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:

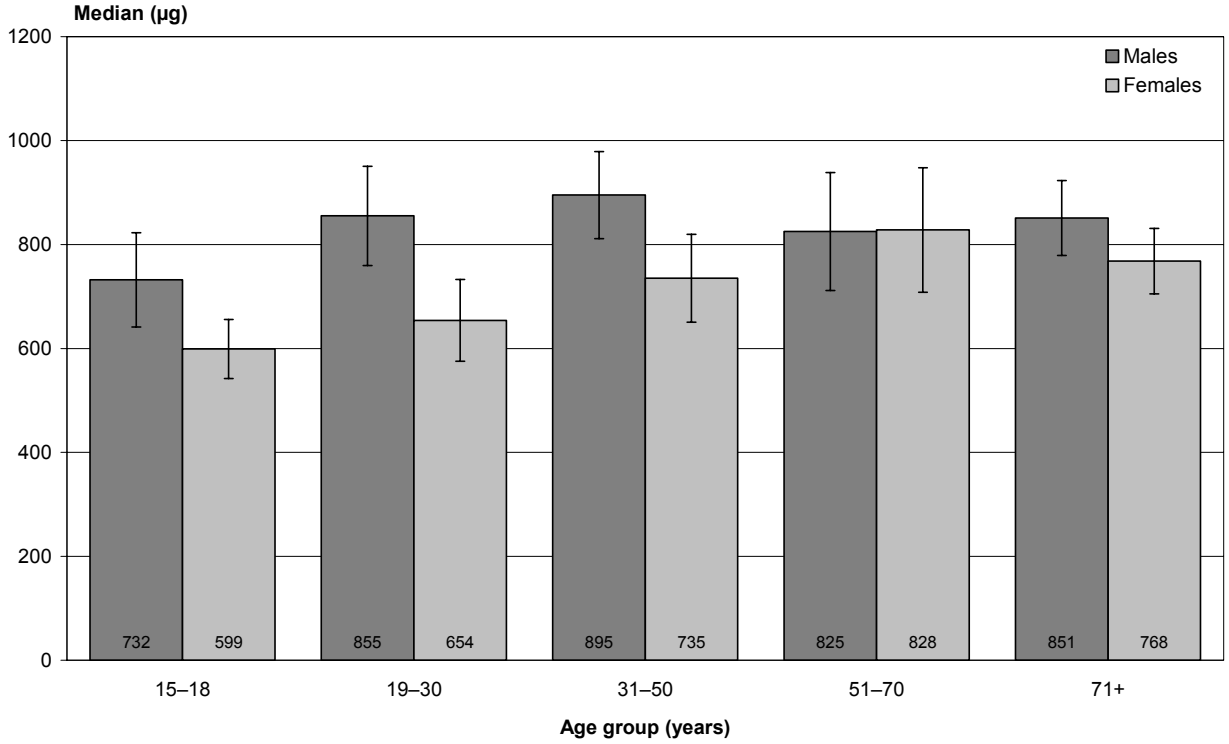
- maintaining healthy corneas, the epithelial cells and mucous membranes of the eye
- supporting reproduction and growth
- maintaining the health of the epithelial tissues and the skin through its role in protein synthesis and cell differentiation (Mann and Truswell 2007; Rolfes et al 2009).

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

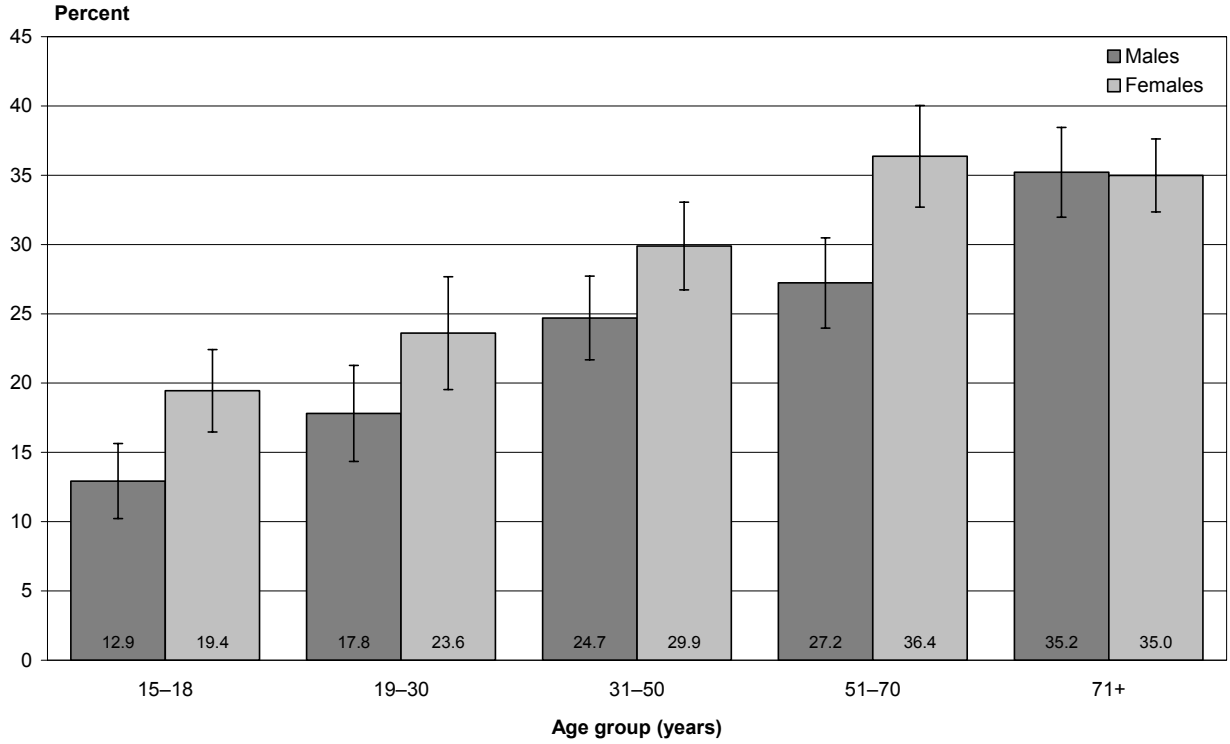


Table 4.1: Vitamin A equivalents intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin A equivalents (µg RE)[1,2]				
		Mean	**10th[3]**	**Median (50th),[3] (95% CI)**	**90th[3]**	**Inadequate intake (%) [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

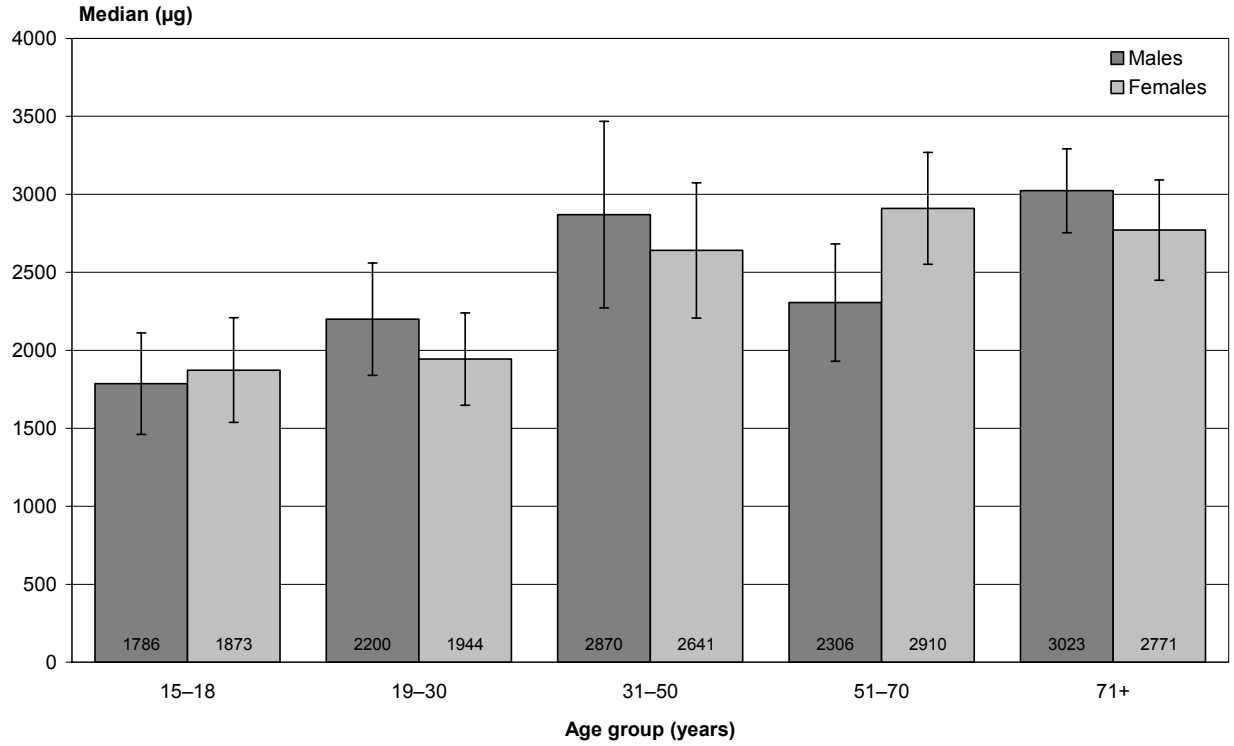
Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Sugar and sweets	0.9	0.6	1.8	0.9	0.4	0.2	0.9	1.7	0.9	1.0	0.5	0.3	0.8
Other meat	0.7	0.0	0.0	0.0	2.6	1.8	0.9	0.2	0.1	0.0	1.3	1.9	0.6
Sausages and processed meats	0.6	1.1	1.0	1.0	0.3	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

