

# Body size

## Introduction

A healthy body size is increasingly recognised as important for good health and wellbeing, as the evidence grows that obese children and adults are at greater risk of short-term and long-term health consequences.

Overweight and obese children are likely to be obese into adulthood, and to have abnormal lipid profiles and high blood pressure at a younger age (Freedman et al 2005; Harding et al 2008; World Cancer Research Fund and American Institute for Cancer Research 2007). Obese children may also suffer stigmatisation due to their weight (Dietz and Robinson 2005).

Obesity is associated with a long list of adult health conditions, including: cardiovascular disease (ischaemic heart disease, high blood pressure and stroke), various types of cancer, type 2 diabetes, kidney disease, fatty liver disease, osteoarthritis, pulmonary embolism, deep vein thrombosis, polycystic ovarian syndrome, gout, gallstones, reproductive disorders, sleep apnoea, complications in pregnancy, complications in surgery, and psychological and social problems (World Health Organization 2000). In addition, obese people are more likely to experience personal, social and professional difficulties (World Cancer Research Fund and American Institute for Cancer Research 2007).

Body mass index (BMI) is a measure of weight adjusted for height, and is calculated by dividing weight in kilograms by height in metres squared ( $\text{kg}/\text{m}^2$ ). BMI is used internationally to classify underweight, overweight and obesity. Since BMI does not distinguish between weight associated with muscle and weight associated with fat, it provides only a crude measure of body fatness in individuals. However, it does provide a good estimate of the proportion of the population with increased risk of health conditions associated with obesity (World Health Organization 2000).

### What were the survey questions?

In the 2006/07 New Zealand Health Survey participants aged two years old and over were weighed and had their height measured using professional anthropometric equipment and standardised techniques. In addition, participants aged five years old and over had their waist circumference measured.

Protocols for collecting height, weight and waist measurements in the survey are available online at [www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health](http://www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health). Less than 1% of participants (0.2% of children and 1.3% of adults) were unable to have their height or weight recorded due to being pregnant, chairbound, unsteady on their feet or in pain etc. A further 2.8% of children and 3.0% of adults refused to have their height and weight measured.

In this report international BMI cut-off points have been used to classify participants as underweight (or thin in children), normal range, overweight or obese. The World Health Organization BMI cut-off points were used for adults aged 18 years and over (World Health Organization 2007) (Table 2.23).

Table 2.23: International cut-off points for adults aged 18 years and over

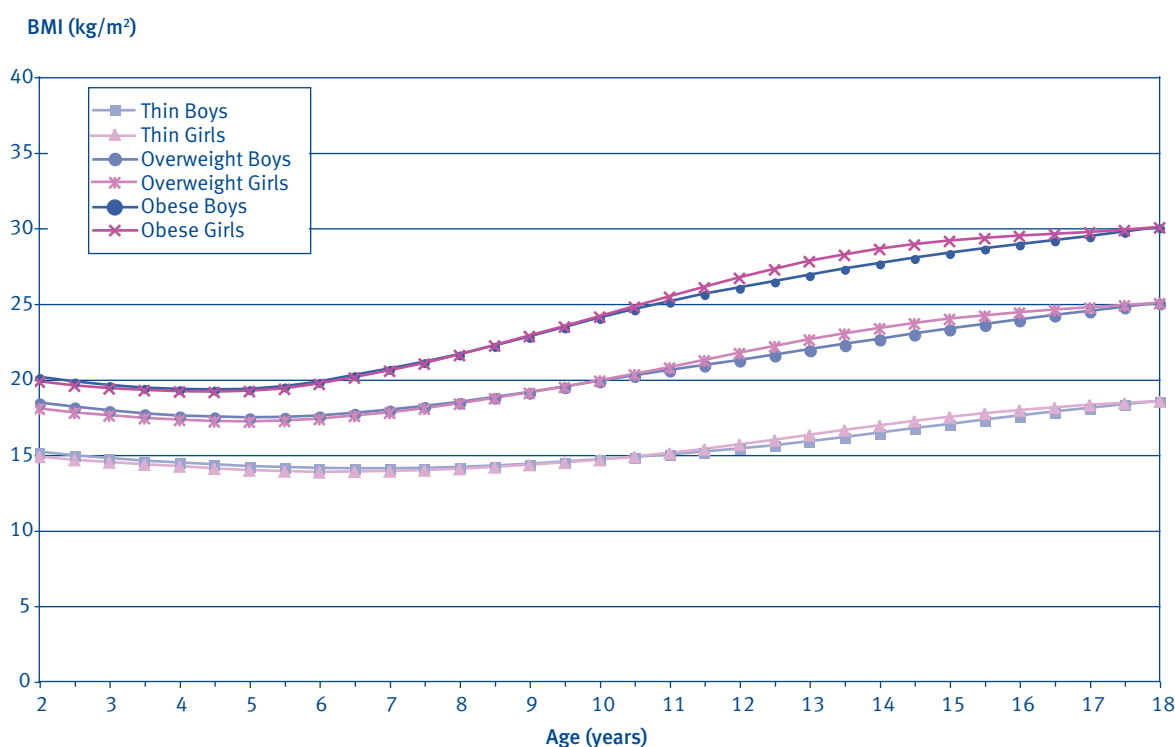
Classification	BMI score (kg/m <sup>2</sup> )	Risk of health conditions*
Underweight	< 18.50	Low risk
Normal range	18.50–24.99	Average risk
Overweight	25.00–29.99	Increased risk
Obese:	≥ 30.00	Substantially increased risk
Obese (class I)	30.00–34.99	Moderate risk
Obese (class II)	35.00–39.99	Severe risk
Obese (class III)	≥ 40.00	Very severe risk

