#]	1.1 (0.0–7.1)	1.6 (0.0–8.6)	[1]
	31–50	5.60 (5.49–5.71)	2.4 (0.9–3.8)	2.4 (0.9–5.2))	5.6 (2.9–8.4)	38.2 (2.1–90.6)
	51–70	5.87 (5.76–5.97)	12.8 (8.3–17.2)	3.1 (1.2–6.5)	14.3 (9.6–18.9)	41.9 (14.1–74.2)
	71+	6.01 (5.93–6.09)	18.0 (13.1–22.9)	6.1 (3.4–10.0)	23.7 (18.4–29.1)	63.2 (49.5–76.9)
	Total	5.62 (5.57–5.68)	6.0 (4.6–7.3)	2.4 (1.4–3.5)	8.4 (6.5–10.2)	48.1 (35.2–61.0)
Females	15–18	5.22 (5.17–5.27)	0.0	0.0	0.0	[1]
	19–30	5.22 (5.17–5.27)	0.1[#]	0.2 (0.0–1.2)	0.5 (0.1–1.4)	[1]
	31–50	5.44 (5.38–5.50)	2.4 (1.3–4.1)	1.6 (0.8–3.0)	4.5 (2.7–6.4)	51.6 (0.1–99.9)
	51–70	5.76 (5.69–5.83)	7.0 (4.5–9.5)	2.0 (1.1–3.5)	8.9 (5.9–11.9)	49.8 (26.6–73.0)
	71+	5.97 (5.89–6.05)	12.1 (8.6–15.5)	4.7 (2.6–7.7)	16.8 (12.5–21.1)	45.7 (28.9–62.6)
	Total	5.52 (5.48–5.56)	4.0 (3.1–4.8)	1.6 (1.1–2.1)	5.9 (4.8–6.9)	48.9 (35.9–61.9
Māori						
Male	15–18	5.32 (5.20–5.45)	0.0	0.0	0.0	[1]
	19–30	5.45 (5.37–5.53)	0.0	0.0	0.0	[1]
	31–50	6.18 (5.67–6.69)	6.1 (1.7–14.8)	2.7 (0.6–7.4)	10.7 (4.6–20.3)	[1]
	51+	6.50 (5.91–7.09)	20.9 (12.3– 32.0)	5.3 (0.7–17.3)	26.8 (15.6–40.5)	[1]
	Total	5.93 (5.70–6.16)	6.8 (4.3–9.3)	2.0 (0.7–4.4)	9.7 (6.0–13.5)	25.7 (8.8–50.6)
Female	15–18	5.29 (5.13–5.46)	0.0	0.0	0.0	[1]
	19–30	5.38 (5.28–5.48)	0.4[#]	1.3 (0.0–7.5)	2.2 (0.2–8.1)	[1]
	31–50	5.59 (5.49–5.69)	5.0 (0.7–15.6)	3.4 (1.3–7.1)	8.0 (3.9–14.1)	[1]
	51+	6.27 (6.00–6.53)	23.8 (15.1– 32.5)	5.1 (1.5–12.1)	28.4 (16.9–40.0)	42.6 (13.7–75.8)
	Total	5.64 (5.55–5.73)	7.1 (4.7–9.5)	2.7 (1.4–4.6)	9.8 (6.5–13.1)	44.0 (19.2–71.3)

		HbA1c (%)	Prevalence of diabetes			Diabetes management
		Mean (95% CI)	Diagnosed by a doctor	Undiagnosed diabetes (not diagnosed by a doctor and HbA1c ≥ 6.5%)	Total[1]	Good management among those diagnosed with diabetes (HbA1c < 7.0%)
Pacific						
Males	15–18	[2]	0.0	0.0	0.0	[2]
	19–30	5.52 (5.35–5.69)	1.2#	9.1 (0.6–34.0)	12.1 (1.8–35.6)	[2]
	31–50	6.00 (5.72–6.29)	8.4 (3.9–15.1)	4.9 (1.8–10.3)	11.6 (5.7–20.2)	[2]
	51+	6.76 (6.22–7.30)	22.7 (12.8–35.6)	18.2 (4.2–43.4)	38.3 (23.4–54.9)	[2]
	Total	5.83 (5.66–6.00)	7.8 (5.4–10.2)	7.9 (2.6–17.6)	14.8 (7.0–22.6)	[2]
Females	15–18	[2]	0.0	0.0	0.0	[2]
	19–30	5.41 (5.30–5.52)	0.7 #	0.0	1.3 (0.0–7.6)	[2]
	31–50	6.17 (5.82–6.53)	9.2 (4.3–16.8)	8.8 (3.7–16.8)	18.6 (10.9–28.8)	[2]
	51+	6.35 (6.04–6.66)	21.4 (12.7–32.5)	17.6 (6.7–34.5)	37.3 (22.9–53.5)	[2]
	Total	5.87 (5.70–6.04)	8.0 (5.5–10.4)	6.2 (3.5–10.2)	14.9 (10.7–19.2)	[2]
NZEO						
Males	15–18	5.29 (5.23–5.34)	0.2#	0.5 (0.0–2.8)	0.8 (0.1–3.0)#	[2]
	19–30	5.23 (5.14–5.32)	0.0	0.0	0.0	[2]
	31–50	5.50 (5.40–5.60)	1.5 (0.0–46.8)	2.1 (0.6–5.5)	4.4 (1.9–8.6)	[2]
	51+	5.85 (5.77–5.93)	13.3 (9.5–17.2)	3.2 (1.5–5.9)	15.3 (11.3–19.3)	51.1 (36.0–66.2)
	Total	5.57 (5.51–5.62)	5.6 (4.0–7.2)	2.0 (1.0–3.0)	7.5 (5.6–9.3)	50.8 (34.9–66.6)
Females	15–18	5.22 (5.17–5.26)	0.0	0.0	0.0	[2]
	19–30	5.19 (5.13–5.25)	0.1#	0.0	0.2 (0.0–0.9)	[2]
	31–50	5.38 (5.32–5.43)	1.5 (0.1–6.9)	1.0 (0.2–2.8)	3.1 (1.4–5.9)	[2]
	51+	5.77 (5.71–5.82)	7.1 (4.8–9.4)	2.2 (1.3–3.6)	9.3 (6.6–11.9)	51.9 (34.3–69.5)
	Total	5.48 (5.44–5.52)	3.3 (2.4–4.2)	1.2 (0.7–1.8)	4.7 (3.5–5.9)	52.3 (35.5–69.2)
By NZDep2006 quintile						
Males	1	5.57 (5.49–5.66)	5.7 (2.2–11.8)	1.5 (0.2–5.2)	8.3 (3.6–12.9)	[2]
	2	5.50 (5.38–5.63)	4.2 (1.2–10.4)	2.4 (0.5–7.0)	7.4 (3.2–14.3)	[2]
	3	5.64 (5.50–5.78)	5.5 (2.2–10.9)	2.9 (0.7–8.0)	8.7 (4.3–13.1)	[2]
	4	5.63 (5.51–5.74)	6.2 (3.6–8.9)	3.0 (1.0–6.7)	8.7 (5.0–12.3)	40.2 (11.9–74.5)
	5	5.77 (5.62–5.92)	8.5 (4.9–12.1)	2.5 (1.3–4.3)	8.9 (5.2–12.6)	40.8 (11.3–76.4)
Females	1	5.48 (5.39–5.57)	2.6 (0.7–6.3)	0.5 (0.1–2.0)	3.5 (1.5–7.0)	[2]
	2	5.47 (5.41–5.52)	2.1 (1.1–3.8)	1.1 (0.4–2.5))	3.4 (1.7–5.1)	[2]
	3	5.45 (5.38–5.52)	3.4 (1.7–6.0)	0.5 (0.1–1.3)	4.8 (2.0–7.6)	[2]
	4	5.54 (5.46–5.62)	4.3 (2.2–6.4)	2.8 (1.4–5.0)	6.9 (4.6–9.2)	47.1 (8.8–88.3)
	5	5.68 (5.58–5.77)	7.8 (5.3–10.2)	3.2 (1.7–5.6)	10.9 (7.6–14.2)	44.7 (23.0–68.0)

1 Total diabetes is not equal to the sum of diagnosed and undiagnosed because the denominators differ.

2 Results not reported due to small sample size.

Confidence interval could not be calculated. Estimate should be interpreted with caution.