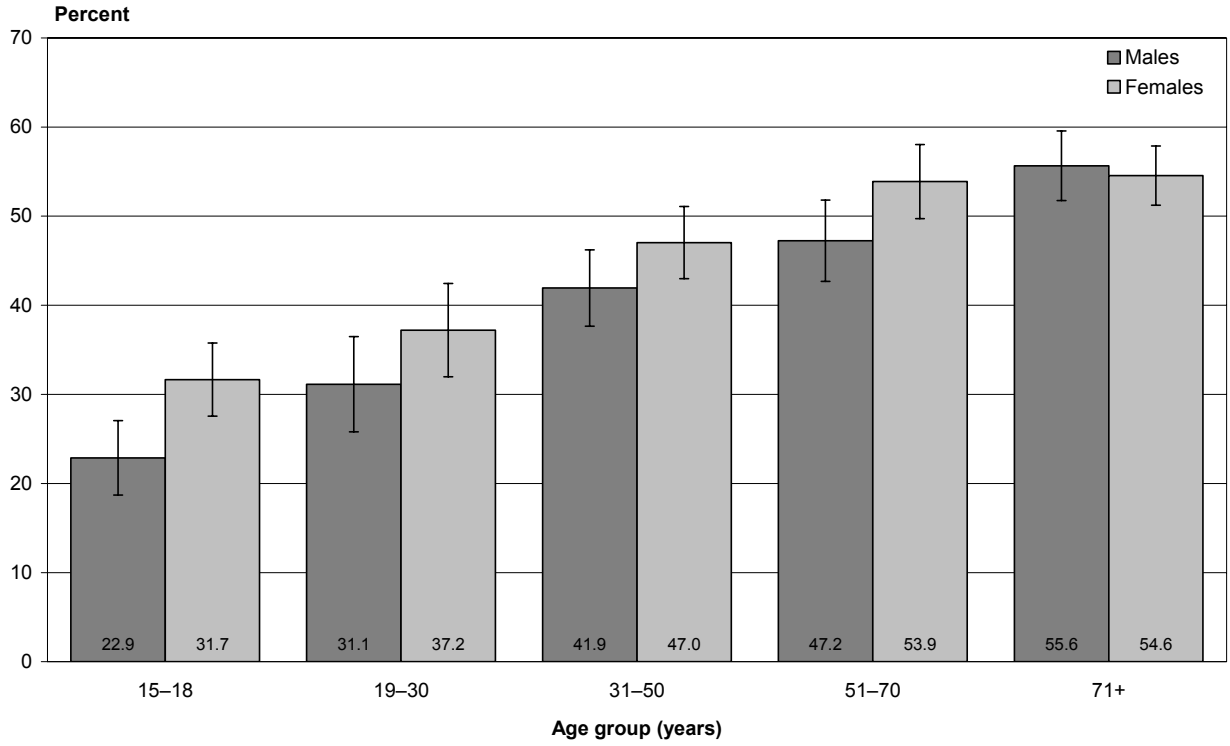


Table 4.3: β-carotene intake, by age group, ethnic group, NZDep2006 and sex

		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

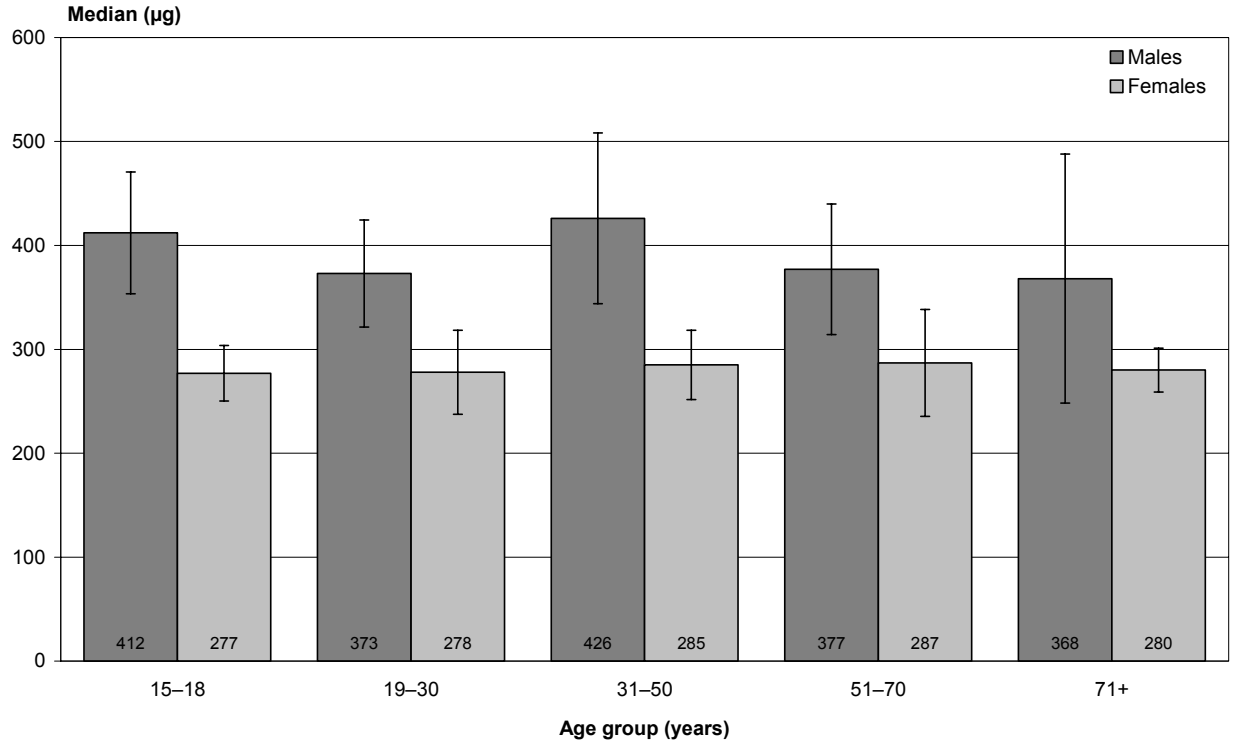
Food group	Total population	Males						Females					
		15–18	19–30	31–50	51–70	71+	Total	15–18	19–30	31–50	51–70	71+	Total
Breakfast cereals	0.4	0.3	0.2	0.3	0.7	0.5	0.4	0.3	0.2	0.4	0.5	0.6	0.4
Bread	0.4	0.4	0.8	0.6	0.4	0.2	0.5	0.2	0.2	0.4	0.3	0.2	0.3
Eggs and egg dishes	0.4	0.8	0.3	0.3	0.3	0.4	0.3	0.3	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

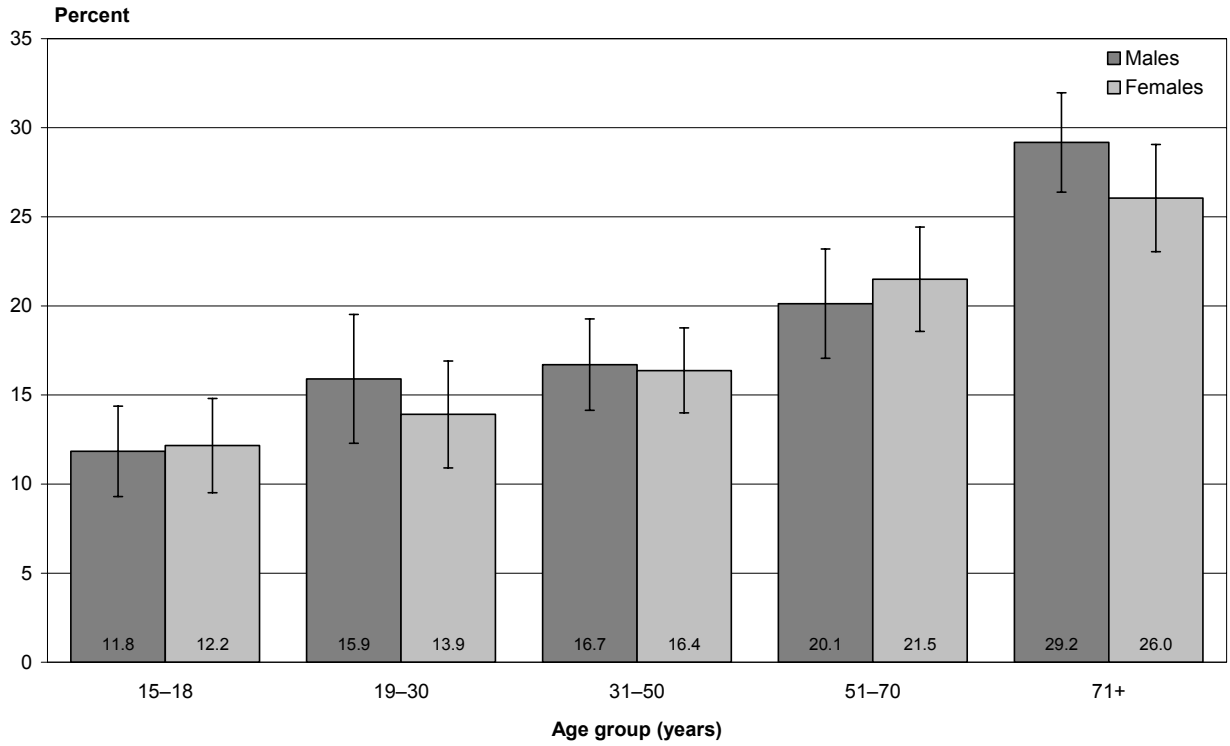


Table 4.5: Retinol intake, by age group, ethnic group, NZDep2006 and sex

		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:

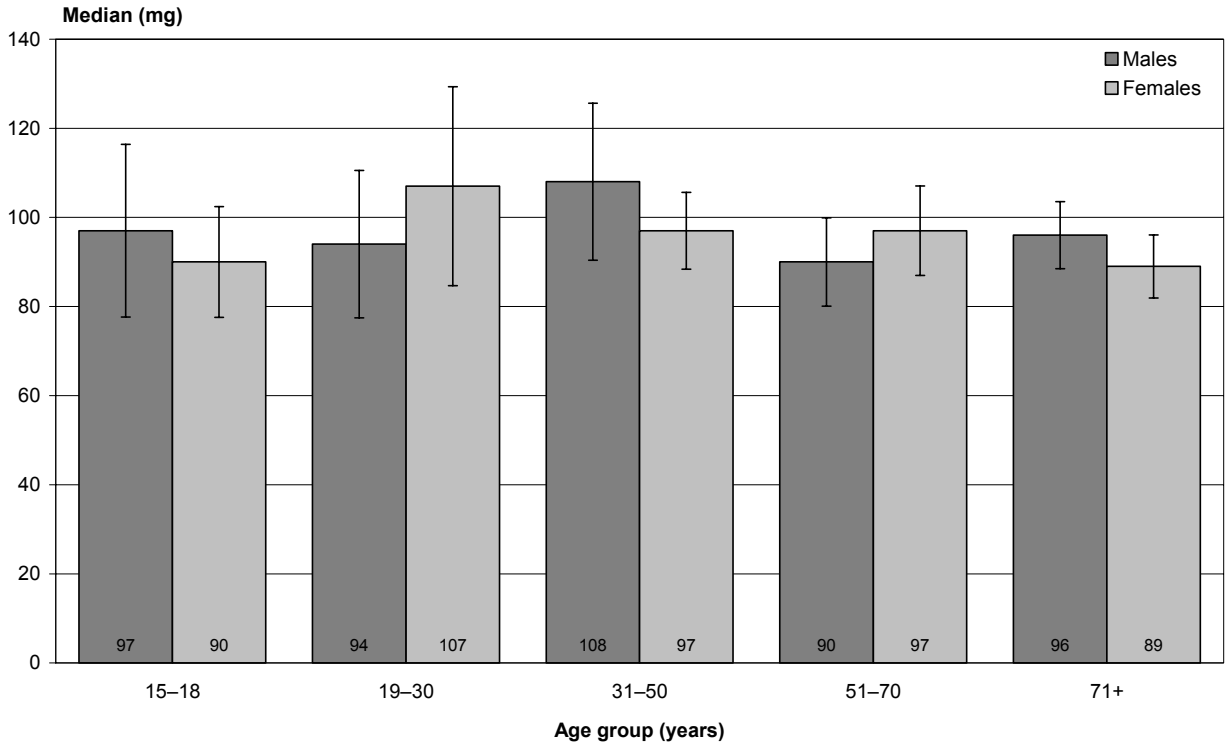
- collagen synthesis
- as an antioxidant
- thyroxine synthesis
- amino acid metabolism
- enhancing resistance to infection
- assisting iron absorption (Rolfes et al 2009).