Adapted from: World Health Organization 2000

Note: \* Only includes health conditions associated with increasing BMI.

For participants aged 2–17 years, BMI cut-off points developed by the International Obesity Taskforce (IOTF) were used to define thinness, overweight and obesity (Cole et al 2000; Cole et al 2007). The IOTF BMI cut-off points are sex and age-specific, and have been designed to coincide with the WHO BMI cut-off points for adults at age 18 years (18.5, 25 and 30 for underweight, overweight and obesity, respectively) (Figure 2.58). See Appendix 4 for a summary table of IOTF BMI cut-off points by six-month steps.

Figure 2.58: International BMI cut-off points for children and adolescents



It is important to note that although BMI cut-off points have been used to define overweight and obesity, the risk of disease increases as BMI increases in all population groups, even within the ‘normal’ range.

In order to comply with international practice and ensure consistency for adults and children, the same BMI cut-off points have been used for all ethnic groups, and no adjustment for clothing weight was made. Although this approach differs to that used for adults in previous

surveys, all data presented in this report have been analysed using the same definitions and therefore time trends can be interpreted as real changes over time. Please refer to the online body size technical report for more information ([www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health](http://www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health)).

## Mean (average) BMI for children and adults

The mean BMI for children aged 2 to 14 years was 18.7 kg/m<sup>2</sup> (18.6–18.8), with no difference between the age-adjusted mean BMI of boys (18.6, 18.5–18.8) and girls (18.8, 18.6–19.0). Mean BMI was highest in the 10–14 year age group (20.7, 20.5–21.0).

Adults aged 15 years and over had a mean BMI of 27.4 kg/m<sup>2</sup> (27.3–27.5). When adjusted for age, there was no difference in the mean BMI for men (27.3, 27.1–27.5) and women (27.1, 26.9–27.3). Mean BMI peaked in the 55–64 year age group for both men (28.9, 28.5–29.4) and women (28.6, 28.2–29.1).

## Mean BMI, by ethnic group

The mean BMI for Pacific children (21.1, 20.6–21.6) and Māori children (19.4, 19.1–19.6) was higher, while the mean BMI for European/Other (18.3, 18.1–18.4) and Asian children (18.1, 17.8–18.4) was lower, than that of all children adjusted for age. There were no significant differences in the mean BMI of boys and girls within all ethnic groups.

The mean BMI for Pacific adults (33.2, 32.7–33.7) and Māori adults (29.8, 29.4–30.1) was higher than that of all adults, while the mean BMI for Asian (24.9, 24.6–25.2) and European/Other (26.8, 26.6–27.0) adults was lower than all adults, adjusted for age. There were no significant differences in the mean BMI of men and women within all ethnic groups.

## Mean BMI, by neighbourhood deprivation

Mean BMI for children was highest in areas of high neighbourhood deprivation (NZDep2006 quintile 5), reaching 19.5 kg/m<sup>2</sup> (19.1–19.9) for boys and 20.0 kg/m<sup>2</sup> (19.5–20.5) for girls living in quintile 5.

Mean BMI for adults was also highest in areas of high neighbourhood deprivation (NZDep2006 quintile 5), reaching 28.6 kg/m<sup>2</sup> (28.1–29.1) for men and 29.5 kg/m<sup>2</sup> (29.0–30.1) for women living in quintile 5.