8.7 Iodine status

Iodine is an essential component of thyroid hormones, which play a critical role in maintaining the body's metabolic rate and normal growth and mental development. There is a wide spectrum of iodine deficiency disorders (IDDs) affecting all life-cycle groups, from the foetus to adult. Mild to moderate iodine deficiency causes a range of disorders, including goitre (enlarged thyroid gland) and hypothyroidism. Severe iodine deficiency during foetal development impairs mental development (Mann and Truswell 2007).

More than 90% of iodine is excreted in the urine, so urinary iodine is a good indicator of recent iodine status. The following International Council for the Control of Iodine Deficiency Disorders (WHO 2007) cut-offs for iodine deficiencies were used to assess iodine deficiency. Where urinary iodine concentration was measured as 0–10 µg/L, it was replaced with the value 10 µg/L, which is the lowest detectable limit of the assay (ICCIDD 2000):

- mild iodine deficiency: median urinary iodine concentration 50–99 µg/L
- moderate iodine deficiency: median urinary iodine concentration 20–49 µg/L.

Median urinary iodine concentration

The median urinary iodine concentration (MUIC) of the New Zealand population aged 15 years and over was 53 µg/L (males 55 µg/L; females 50 µg/L), which indicates mild iodine deficiency. MUICs were similar across all age groups (Table 8.9).

The MUIC was 55 µg/L for Māori males and 57 µg/L for Māori females; 74 µg/L for Pacific males and 72 µg/L for Pacific females.

In the general population 47% had urinary iodine concentrations < 50 µg/L and 79% had concentrations < 100 µg/L. The ICCIDD suggests that no more than 20% of a population should have urinary iodine concentration below 50 µg/L (moderate deficiency).

The proportion of the population with an MUIC < 50 and < 100 µg/L was similar for males and females in all three ethnic groups. The proportion of the population with an MUIC < 50 and < 100 µg/L was also similar across all NZDep2006 quintiles. Overall, there was no gradient in median urinary iodine concentration across NZDep2006 quintiles after adjusting for age, sex and ethnic group.

Table 8.9: Urinary iodine, by age group, ethnic group, NZDep2006 and sex

		Median (µg/L)[1]	% <50 µg/L[2]	%<100 µg/L[2]
Total population		53 (50–56)	47 (44–50)	79 (77–81)
By age group (years)				
Males	15–18	52 (45–58)	46 (37–56)	80 (71–87)
	19–30	57 (51–66)	39 (30–49)	79 (70–86)
	31–50	52 (47–60)	47 (40–54)	81 (75–85)
	51–70	58 (49–68)	44 (38–51)	76 (70–81)
	71+	66 (59–75)	38 (31–45)	71 (65–76)
	Total	55 (52–61)	44 (40–48)	78 (75–81)
Females	15–18	53 (49–61)	45 (38–52)	78 (70–84)
	19–30	48 (42–55)	51 (42–60)	82 (75–87)
	31–50	46 (42–55)	53 (46–59)	82 (77–86)
	51–70	53 (45–60)	48 (41–54)	80 (75–85)
	71+	56 (49–64)	45 (39–51)	73 (67–79)
	Total	50 (47–55)	50 (46–54)	80 (78–83)
Māori				
Male	15–18	43 (30–76)	52 (28–75)	83 (55–95)
	19–30	53 (39–74)	45 (28–64)	79 (57–92)
	31–50	54 (41–67)	42 (30–55)	84 (73–91)
	51+	64 (46–86)	38 (23–55)	68 (55–78)
	Total	55 (47–65)	43 (35–53)	79 (70–86)
Female	15–18	49 (43–65)	49 (29–69)	80 (59–92)
	19–30	54 (42–64)	42 (29–57)	89 (81–94)
	31–50	56 (42–67)	46 (36–56)	79 (68–86)
	51+	63 (50–77)	39 (29–51)	70 (55–81)
	Total	57 (50–63)	44 (37–51)	80 (74–85)
Pacific				
Males	15–18	[3]	[3]	[3]
	19–30	68 (49–89)	34 (18–55)	73 (55–86)
	31–50	80 (67–92)	30 (20–44)	70 (55–82)
	51+	96 (73–123)	24 (13–39)	54 (39–68)
	Total	74 (64–91)	30 (21–42)	68 (58–76)
Females	15–18	[3]	[3]	[3]
	19–30	66 (45–95)	39 (25–55)	68 (50–82)
	31–50	78 (65–94)	24 (16–35)	63 (51–75)
	51+	72 (56–90)	28 (17–43)	65 (50–78)
	Total	72 (64–90)	30 (23–38)	65 (55–73)

		Median (μg/L)[1]	% <50 μg/L[2]	%<100 μg/L[2]
NZEO				
Males	15–18	53 (46–57)	46 (37–56)	80 (71–87)
	19–30	56 (51–67)	37 (27–49)	79 (68–87)
	31–50	51 (45–58)	48 (40–57)	81 (74–87)
	51+	58 (50–66)	44 (38–50)	76 (71–81)
	Total	55 (51–60)	44 (40–49)	79 (75–82)
Females	15–18	50 (47–56)	49 (41–56)	80 (73–86)
	19–30	47 (39–54)	53 (42–64)	83 (75–89)
	31–50	45 (41–52)	55 (48–62)	84 (78–88)
	51+	52 (47–59)	48 (43–53)	79 (75–83)
	Total	48 (45–53)	51 (47–56)	82 (79–84)
By NZDep2006 quintile				
Males	1	55 (47–64)	45 (36–53)	78 (70–84)
	2	51 (45–63)	48 (38–57)	81 (73–88)
	3	56 (47–64)	46 (37–55)	84 (76–89)
	4	55 (48–61)	44 (36–52)	78 (69–85)
	5	66 (54–81)	36 (29–44)	69 (62–75)
Females	1	51 (44–57)	49 (42–56)	83 (76–88)
	2	45 (38–57)	54 (45–62)	80 (73–85)
	3	48 (42–61)	51 (43–59)	86 (80–90)
	4	48 (43–56)	52 (45–59)	77 (70–83)
	5	56 (50–63)	42 (36–49)	76 (71–81)

1 Mild iodine deficiency: median urinary iodine concentration 50–99 μg/L; moderate iodine deficiency: median urinary iodine concentration 20–49 μg/L; severe iodine deficiency: median urinary iodine concentration < 20 μg/L.

2 WHO/UNICEF/ICCIDD recommend that no more than 50% of the population have a MUIC < 100 ug/L, and no more than 20% have a MUIC < 50 ug/L.