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

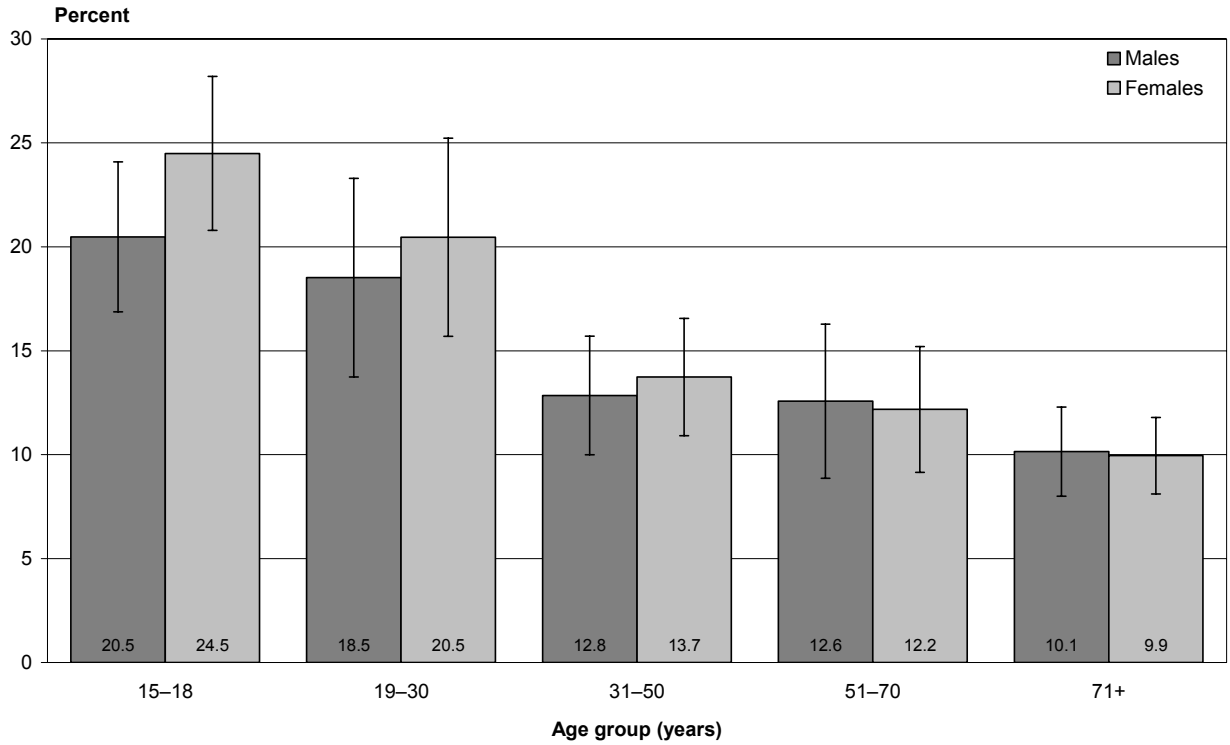


Table 4.7: Vitamin C intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin C (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%)[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

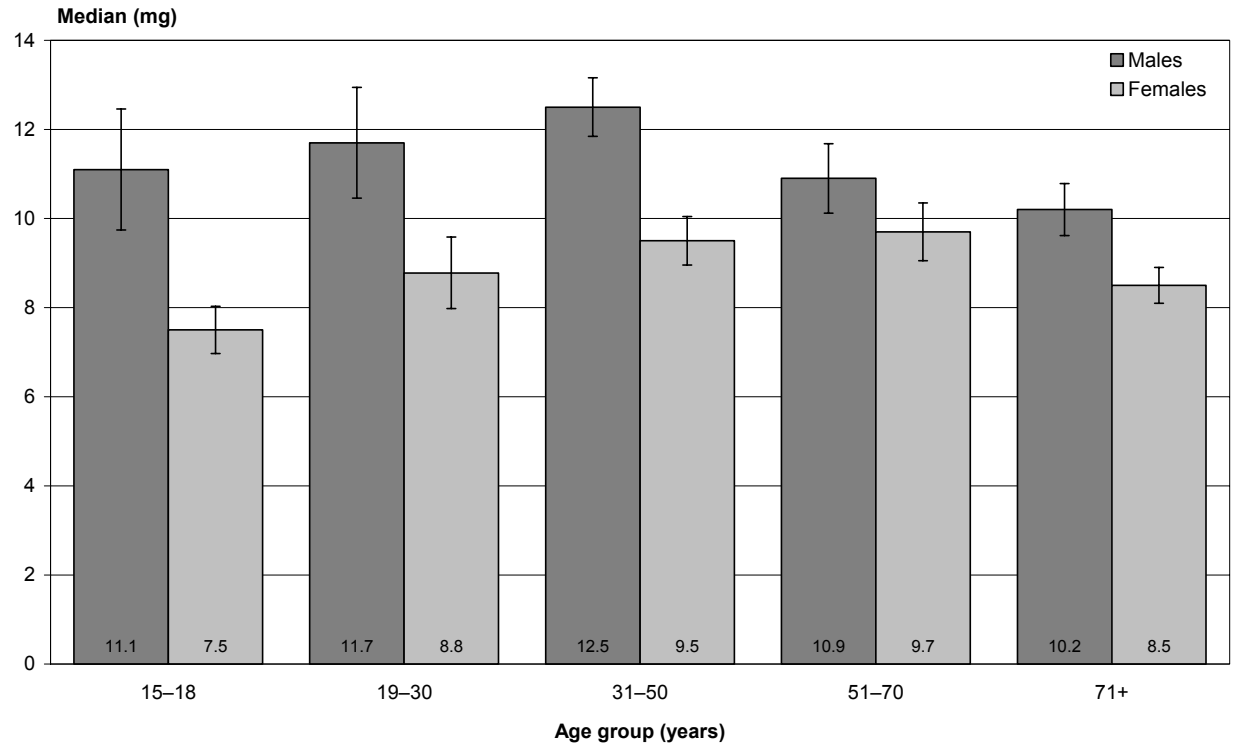
There are eight naturally occurring forms of vitamin E, including four tocopherols and four tocotrienols, whose abundance and biological activity vary considerably (Mann and Truswell 2007). Vitamin E is a powerful fat-soluble antioxidant, which helps stabilise cell membranes and protect plasma lipoproteins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

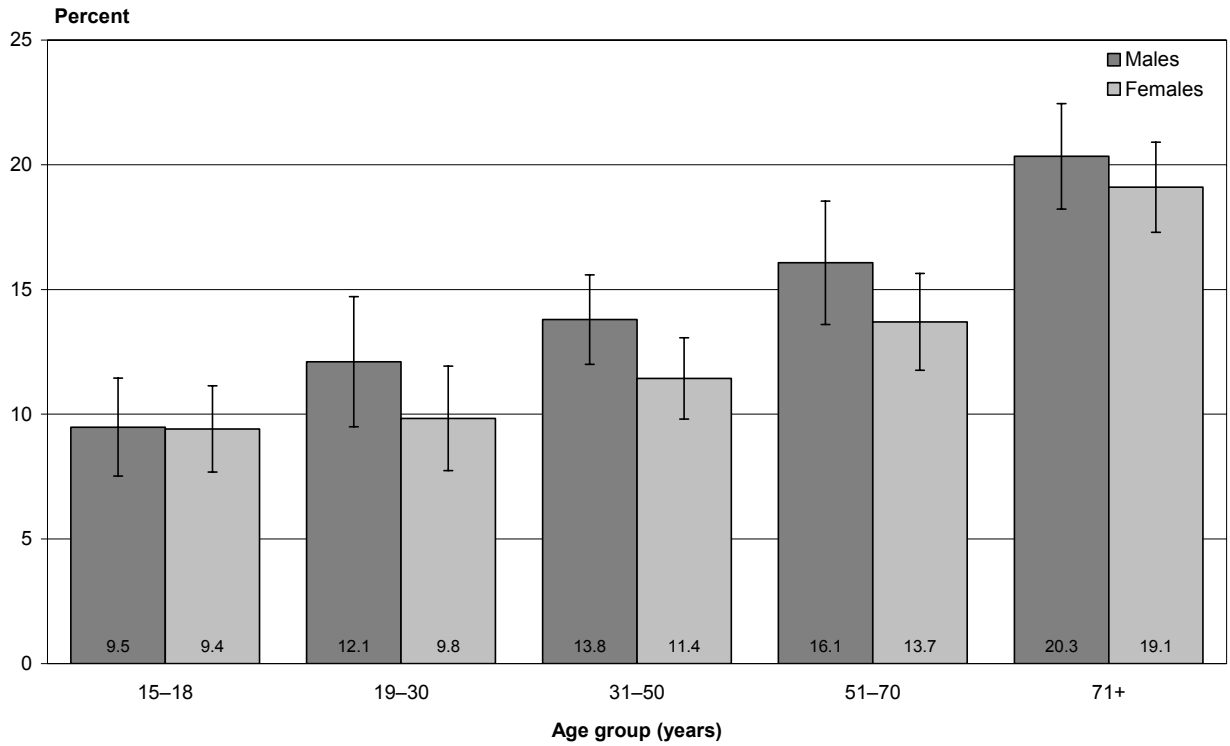


Table 4.9: Vitamin E intake, by age group, ethnic group, NZDep2006 and sex

		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.

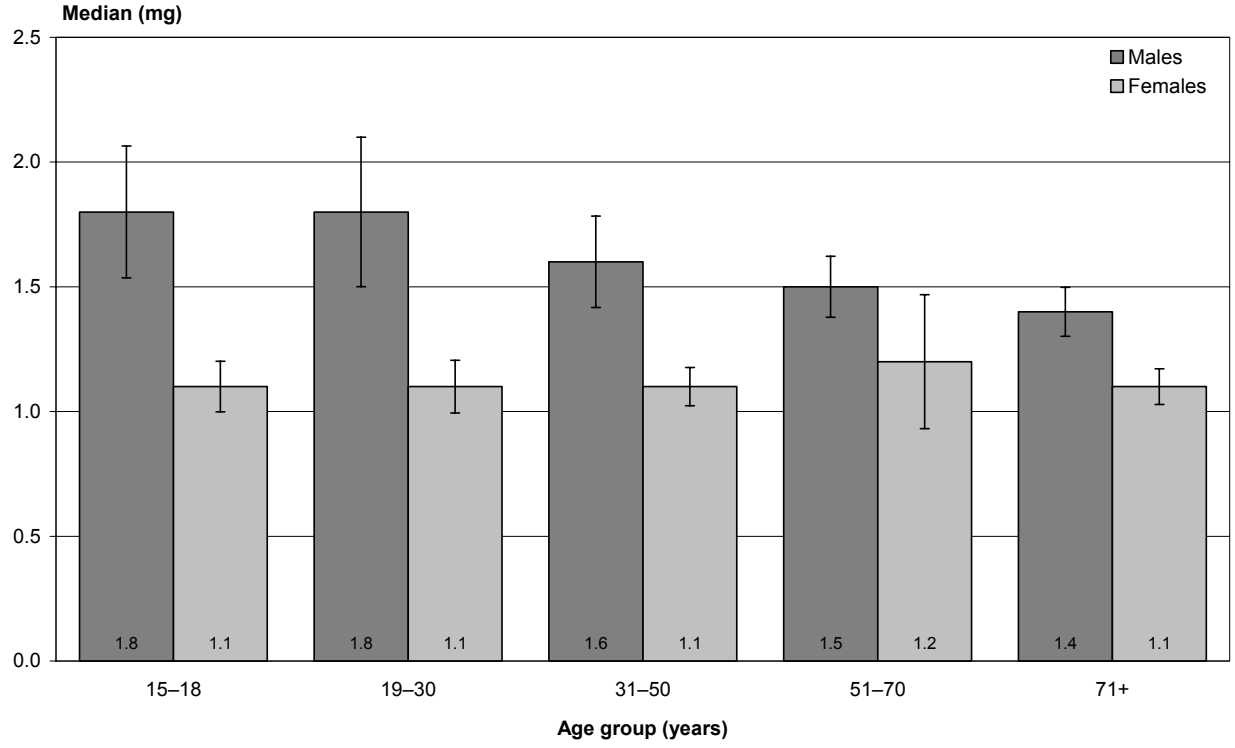
4.5 The B vitamins

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 cereal*s, by age group and sex

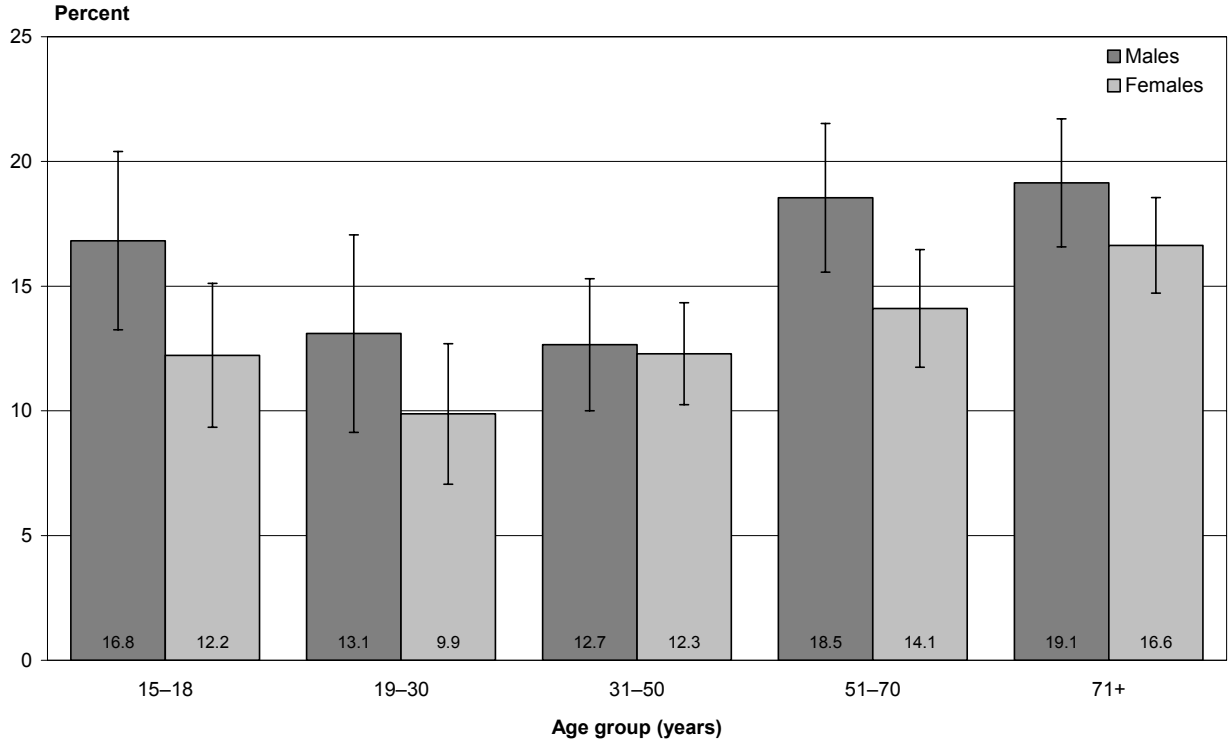


Table 4.11: Thiamin intake, by age group, ethnic group, NZDep2006 and sex

		Thiamin (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake[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

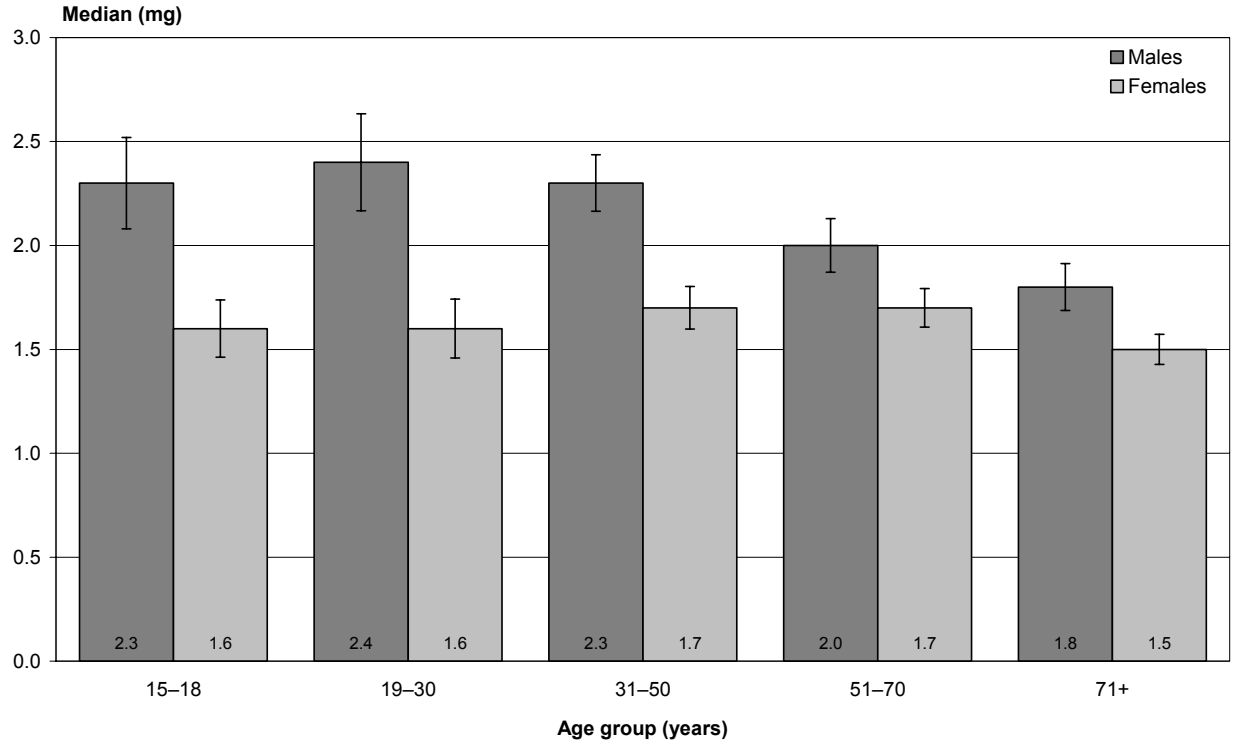
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

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

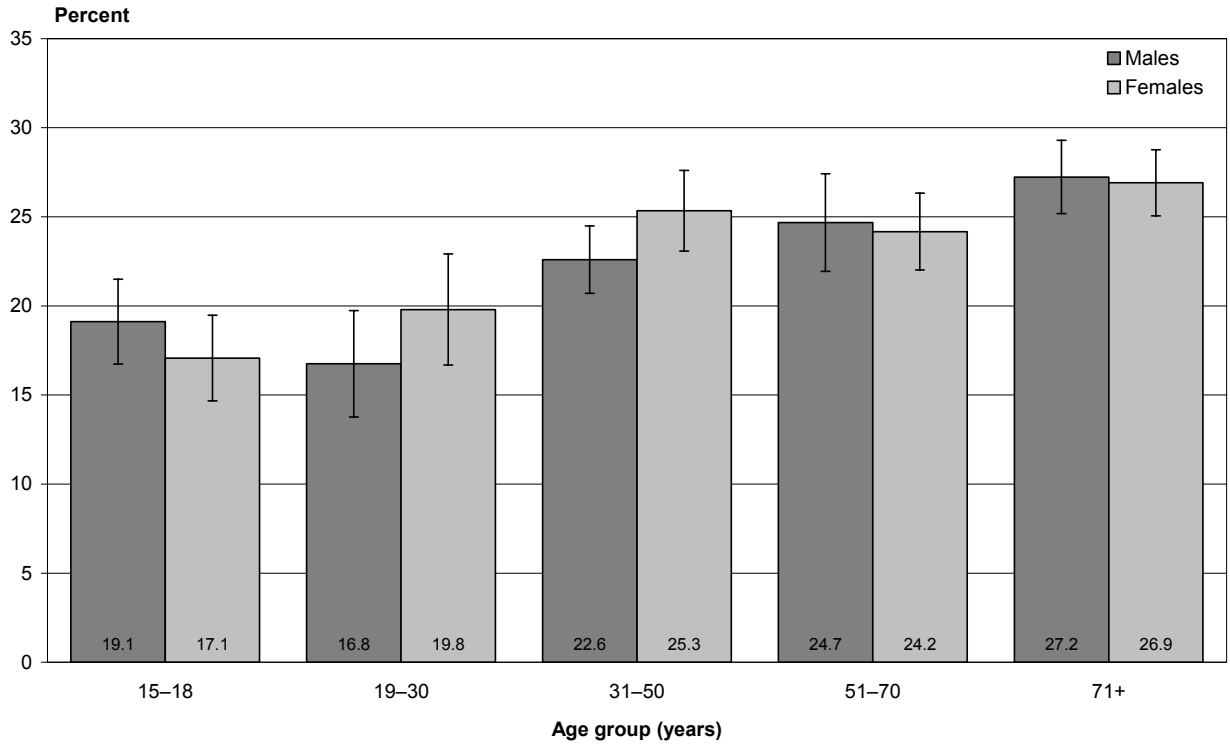


Table 4.13: Riboflavin intake, by age group, ethnic group, NZDep2006 and sex

		Riboflavin (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake[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
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

		Riboflavin (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%), (95% CI)[3]
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

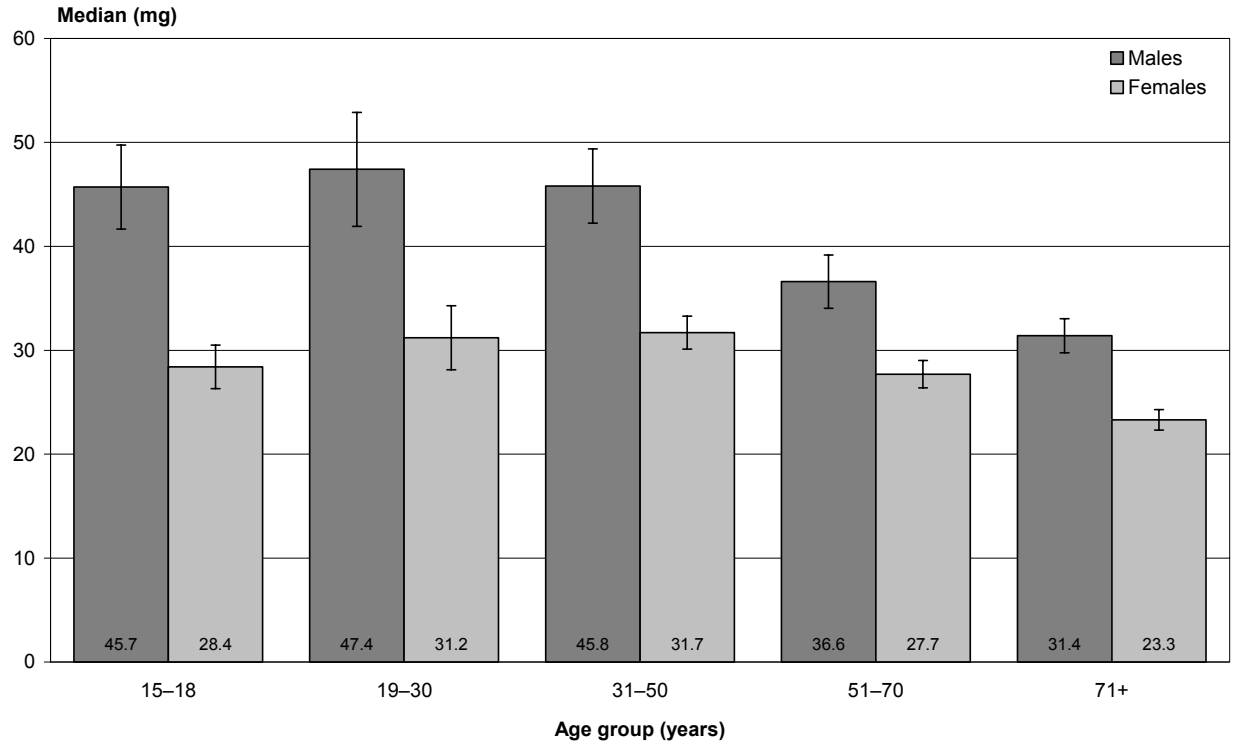
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