3 Results not reported due to small sample size.

9 Have We Changed?

Data from the 2008/09 NZANS have been compared to data from the 1997 National Nutrition Survey. These surveys were similar in many respects: they had the same target population, similar sample sizes and response rates; they collected data via face-to-face interviews in the participants' homes; they used the same electronic multiple-pass 24-hour diet recall and protocols for anthropometric measurements; and they included some of the same questions. However, caution is still advised when comparing data across surveys because there were some differences in survey design and data collection methods (see Table 9.1), and these may influence the comparability of the results.

All data have been analysed using the same definitions and cut-offs. Where definitions or cut-offs used in the original survey analyses differed to those used in the 2008/09 NZANS, earlier data have been re-analysed to ensure comparability. For example, data from the 1997 National Nutrition Survey were re-analysed using the BMI cut-offs for overweight and obesity used in the 2008/09 NZANS.

Crude data are presented in this chapter for indicators considered comparable between surveys. For some indicators included in both surveys, data were not considered to be comparable due to differences in instruments (eg, blood pressure) or question wording (eg, dietary supplements). A comment is made in the text if there was a statistically significant increase or decrease from 1997 to 2008/09, as determined by non-overlapping 95% confidence intervals.

Because the age and ethnic structure of the New Zealand population changed between 1997 and 2008/09, time trends have also been examined for all indicators after adjusting for age and ethnicity. For most indicators this adjustment did not affect the direction of changes (ie, increase or decrease) and so no further comment is made in the text. 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 it is indicated by a footnote in the table and an additional comment is made in the text.

Further analysis of selected time trends for Māori and non-Māori will be included in a supplementary report published in late 2011. Time trends for Pacific people are unavailable due to the small sample of Pacific people in the 1997 National Nutrition Survey.

Table 9.1: Summary of design and methods of the adult nutrition surveys

	1997 National Nutrition Survey	**2008/09 NZANS**
Target population	Usually resident, non-institutionalised, civilian adult population (15+ years) living in permanent private dwellings	Usually resident, non-institutionalised, civilian adult population (15+ years) living in permanent private dwellings
Sampling frame	Area-based frame	Area-based frame
Design	Linked to the 1996/97 New Zealand Health Survey, which had a complex, cluster sampling design	Multi-stage, stratified, probability-proportional-to-size (PPS) sampling design
Oversampling	New Zealand Māori and Pacific people	New Zealand Māori and Pacific people; some age groups (15–18, 70+ years)
Recruitment agency	Statistics New Zealand	CBG Health Research Ltd
Data collection agency	University of Otago	University of Otago
Data collection period	December 1996 to November 1997	October 2008 to October 2009
Location of data collection	Participant's home	Participant's home (local clinic for blood)
Day of primary interview	Monday 14.5%, Tuesday 17.5% , Wednesday 17.7%, Thursday 17.0%, Friday 12.9%, Saturday 11.4%, Sunday 9.0%	Monday 16.0%, Tuesday 17.2% , Wednesday 19.1%, Thursday 16.7%, Friday 13.5%, Saturday 9.3%, Sunday 8.2%
Sample size	24-hour recall: 4636 Repeat 24-hour recall: 695 Anthropometry: 4420 Blood: 3369	24-hour recall: 4721 Repeat 24-hour recall: 1180 Anthropometry: 4503 Blood: 3348
Response rate	50% (taking into account response rate of 1996/97 New Zealand Health Survey)	61%
24-hour diet recall	Computer based Three pass Detailed probe questions Repeat on subsample (15%)	Computer based Three pass Detailed probe questions Repeat on subsample (25%)
Questionnaires	Self-administered qualitative Food Frequency Questionnaire, checked with participant by interviewer and electronically scanned. Interviewer-administered (CAPI) questionnaire, including modules on dietary supplements and food security.	Interviewer-administered (CAPI) questionnaire, including modules on dietary habits, nutrition-related health and food security.
Anthropometric measurements	Participant in light clothing, no shoes	Participant in light clothing, no shoes
Biochemical measures	Non-fasting blood sample	Non-fasting blood sample and spot urine

9.1 Energy and macronutrient intakes

There was a decrease in the reported mean daily energy intake in 2008/09 compared to that reported in 1997 (Table 9.2), although the decrease for females was not significant. This reported decrease in energy intake is inconsistent with trends in body size. The increase in mean body weight, BMI and obesity prevalence suggests that energy balance is unbalanced, with energy ‘in’ exceeding energy ‘out’. This survey did not assess energy expenditure, so further research is required to explore the underlying reasons for the reported decrease in energy intake from 1997 to 2008/09.

From 1997 to 2008/09 the contribution of total fat to energy in the diet decreased for males (35.4% to 33.7%), with a small but not significant decrease for females (34.5% to 33.8%) (Table 9.2). The proportion of energy from saturated fat decreased for both males (15.1% to 13.1%) and females (14.7% to 13.1%), while the proportion of energy from monounsaturated fat increased for both males (11.8% to 12.4%) and females (11.4% to 12.3%). This decrease in total fat has been offset by an increased proportion of energy coming from protein for males and females.

Table 9.2: Energy intake and contribution from macronutrients, by sex, 1997 and 2008/09

Indicator	Sex	1997 NNS (95% CI)	2008/09 NZANS (95% CI)	Trend from 1997 to 2008/09
Mean energy (MJ) intake	Males	12.0 (11.7–12.2)	10.7 (10.4–11.1)	↓
	Females	8.0 (7.8–8.1)	7.6 (7.5–7.8)	nc
Percent energy from protein	Males	15.4 (15.1–15.7)	16.4 (16.2–16.7)	↑
	Females	15.8 (15.6–16.1)	16.5 (16.2–16.8)	↑
Percent energy from total fat	Males	35.4 (34.8–35.9)	33.7 (33.1–34.3)	↓
	Females	34.5 (34.0–35.0)	33.8 (33.2–34.3)	nc
Percent energy from saturated fat	Males	15.1 (14.7–15.4)	13.1 (12.8–13.4)	↓
	Females	14.7 (14.4–15.0)	13.1 (12.8–13.4)	↓
Percent energy from monounsaturated fat	Males	11.8 (11.6–12.0)	12.4 (12.2–12.7)	↑
	Females	11.4 (11.2–11.6	12.3 (12.1–12.5)	↑
Percent energy from polyunsaturated fat	Males	5.0 (4.8–5.1)	4.8 (4.6–4.9)	nc
	Females	4.9 (4.8–5.0)	4.9 (4.8–5.1)	nc
Percent energy from carbohydrate	Males	45.0 (44.3–45.6)	46.0 (45.3–46.6)	nc
	Females	47.3 (46.8–47.8)	47.1 (46.6–47.7)	nc

Notes:

These figures are not adjusted for intra-individual variation. Percent energy from macronutrients was calculated using the following conversion factors: 16.7 kJ/g for carbohydrate, 16.7 kJ/g for protein, and 37.7 kJ/g for fat).

nc = No change

9.2 Selected nutrient intakes

The intake of many nutrients by the New Zealand population aged 15 years and over was similar in 1997 and 2008/09, but there were some differences (Table 9.3). Median intakes of vitamin B_6 and selenium increased in both males and females. For females, there was an increase in median intake of vitamin E. Median intakes of several nutrients also dropped for both males and females, including vitamin A, zinc and potassium. The drop in vitamin A is due to a decreased intake of both plant sources (β-carotene) and animal sources (retinol). For males, there was a decline in median intake of sucrose, vitamin C and iron. After adjusting for age and ethnicity, there was an increase in the median intake of riboflavin for males and females, and calcium for males, and a decrease in the median intake of thiamin for females.