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

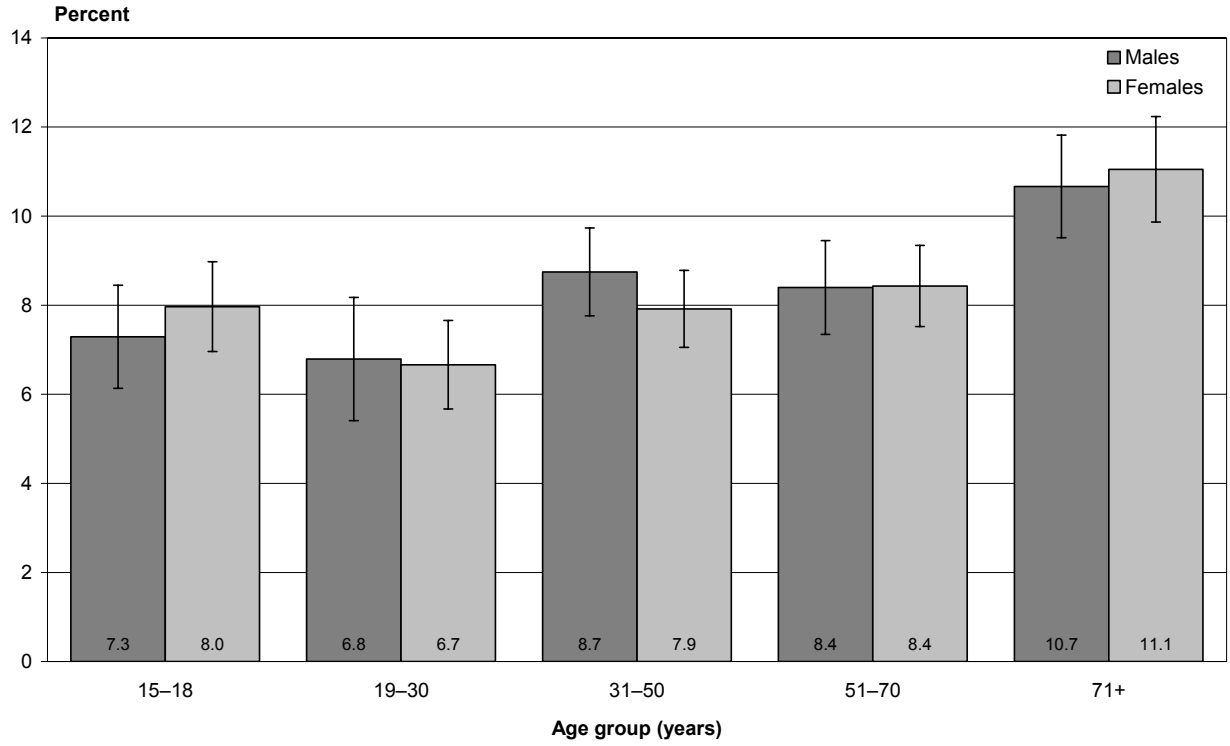


Table 4.15: Niacin equivalents intake, by age group, ethnic group, NZDep2006 and sex

		Niacin equivalents (mg)[1]				
		Mean	**10th[2]**	**Median (50th)[2] (95% CI)**	**90th[2]**	**Inadequate intake (%)[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

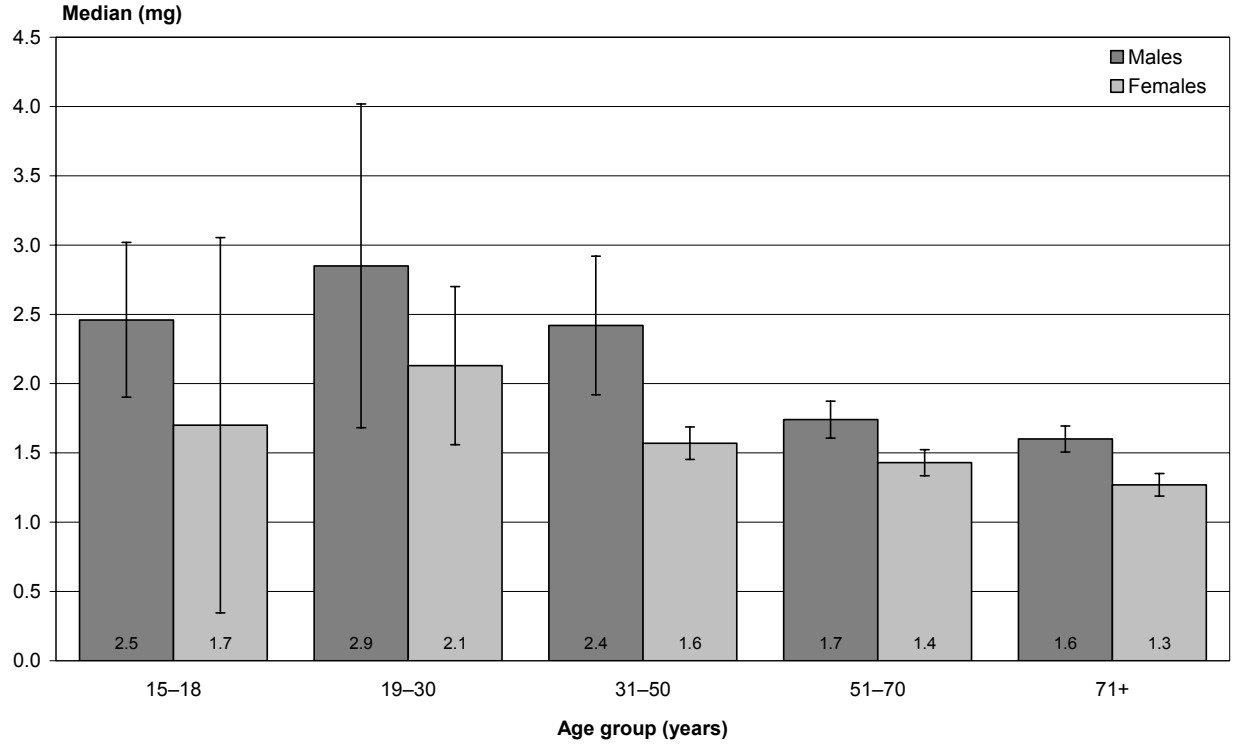
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

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

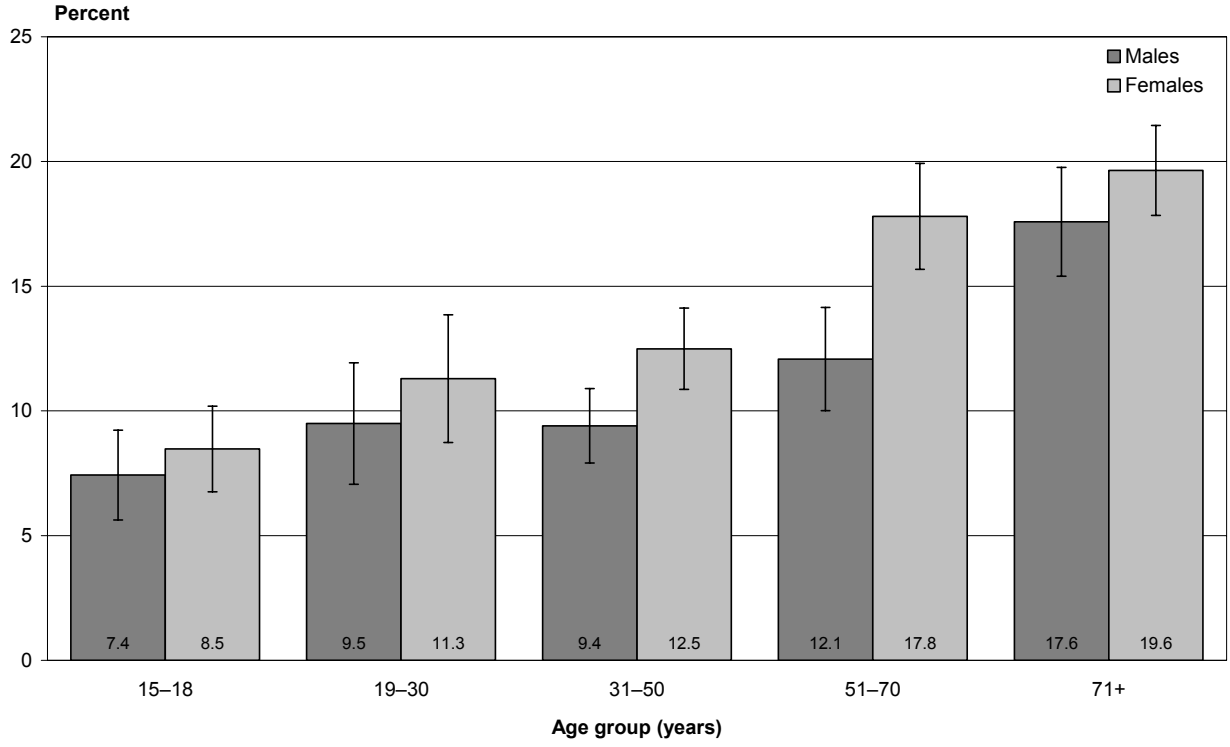


Table 4.17: Vitamin B_6 intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin B_6 (mg)[1]				
		Mean	**10th**[2]	**Median (50th),**[2] **(95% CI)**	**90th**[2]	**Inadequate intake (%)** [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

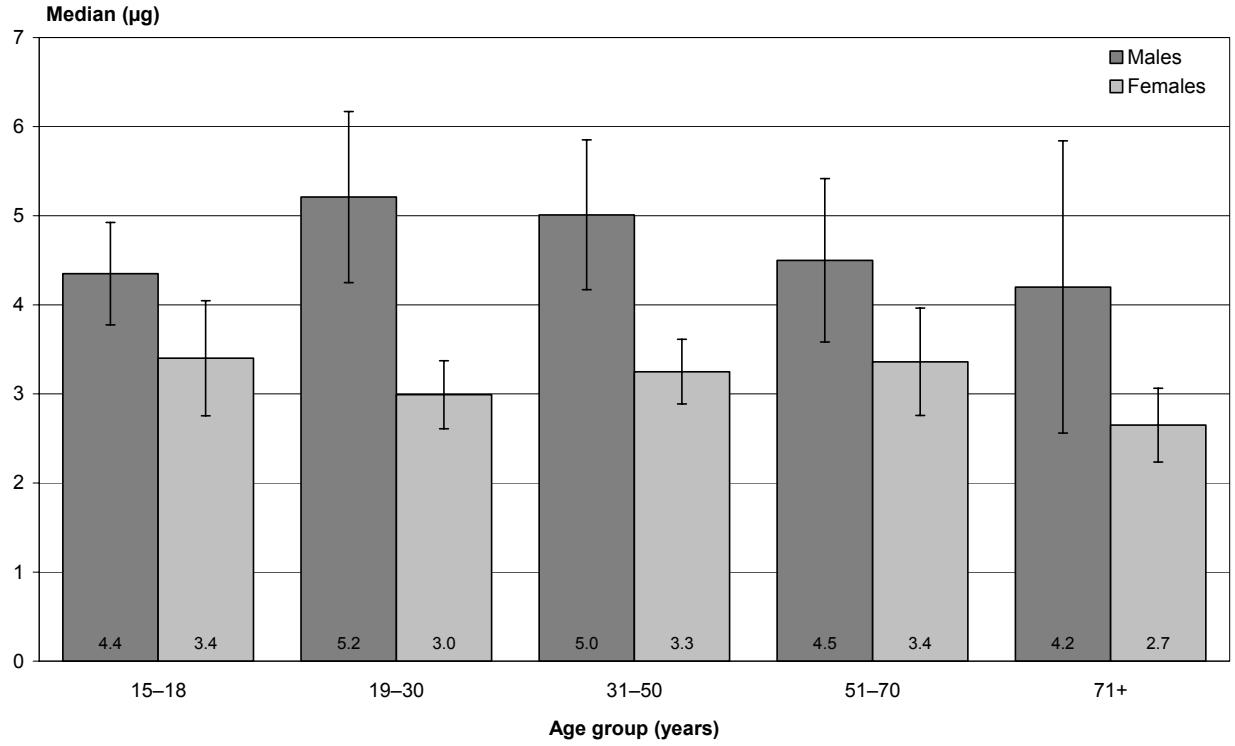
1 Proportion of total nutrient intake obtained from each food group. Results for Māori, Pacific, NZEO and NZDep2006 are in the online data tables. For full food group definitions, see Table 2.2. 95% confidence intervals are presented only for the top 10 food groups.

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

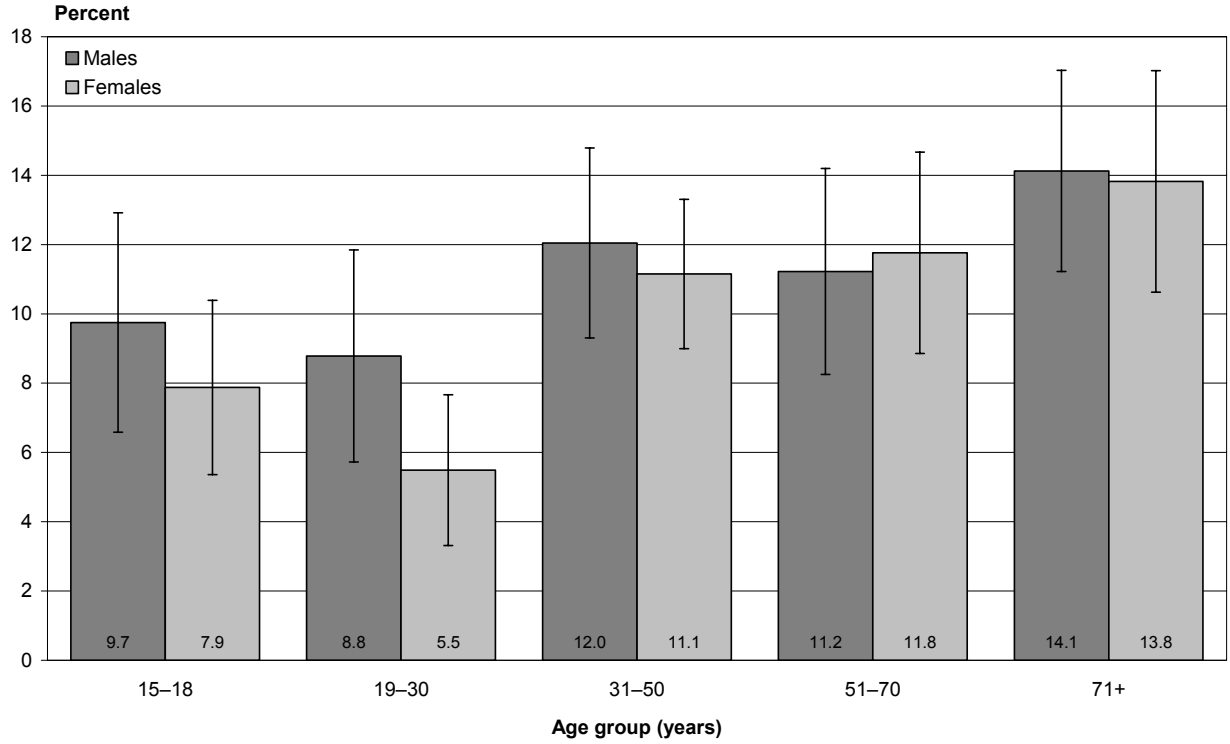


Table 4.19: Vitamin B_{12} intake, by age group, ethnic group, NZDep2006 and sex

		Vitamin B_{12} (µg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%)[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).

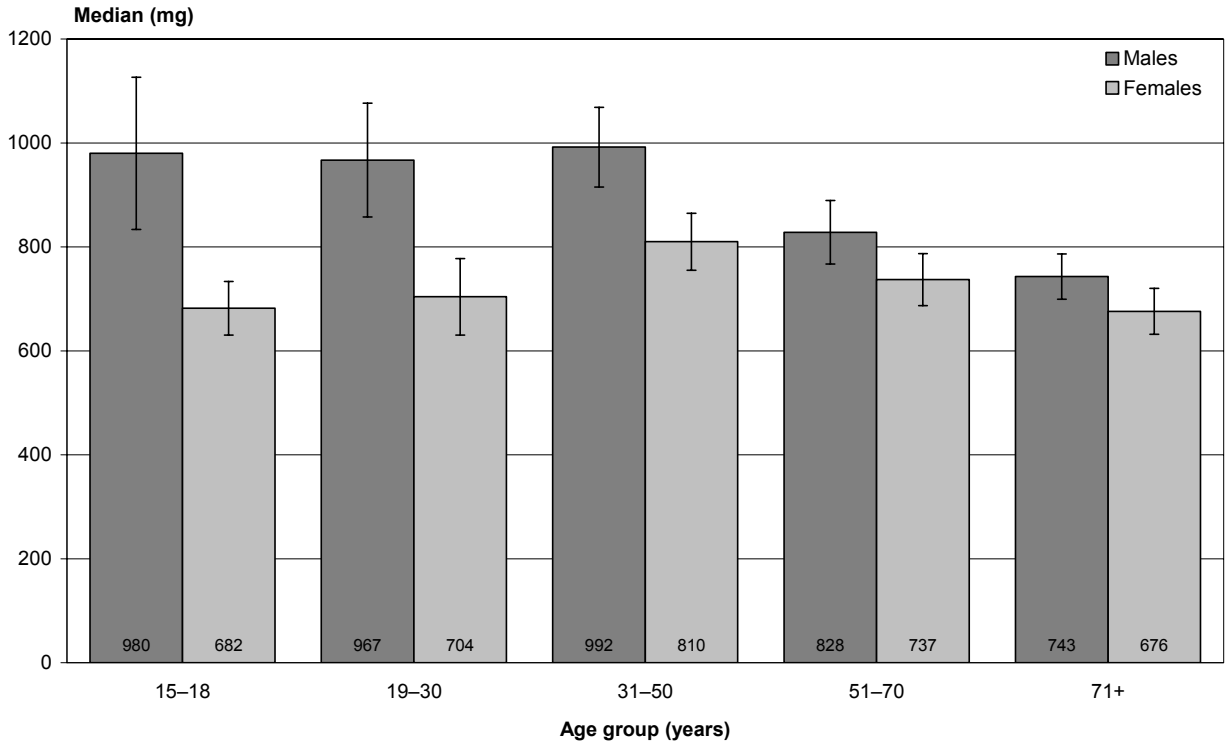
Peak bone mass is developed during young adulthood, then bone density decreases in later life due to falling sex steroids, and falls sharply following menopause in women (Mann and Truswell 2007). Other functions of calcium include involvement in muscle contraction and relaxation, nerve functioning, blood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

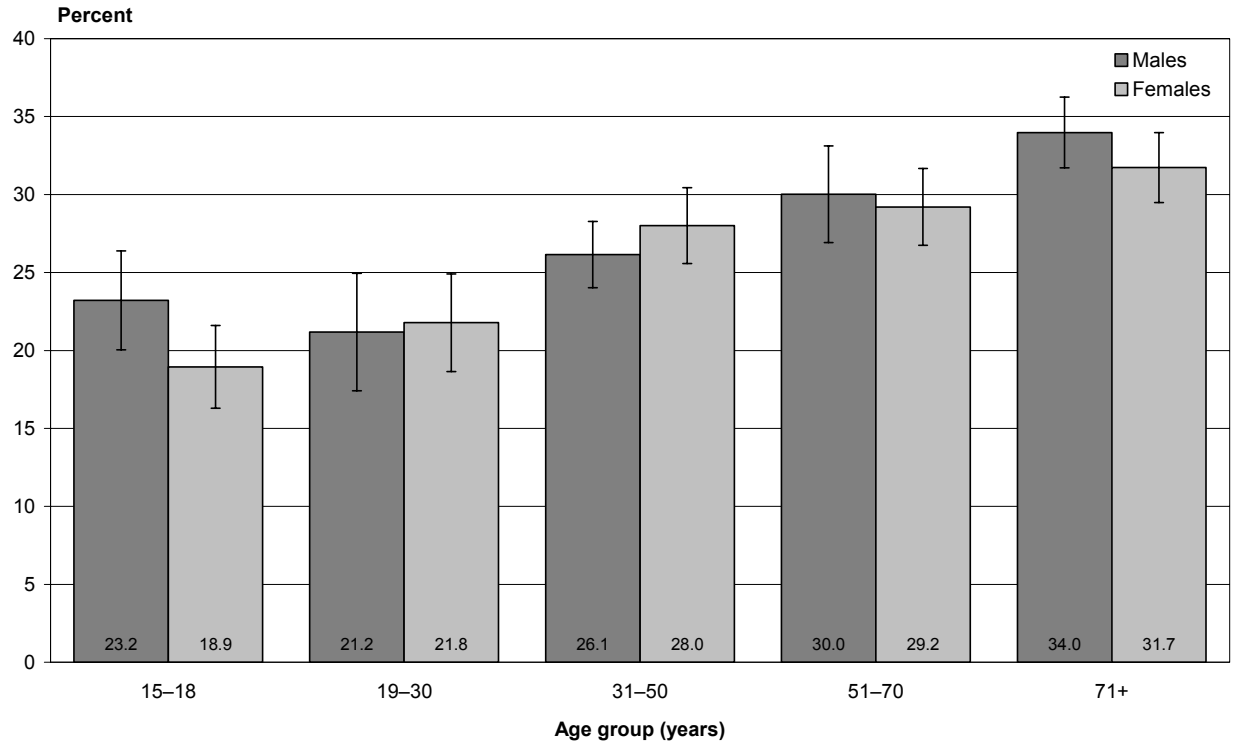


Table 4.21: Calcium intake, by age group, ethnic group, NZDep2006 and sex

		Calcium (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%)[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

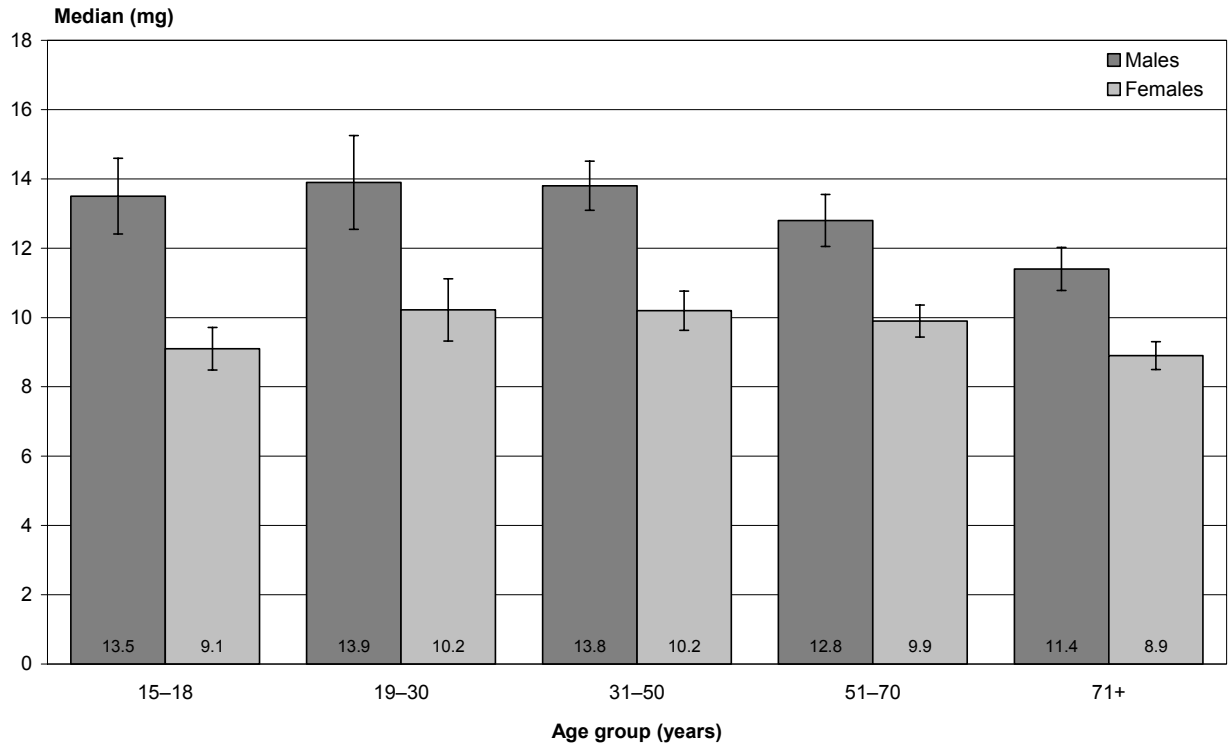
Iron is part of the proteins haemoglobin and myoglobin, which are responsible for the transport of oxygen in blood and for making oxygen available for muscle contraction, respectively (Rolfes et al 2009).