Table 9.3: Median usual daily nutrient intakes, by sex, 1997 and 2008/09

Nutrient	Male			Female		
	1997 NNS (95% CI)	2008/09 NZANS (95% CI)	Trend from 1997 to 2008/09	1997 NNS (95% CI)	2008/09 NZANS (95% CI)	Trend from 1997 to 2008/09
Sucrose (g)	62 (60–64)	55 (51–59)	↓	45 (43–47)	42 (40–44)	nc
Fructose (g)	23 (22–24)	22 (20–23)	nc	19 (18–19)	18 (17–19)	nc
Lactose (g)	14 (13–15)	14 (14–15)	nc	12 (12–13)	12 (12–13)	nc
Total dietary fibre (mg)	23 (23–24)	22 (21–23)	nc	18 (17–18)	18 (17–18)	nc
Total vitamin A (µg RE)	1076 (1013–1138)	846 (802–890)	↓	842 (802–882)	727 (692–762)	↓
β-carotene (µg)	3177 (2901–3453)	2598 (2294–2902)	nc	2800 (2615–2985)	2564 (2362–2766)	nc
Retinol (µg)	485 (453–517)	393 (365–421)	↓	334 (323–345)	281 (265–297)	↓
Vitamin C (mg)	111 (106–116)	99 (93–105)	↓	95 (90–100)	99 (93–105)	nc
Vitamin E (mg)	11.2 (10.9–11.5)	11.5 (11.0–12.0)	nc	8.4 (8.1–8.7)	9.1 (8.8–9.4)	↑
Thiamin (mg)	1.7 (1.6–1.7)	1.6 (1.5–1.7)	nc	1.2 (1.2–1.2)	1.1 (1.0–1.2)	nc[2]
Riboflavin (mg)	2.0 (2.0–2.1)	2.2 (2.1–2.3)	nc[1]	1.5 (1.5–1.6)	1.7 (1.6–1.7)	nc[1]
Niacin (mg NE)	43 (41–44)	42 (40–44)	nc	29 (28–29)	29 (28–30)	nc
Vitamin B6 (mg)	1.7 (1.6–1.7)	2.2 (2.0–2.5)	↑	1.2 (1.2–1.3)	1.6 (1.4–1.7)	↑
Vitamin B12 (µg)	5.2 (4.7–5.7)	4.7 (4.3–5.1)	nc	3.4 (3.2–3.6)	3.3 (3.0–3.5)	nc
Calcium (mg)	857 (831–883)	919 (878–960)	nc[1]	691 (654–728)	745 (719–771)	nc
Iron (mg)	14.6 (14.2–15.0)	13.2 (12.8–13.6)	↓	9.9 (9.7–10.1)	9.9 (9.6–10.2)	nc
Zinc (mg)	14.5 (14.1–14.9)	12.9 (12.4–13.4)	↓	9.8 (9.5–10.1)	9.0 (8.7–9.3)	↓
Potassium (mg)	3922 (3831–4013)	3449 (3341–3557)	↓	2936 (2876–2996)	2757 (2681–2833)	↓
Selenium (µg)	56 (53–59)	67 (62–72)	↑	39 (35–43)	47 (44–50)	↑

Note: nc = No change.

1 Significant increase after adjusting for age and ethnicity.

2 Significant decrease after adjusting for age and ethnicity.

9.3 Vegetable and fruit intake

It is recommended that adults eat at least three servings of vegetables and at least two servings of fruit each day (Ministry of Health 2003b). Participants were asked how many servings of vegetables (excluding juice) they eat on average each day, and how many servings of fruit (excluding juice) they eat on average each day.

There was no change from 1997 to 2008/09 in the proportion of males and females who reported they consumed the recommended three or more servings of vegetables a day (Table 9.4). However, there was an increase in the proportion of both males and females who reported that they consumed the recommended two or more servings of fruit a day.

Table 9.4: Vegetable and fruit intake, by sex, 1997 and 2008/09

Indicator	Sex	1997 NNS	2008/09 NZANS	Trend from 1997 to 2008/09
3 or more servings of vegetables per day: percent (95% CI)	Males	61.8 (58.7–64.8)	59.3 (55.7–62.9)	nc
	Females	73.1 (70.9–75.3)	72.2 (69.5–74.8)	nc
2 or more servings of fruit per day: percent (95% CI)	Males	34.8 (31.6–37.9)	54.6 (51.4–57.8)	↑
	Females	56.1 (53.6–58.7)	65.8 (63.6–67.9)	↑

Note: nc = No change.

9.4 Body size

There was an increase in mean weight and BMI in both males and females from 1997 to 2008/09, but no change in mean height (Table 9.5). From 1997 to 2008/09 there was an increase in the prevalence of obesity in both males and females, but no change in the prevalence of overweight. Changes in the age and ethnic composition of the population had little impact on trends in obesity. After adjustment for age and ethnic group, the prevalence of obesity in 2008/09 compared to 1997 was 1.5 times higher for males and 1.3 times higher for females. Data from the 2002/03 and 2006/07 New Zealand Health Surveys have previously shown that the prevalence of obesity has increased since 1997 (Ministry of Health 2008).

Table 9.5: Body size, by sex, 1997 and 2008/09

Indicator	Sex	1997 NNS	2008/09 NZANS	Trend from 1997 to 2008/09
Weight (kg) [1]: mean (95% CI)	Males	80.4 (79.6–81.2)	85.1 (84.1–86.1)	↑
	Females	68.7 (67.9–69.5)	72.6 (71.6–73.5)	↑
Height (m): mean (95% CI)	Males	175.3 (174.8–175.7)	175.7 (175.3–176.1)	nc
	Females	162.2 (161.9–162.6)	162.2 (161.8–162.6)	nc
BMI (kg/m^2) [1]: mean (95% CI)	Males	26.2 (25.9–26.4)	27.6 (27.2–27.9)	↑
	Females	26.1 (25.8–26.4)	27.6 (27.2–27.9)	↑
Overweight [1]: percent (95% CI)	Males	40.3 (36.8–43.7)	41.3 (38.2–44.5)	nc
	Females	29.9 (27.4–32.5)	32.8 (29.8–35.9)	nc
Obese[1]: percent (95% CI)	Males	17.0 (14.9–19.1)	27.7 (24.9–30.6)	↑
	Females	20.6 (18.6–22.5)	27.8 (25.1–30.4)	↑

Notes:

WHO (2007) BMI cut-offs used to classify overweight and obesity among adults aged 19+ years, and the IOTF (Cole et al 2000, 2007) BMI cut-offs used to classify overweight and obesity in adults aged 15–18 years (see Chapter 8 for details).

nc = No change.

1 Data re-analysed so results differ to those published in NZ Food NZ People: Key Results of the 1997 National Nutrition Survey.

9.5 Total and HDL cholesterol

From 1997 to 2008/09 mean total cholesterol concentrations decreased by 0.61 mmol/L in males and by 0.56 mmol/L in females (Table 9.6). Mean HDL cholesterol concentrations increased in both males and females.

Table 9.6: Mean total and HDL cholesterol concentration, by sex, 1997 and 2008/09

Indicator	Sex	1997 NNS	2008/09 NZANS	Trend from 1997 to 2008/09
Total cholesterol (mmol/L): mean (95% CI)	Males	5.70 (5.63–5.78)	5.09 (5.01–5.16)	↓
	Females	5.73 (5.66–5.79)	5.17 (5.10–5.24)	↓
HDL cholesterol (mmol/L): mean (95% CI)	Males	1.18 (1.16–1.20)	1.23 (1.21–1.26)	↑
	Females	1.43 (1.40–1.45)	1.50 (1.47–1.52)	↑

Note: nc = No change.