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

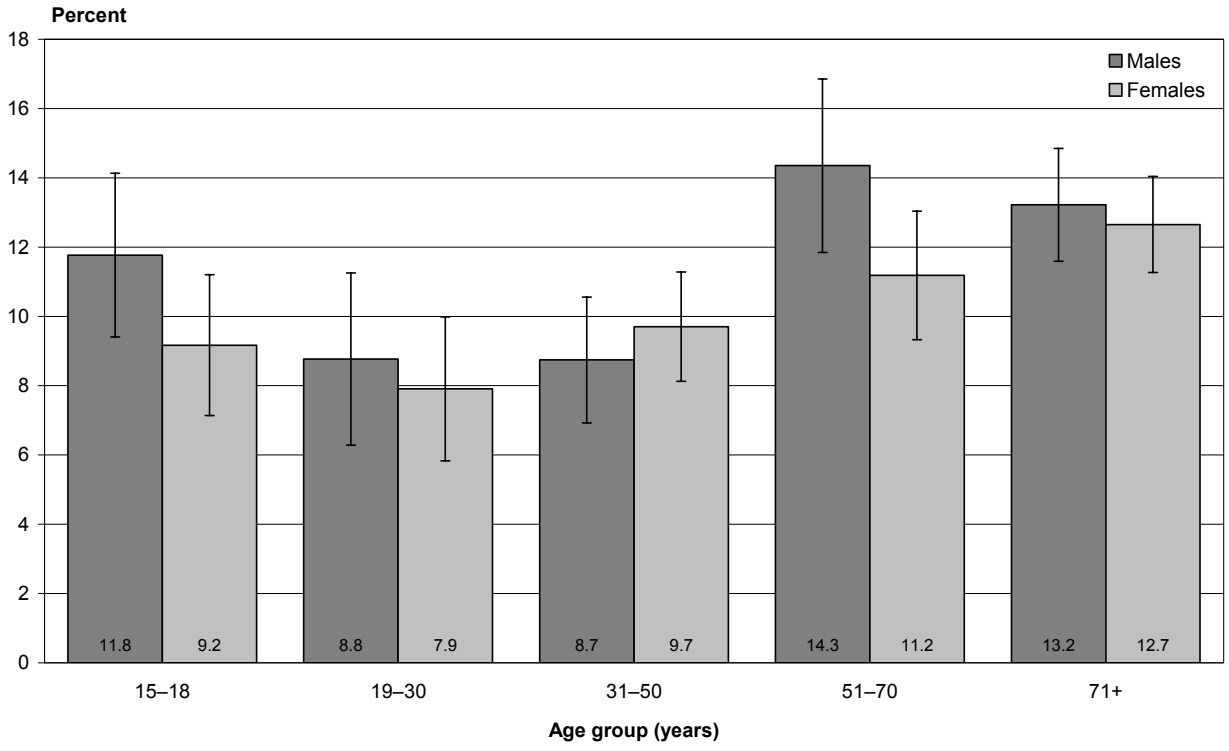


Table 4.23: Iron intake, by age group, ethnic group, NZDep2006 and sex

		Iron (mg)[1]				
		Mean	10th[2]	Median (50th),[2] (95% CI)	90th[2]	Inadequate intake (%)[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

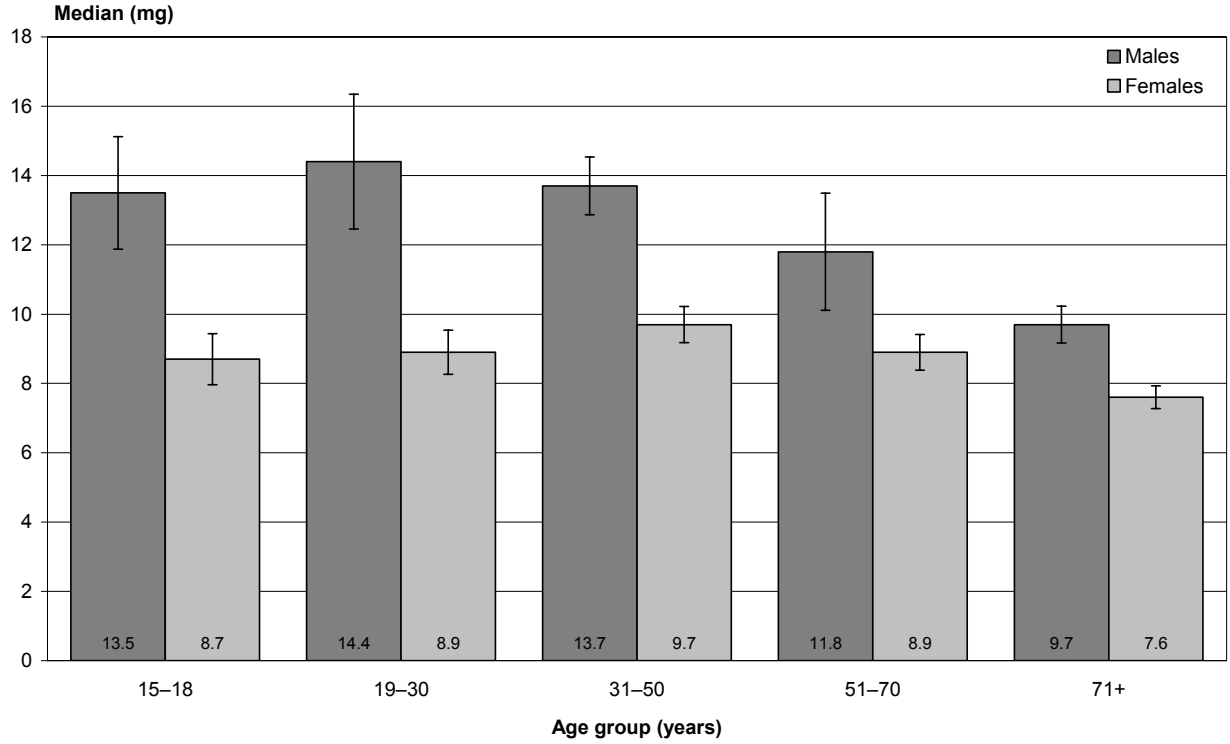
The trace element zinc acts as a cofactor for more than 100 enzymes in the body (Rolfes et al 2009). Zinc is important in major metabolic pathways, including protein and nucleic acid synthesis. It is also involved in the synthesis and action of insulin (Mann and Truswell 2007). Other functions include 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

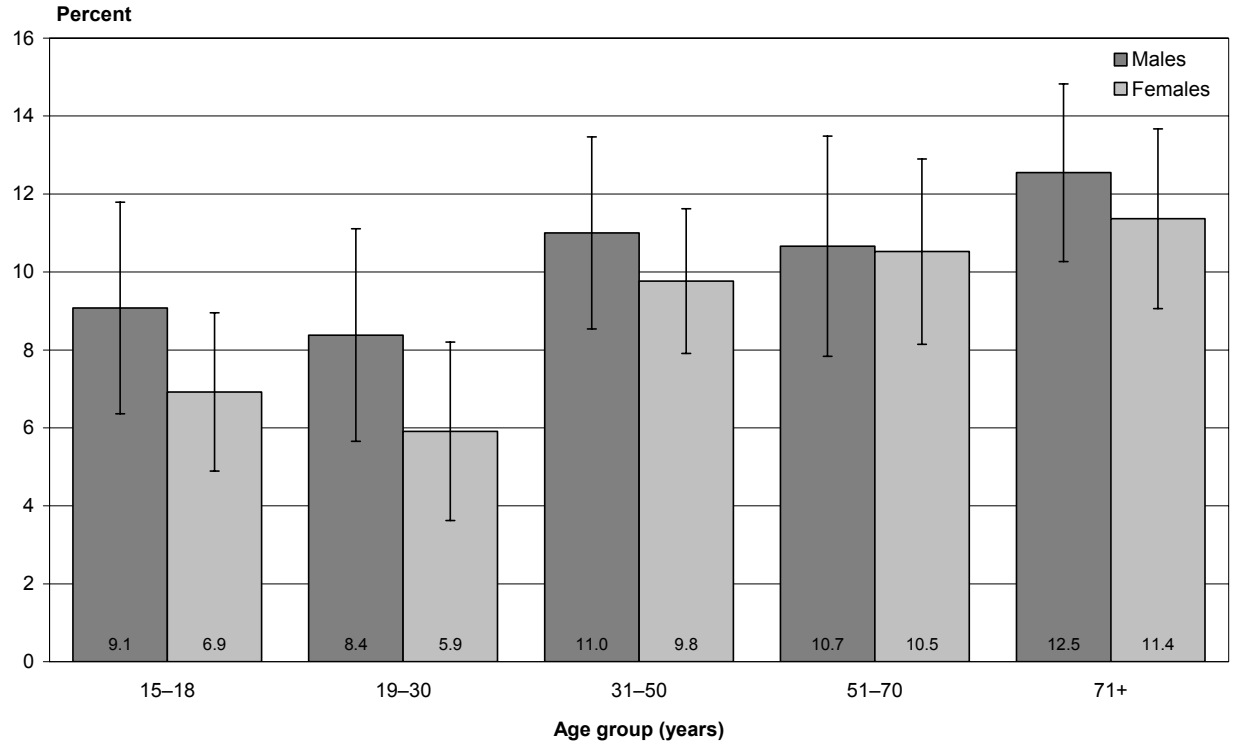


Table 4.25: Zinc intake, by age group, ethnic group, NZDep2006 and sex

		Zinc (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%)[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.