9.6 Iron status

From 1997 to 2008/09 the prevalence of iron deficiency in females increased from 2.9% to 7.2% (Table 9.7). After adjusting for age and ethnicity, there was an increase in the prevalence of low iron stores in females.

Table 9.7: Iron status, by sex, 1997 and 2008/09

Indicator	Sex	1997 NNS	2008/09 NZANS	Trend from 1997 to 2008/09
Serum ferritin (ug/L): mean (95% CI)	Males	185 (176–194)	177 (165–189)	nc
	Females	77 (72–81)	79 (75–84)	nc
Haemoglobin (g/L): mean (95% CI)	Males	151 (150–152)	149 (148–150)	nc
	Females	135 (135–136)	133 (132–133)	↓
Low iron stores:[1] percent (95% CI)	Males	0.5 (0.1–1.5)[4]	1.5 (0.7–2.5)	nc
	Females	5.5 (4.2–6.8)	8.4 (6.5–10.3)	nc[5]
Iron deficiency:[2] percent (95% CI)	Males	0.3 (0–1.3)[4]	1.1 (0.3–1.9)	nc
	Females	2.9 (1.9–3.9)	7.2 (5.4–9.0)	á
Iron deficiency anaemia:[3] percent (95% CI)	Males	0.3 (0–1.3)[4]	0.6 (0.1–1.6)[4]	nc
	Females	2.3 (1.4–3.2)	3.5 (2.2–4.8)	nc

1 Serum ferritin < 12 µg/L.

2 Serum ferritin < 12 µg/L and zinc protoporphyrin > 60 µg/mol.

3 Serum ferritin < 12 µg/L and zinc protoporphyrin > 60 µg/mol and haemoglobin < 136 g/L males 15–19 years; < 137 g/L males 20–49 years; < 133 g/L males 50–69 years; < 124 g/L males 70+ years; < 120 g/L females 15–69 years; < 118 g/L females 70+ years.

4 Both point estimate and 95% CI are based on small number so interpret with caution.

5 Significant increase after adjusting for age and ethnicity.

nc = No change.

9.7 Food security

From 1997 to 2008/09 the proportion of households *fully/almost food secure* fell from 78.5% to 61.7% in males and from 73.0% to 56.6% in females (Table 9.8). The proportion of households in the category *moderately food secure* has risen by just over 10 percentage points. The prevalence of the total population aged 15 years and over experiencing *low food security* increased from 1997 to 2008/09 for both males (1.6% to 5.6%) and females (3.8% to 8.8%).

Table 9.8: Categories of food security, by sex, 1997 and 2008/09

Indicator	Sex	1997 NNS (95% CI)	2008/09 NZANS (95% CI)	Trend from 1997 to 2008/09
Fully/almost secure: percent	Males	78.5 (76.1–80.9)	61.7 (58.4–65.1)	↓
	Females	73.0 (70.9–75.0)	56.6 (53.7–59.5)	↓
Moderately food secure: percent	Males	19.9 (17.5–22.2)	32.6 (29.5–35.8)	↑
	Females	23.2 (21.3–25.2)	34.6 (31.9–37.3)	↑
Low food security: percent	Males	1.6 (1.1–2.2)	5.6 (4.3–6.9)	↑
	Females	3.8 (3.0–4.6)	8.8 (7.2–10.4)	↑

Note: Categories of food security were derived from eight variables using Rasch analysis (see Chapter 7.2).

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Appendices

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Appendix 2: Participant feedback

Dear

We are very grateful for your willingness to take part in the 2008/09 New Zealand Adult Nutrition Survey. Your involvement has been extremely helpful and we appreciate your availability and co-operation.

Results of your assessments are listed below and an explanation is given over the page. If any of your values are outside the desirable range we suggest you approach your regular doctor to discuss these results.

Height (cm):
Weight (kg):
Body mass index (BMI):

Waist (cm):

Systolic blood pressure (mmHg):
Diastolic blood pressure (mmHg):

Total cholesterol (mmol/L):
HDL cholesterol (mmol/L):

Haemoglobin (g/L):
Ferritin (µg/L):

Remember to check the explanation over the page and if any of these results concern you please discuss them with your doctor.

Please find enclosed your .... supermarket vouchers.

Again, very many thanks for your help.

Yours sincerely

Dr Winsome Parnell
Nutrition Director

Appendix 3: Analytical techniques for nutrients in the New Zealand Food Composition Database (NZFCDB)

Table A4.1: Analytical techniques for nutrients

Nutrient	INFOODS tagname[1]	Units	Method
Energy	ENERC	kJ	Calculated as follows: protein = 16.7 kJ/g; total fat = 37.7 kJ/g; available carbohydrate = 16.7 kJ/g; alcohol = 29.3 kJ/g. Energy from fibre is not included.
Protein	PROCNT	g	Calculated from total nitrogen; generally FAO/WHO conversions factors
Total fat	FAT	g	Several methods depending on food matrix
Saturated fat	FASAT	g	Sum of individual saturated fatty acids; GC of methyl esters
Monounsaturated fat	FAMS	g	Sum of individual monounsaturated fatty acids; GC of methyl esters
Polyunsaturated fat	FAPU	g	Sum of individual polyunsaturated fatty acids; GC of methyl esters
Cholesterol	CHOLE	mg	GC
Carbohydrate	CHOAVL	g	Available carbohydrate; sum of mono-, di- and oligosaccharides, starch and glycogen; or enzymatic digestion and colorimetry
Dietary fibre	PSACNS	g	Non-starch polysaccharides/fibre; Englyst method
Total sugars	SUGAR	g	Total available sugars, sum of individual mono- and disaccharides; GC or HPLC
Fructose	FRUS	g	Available fructose, sum of individual d-fructose monosaccharides; GC or HPLC
Sucrose	SUCS	g	Available sucrose, sum of individual sucrose disaccharides; GC or HPLC
Lactose	LACS	g	Available lactose, sum of individual lactose disaccharides; GC or HPLC
Alcohol	ALC	g	Alcohol / ethyl alcohol, hydrometer or GC
Vitamin A equivalents	VITA	µg	Total vitamin A equivalents / retinol equivalents; equals (µg retinol) + (0.166 x µg β-carotene equivalents); HPLC. Conversion factors used for vitamin A equivalents were 6 for β-carotene and 12 for other carotenoids
Retinol	RETNOL	µg	All trans retinol only, HPLC
β-carotene	CARTBEQ	µg	Beta-carotene equivalents; equals (µg β-carotene) + (0.5 x µg other provitamin A carotenoids); HPLC
Vitamin C	VITC	mg	HPLC and titration
Vitamin E	VITE	mg	Vitamin E/α-tocopherol equivalents; equals (mg α-tocopherol) + (0.4 x mg β-tocopherol) + (0.1 x mg gamma-tocopherol) + (0.01 x mg delta-tocopherol) + (0.3 x mg alpha-tocotrienol) + (0.05 x mg β-tocotrienol) + (0.01 x mg gamma-tocotrienol); HPLC
Thiamin	THIA	mg	HPLC, fluorescence detection of thiochrome
Riboflavin	RIBF	mg	HPLC, fluorescence detection
Niacin equivalents	NIAEQ	mg	Total niacin equivalents; equals (mg preformed niacin (HPLC, UV detection)) + (1/60 x mg tryptophan (HPLC))
Vitamin B_6	VITB6C	mg	HPLC, fluorescence detection