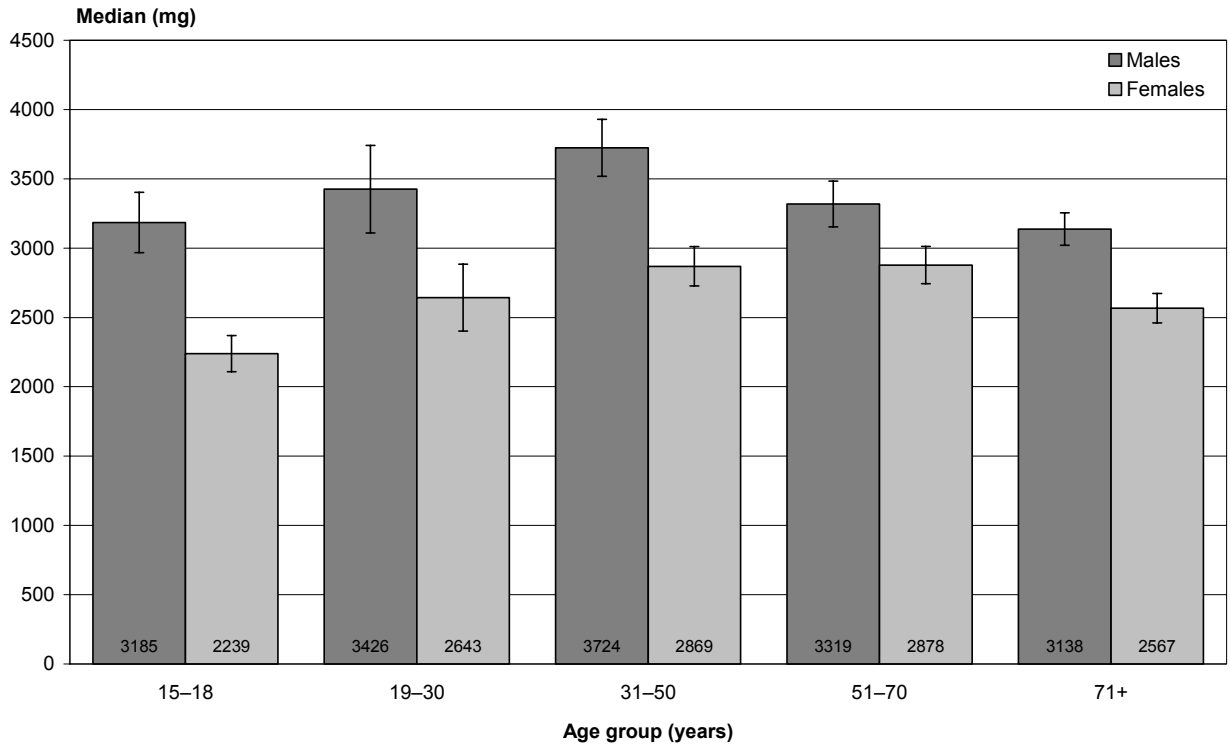
4.9 Potassium

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

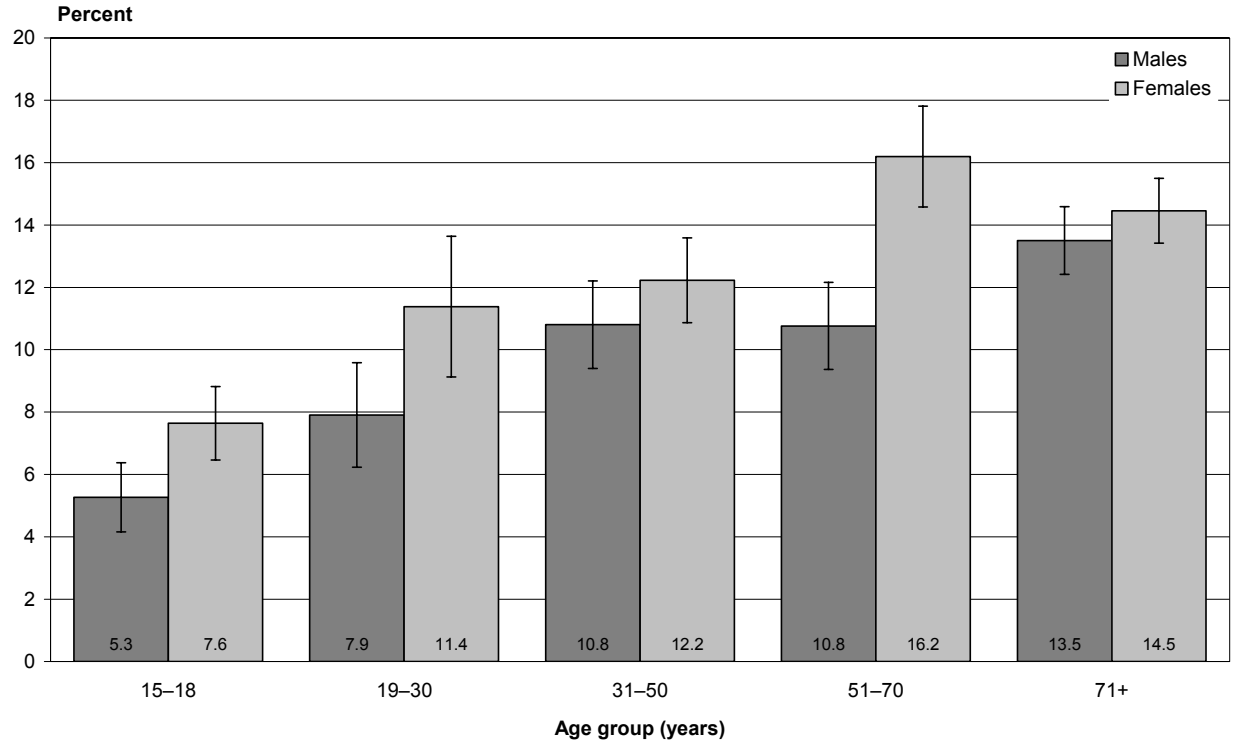


Table 4.27: Potassium intake, by age group, ethnic group, NZDep2006 and sex

		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).

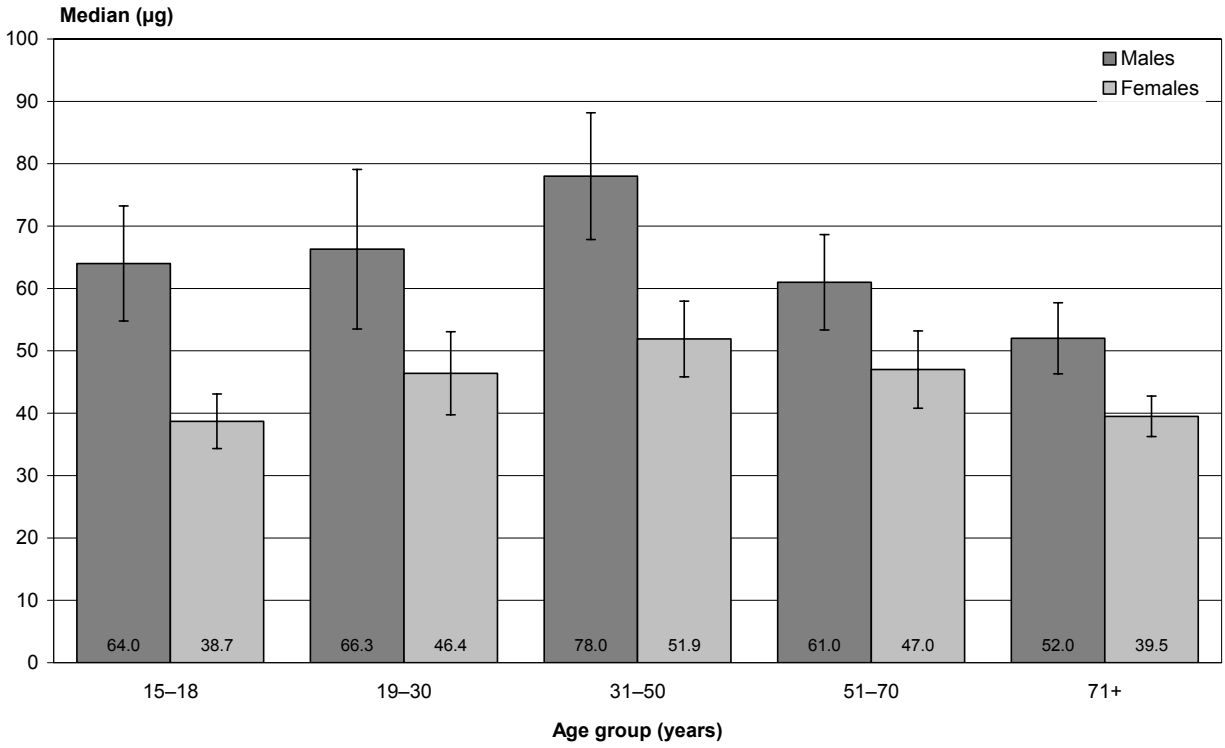
The selenium content of plant foods is dependent on the selenium content of the soils in which they are grown. Fruit, vegetables and grains grown in New Zealand tend to have lower selenium levels than plant foods from countries where the soil selenium concentrations are higher. The selenium content of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

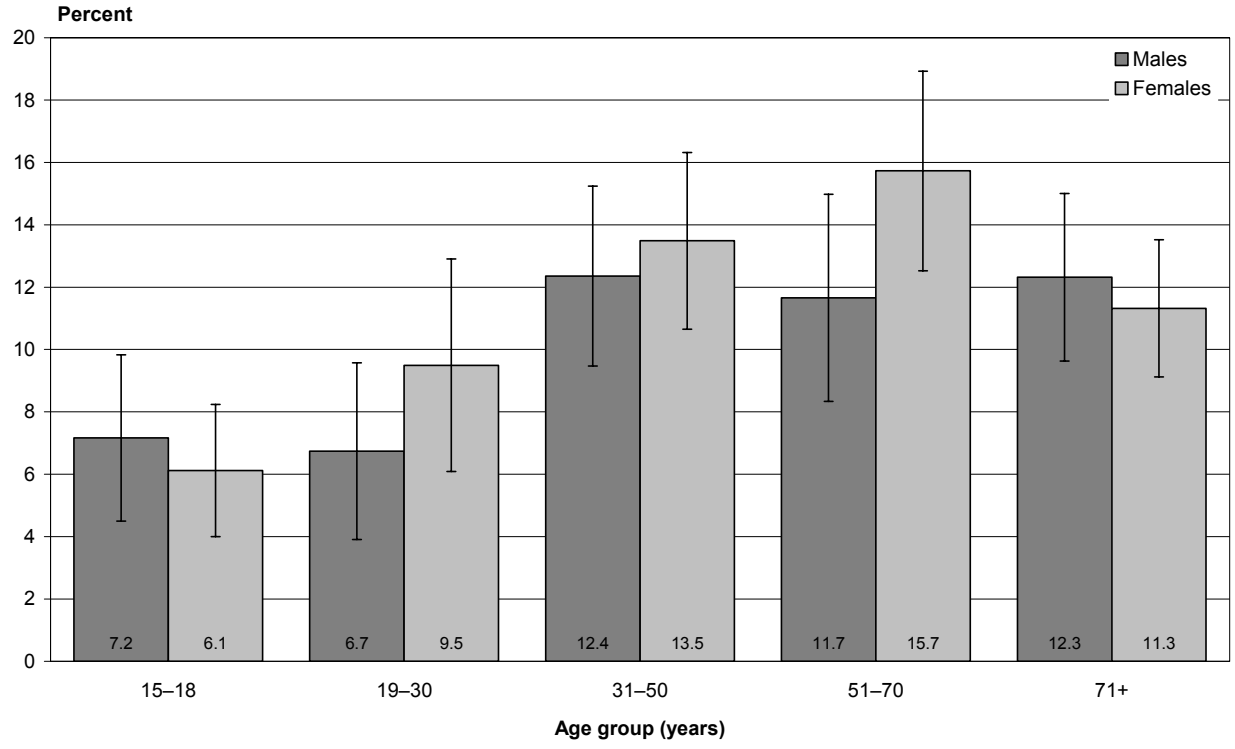


Table 4.29: Selenium intake, by age group, ethnic group, NZDep2006 and sex

		Selenium (mg)[1]				
		Mean	**10th[2]**	**Median (50th),[2] (95% CI)**	**90th[2]**	**Inadequate intake (%)[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.