Nutrient	INFOODS tagname[1]	Units	Method
Vitamin B_{12}	VITB12	µg	Microbiological
Folate	FOLDFE	µg	Dietary folate equivalents (a combination of synthetic and naturally occurring folate); radioassay or microbiological. Dietary folate equivalents (FOLDFE) = food folate (FOLFD) + folic acid (FOLAC) x 1.67
Calcium	CA	mg	Biological material digestion, ICP-OES
Phosphorus	P	mg	Biological material digestion, ICP-OES
Magnesium	MG	mg	Biological material digestion, ICP-OES
Iron	FE	mg	Biological material digestion, ICP-OES
Zinc	ZN	mg	Biological material digestion, ICP-MS
Potassium	K	mg	Biological material digestion, ICP-OES
Selenium	SE	µg	TMAH (tetra methyl ammonium hydroxide) micro digestion, ICP-MS

Notes:

GC = gas chromatography

HPLC = high performance liquid chromatography

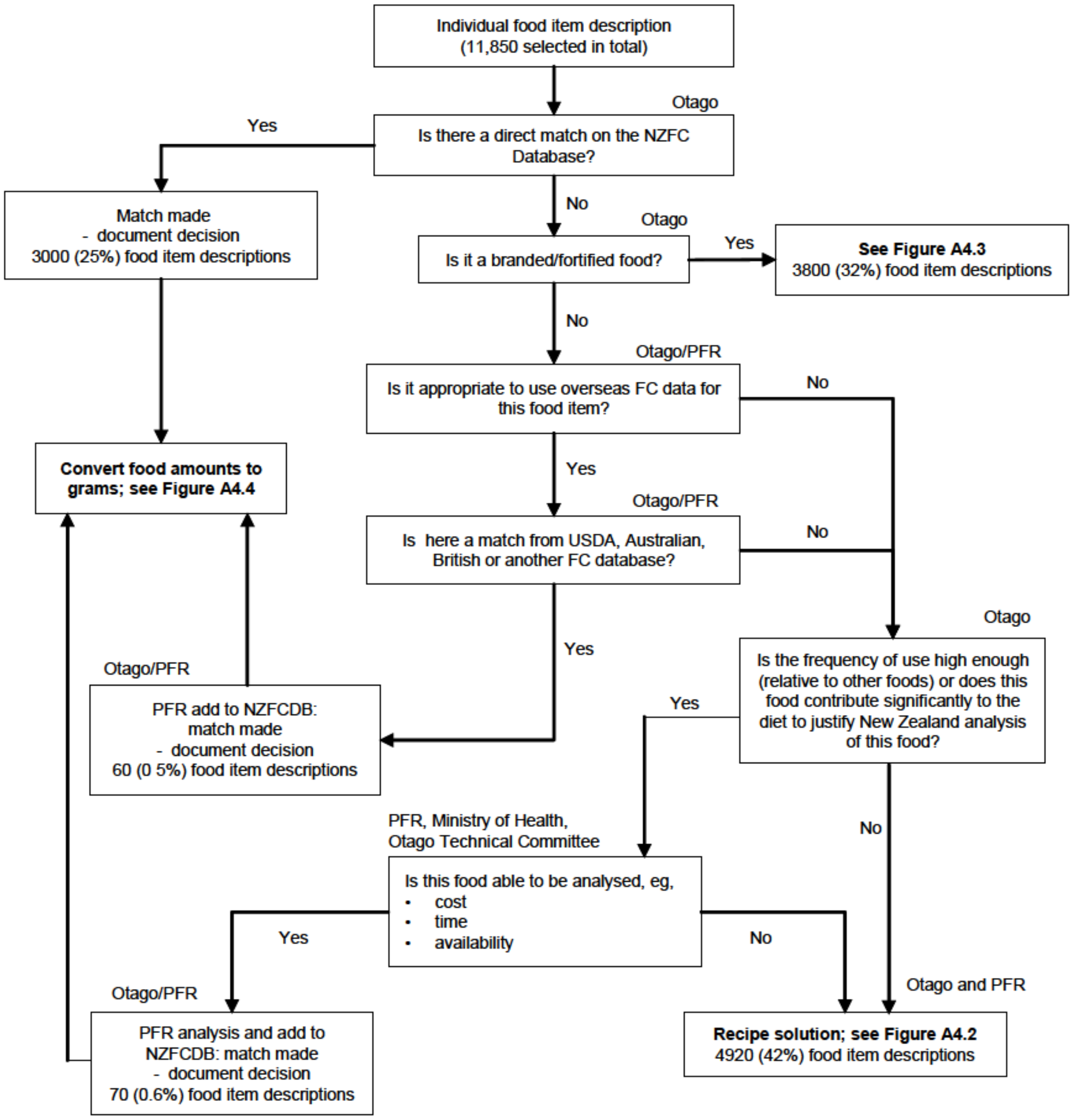
ICP-OES = inductively coupled plasma–optical emission spectroscopy

ICP-MS = inductively coupled plasma–mass spectroscopy

1 Klensin et al 1989. The up-to-date listing can be found on: http://www.fao.org/infoods/

Appendix 4: Nutrient matching

Figure A4.1: Matching foods to nutrient lines from food composition databases



Key:

Otago–University of Otago

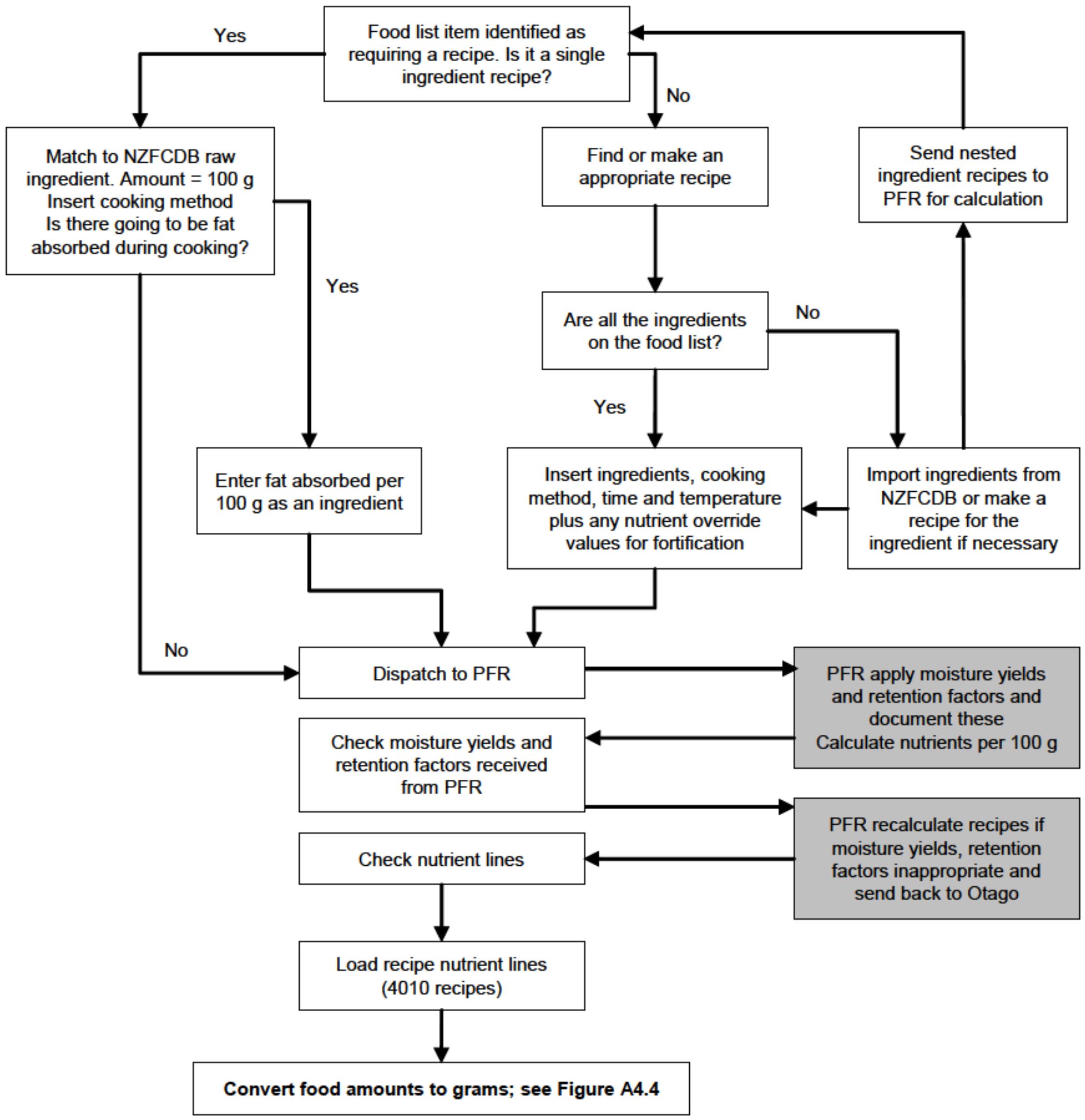
PFR–Plant & Food Research Ltd

FC–food composition

USDA–United States Department of Agriculture

NZFCDB–New Zealand Food Composition Database

Figure A4.2: 2008/09 NZ Adult Nutrition Survey recipes



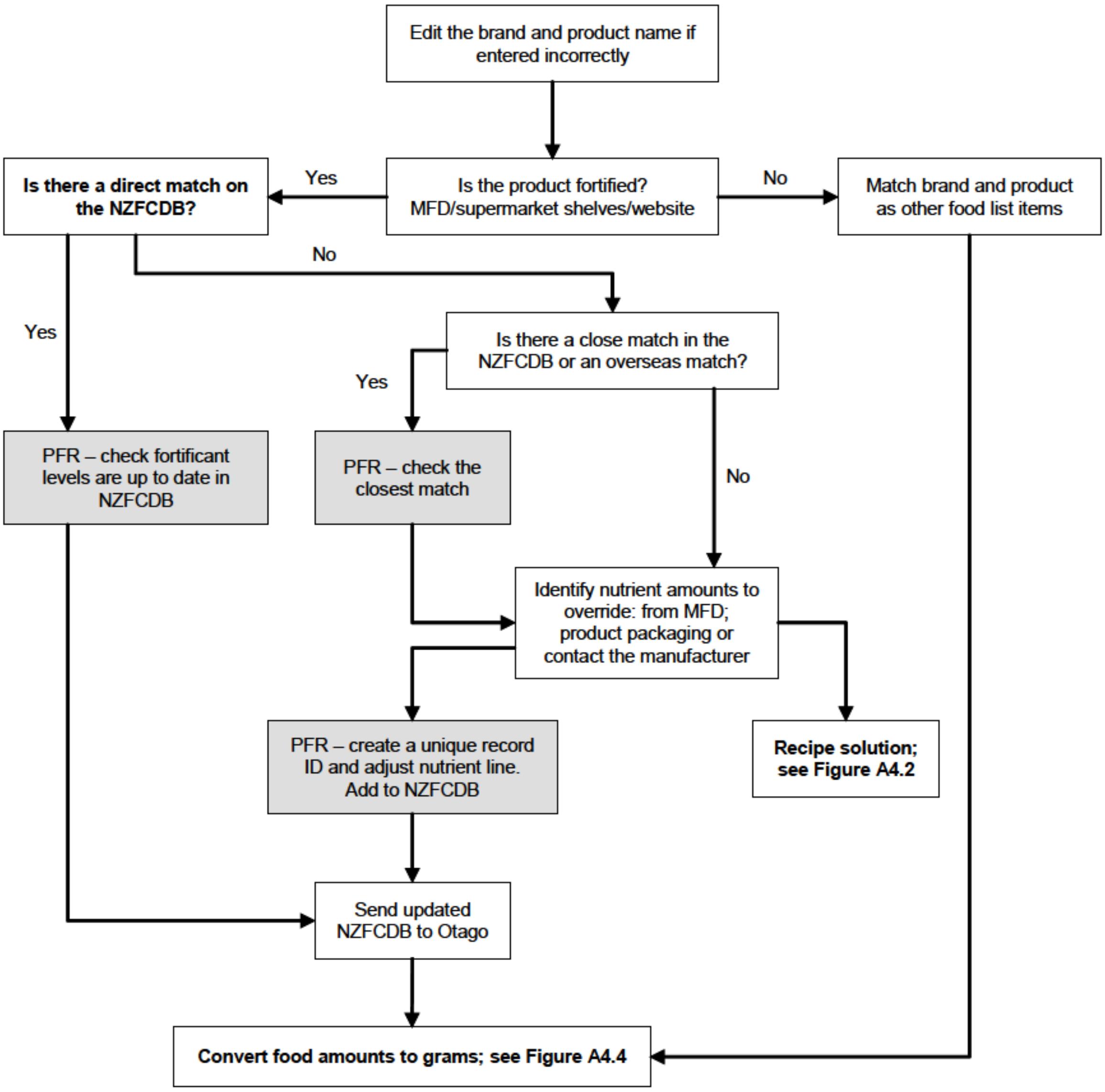
Key

Otago–University of Otago

PFR–Plant & Food Research Ltd

NZFCDB–New Zealand Food Composition Database

Figure A4.3: Brand and product name nutrient matching



Key

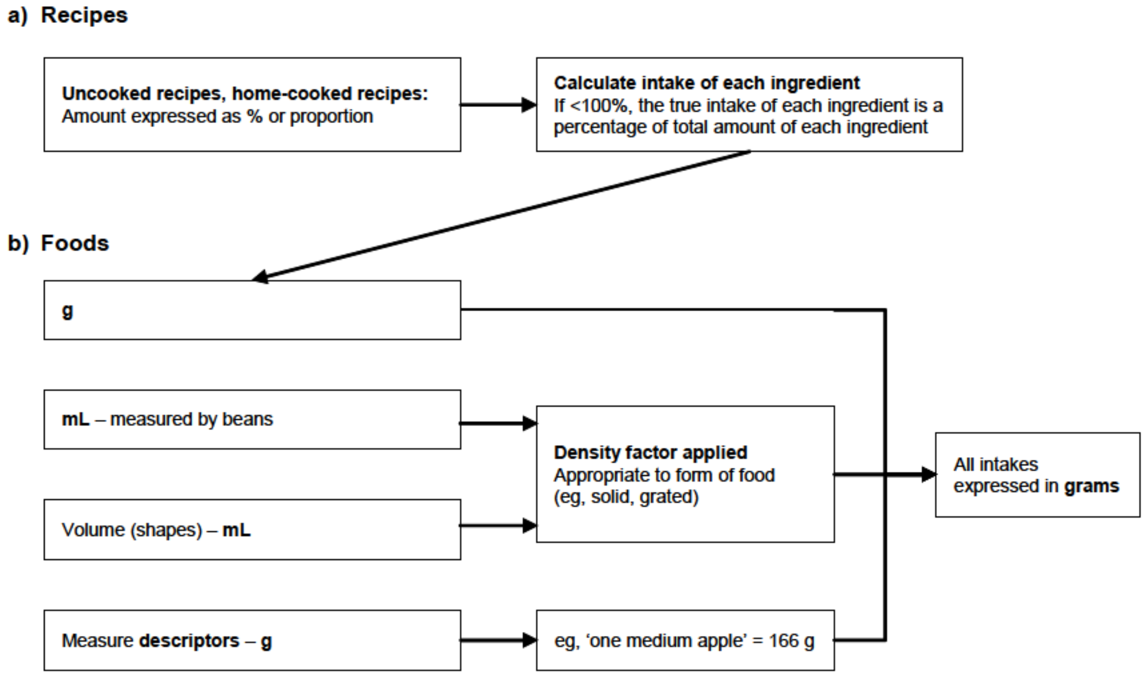
MFD–Manufactured Food Database

PFR–Plant & Food Research Ltd

NZFCDB–New Zealand Food Composition Database

Record ID–unique alphanumeric number for each food item

Figure A4.4: Food amounts converted to grams



Appendix 5: Cell sizes

The following table shows the distribution of the sample numbers of final interviews and measurements. The sample size includes respondents who provided any valid data for a section (eg, answered at least one question or had at least one measurement). Pregnant women were excluded from the examination component (anthropometry, blood pressure, biochemical indices). Note that the sample size for some population subgroups was small, particularly for Māori and Pacific aged 15–18 years.

Table A5.1: Number of respondents for each component of the survey, by age group, sex, ethnic group and NZDep2006

		Number of respondents										
		Initial demography	24-hour diet recall		Dietary habits	Nutrition-related health	Additional sociodemography	Food security[1]	Blood pressure	Anthropometry BMI[2]	Blood analysis HbA1c[3]	Urine analysis sodium[4]
			Initial	Repeat								
Total New Zealand sample		4721	4721	1180	4718	4714	4713	4635	4407	4503	3348	3315
By age group (years)												
Males	15–18	326	326	88	326	326	326	299	319	321	195	192
	19–30	284	284	63	284	283	283	282	274	277	152	150
	31–50	598	598	140	598	598	598	595	577	583	381	379
	51–70	378	378	98	378	377	377	377	354	368	319	314
	71+	480	480	123	480	480	480	478	450	454	423	418
	Total	**2066**	**2066**	**512**	**2066**	**2064**	**2064**	**2031**	**1974**	**2003**	**1470**	**1453**
Females	15–18	373	373	90	373	373	373	347	359	359	228	220
	19–30	434	434	101	434	434	434	429	392	395	240	239
	31–50	746	746	176	745	745	745	740	675	698	508	508
	51–70	517	517	142	517	516	516	512	482	495	420	419
	71+	585	585	159	583	582	581	576	525	553	482	476
	Total	**2655**	**2655**	**668**	**2652**	**2650**	**2649**	**2604**	**2433**	**2500**	**1878**	**1862**
Māori												
Males	15–18	49	49	18	49	49	49	45	48	49	27	27
	19–30	94	94	22	94	94	94	93	89	89	41	41
	31–50	161	161	37	161	161	161	160	153	154	103	102
	51+	101	101	31	101	100	100	100	93	96	75	75
	Total	**405**	**405**	**108**	**405**	**404**	**404**	**398**	**383**	**388**	**246**	**245**
Females	15–18	62	62	15	62	62	62	59	59	58	38	37
	19–30	177	177	33	177	177	177	177	155	157	82	82
	31–50	250	250	57	250	250	250	249	223	235	161	161
	51+	146	146	47	146	146	146	144	133	139	113	113
	Total	**635**	**635**	**152**	**635**	**635**	**635**	**629**	**570**	**589**	**394**	**393**

		Number of respondents										
		Initial demography	24-hour diet recall		Dietary habits	Nutrition-related health	Additional sociodemography	Food security[1]	Blood pressure	Anthropometry BMI[2]	Blood analysis HbA1c[3]	Urine analysis sodium[4]
			Initial	Repeat								
Pacific												
Males	15–18	29	29	10	29	29	29	27	27	27	13	13
	19–30	82	82	14	82	82	82	82	80	82	35	35
	31–50	166	166	35	166	166	166	166	160	163	97	97
	51+	72	72	20	72	71	71	70	67	66	58	57
	Total	**349**	**349**	**79**	**349**	**348**	**348**	**345**	**334**	**338**	**203**	**202**
Females	15–18	44	44	11	44	44	44	40	41	40	15	15
	19–30	120	120	24	120	120	120	119	106	105	61	60
	31–50	167	167	41	167	167	167	164	150	157	107	107
	51+	77	77	20	77	77	77	74	69	72	52	52
	Total	**408**	**408**	**96**	**408**	**408**	**408**	**397**	**366**	**374**	**235**	**234**
NZEO												
Males	15–18	275	275	71	275	275	275	253	270	271	170	167
	19–30	161	161	40	161	160	160	160	155	158	96	94
	31–50	343	343	80	343	343	343	341	334	338	225	223
	51+	718	718	179	718	718	718	717	675	691	634	625
	Total	**1497**	**1497**	**370**	**1497**	**1496**	**1496**	**1471**	**1434**	**1458**	**1125**	**1109**
Females	15–18	312	312	77	312	312	312	291	303	304	201	194
	19–30	224	224	62	224	224	224	220	208	210	148	148
	31–50	425	425	107	424	424	424	423	389	399	304	304
	51+	916	916	248	914	912	911	907	838	874	764	757
	Total	**1877**	**1877**	**494**	**1874**	**1872**	**1871**	**1841**	**1738**	**1787**	**1417**	**1403**

		Number of respondents										
		Initial demography	24-hour diet recall		Dietary habits	Nutrition-related health	Additional sociodemography	Food security[1]	Blood pressure	Anthropometry BMI[2]	Blood analysis HbA1c[3]	Urine analysis sodium[4]
			Initial	Repeat								
By NZDep2006 quintile												
Males	1	341	341	85	341	341	341	335	335	336	266	263
	2	352	352	91	352	352	352	340	342	344	262	257
	3	349	349	87	349	348	348	345	332	339	254	254
	4	448	448	103	448	447	447	443	418	427	317	309
	5	576	576	146	576	576	576	568	547	557	371	370
	Total	**2066**	**2066**	**512**	**2066**	**2064**	**2064**	**2031**	**1974**	**2003**	**1470**	**1453**
Females	1	323	323	85	322	322	322	310	307	308	245	242
	2	477	477	127	477	476	475	467	447	456	355	351
	3	412	412	102	411	411	411	407	381	398	313	312
	4	624	624	166	624	623	623	614	559	583	434	429
	5	819	819	188	818	818	818	806	739	755	531	528
	Total	**2655**	**2655**	**668**	**2652**	**2650**	**2649**	**2604**	**2433**	**2500**	**1878**	**1862**

Notes: Includes respondents who provided valid data for each section (ie, answered at least one question or had at least one measurement).

Dietary habits includes eating habits and dietary supplements.

1 Cell sizes are based on the final food security categories.

2 Other components of anthropometry may have different cell sizes.

3 n = 3359 gave blood but the greatest number for an individual component was HbA1c (n = 3348).

4 Other components of urinary analysis may have different cell sizes.