## Time trends in mean BMI for children aged 5–14 years and adults

There has been no change in the mean BMI for children aged 5–14 years since 2002 (adjusted for age). There was no change by gender between 2002 and 2006/07. Among Māori children, there was a decrease in mean BMI from 22.1 kg/m<sup>2</sup> (21.5–22.7) in 2002 to 19.9 kg/m<sup>2</sup> (19.6–20.2) in 2006/07.

While still increasing over time, the rate of increase in age-adjusted mean BMI for adults appears to have recently slowed. In 1997, the mean BMI was 26.0 kg/m<sup>2</sup> (25.8–26.2) increasing to 26.9 kg/m<sup>2</sup> (26.7–27.0) in 2002/03, then to 27.2 kg/m<sup>2</sup> (27.0–27.3) in 2006/07. This pattern was the same for both men and women.

For Māori men and women, there have been no significant changes in mean BMI across the three surveys (1997, 2002/03 and 2006/07).

The remainder of this section focuses on the results for BMI classifications of thin, normal range, overweight and obese.

## Body size of children and adults

Most New Zealand children aged 2–14 years had a body mass index in the normal range. One in five were overweight and a further one in twelve were obese. One in thirty-four were thin (Table 2.24).

Table 2.24: Body size of children aged 2–14 years, using international cut-off points (unadjusted)

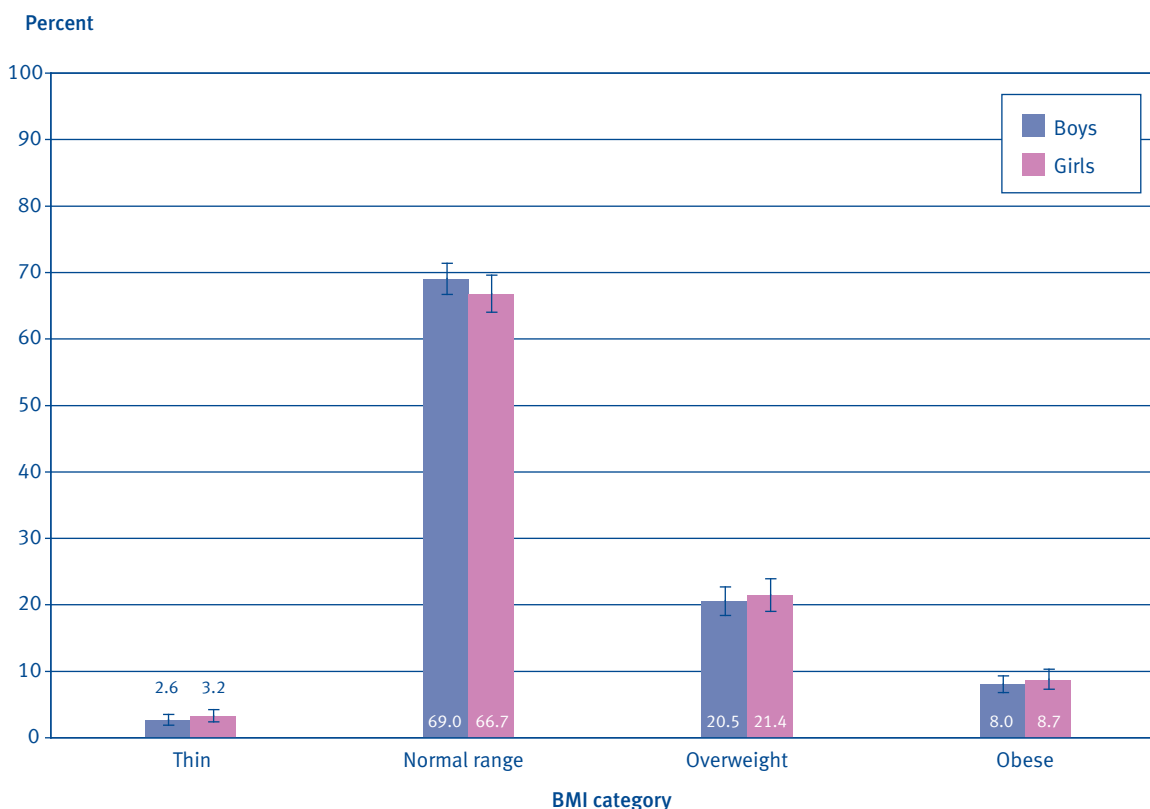
Classification	Risk of health conditions*	Prevalence (95% CI)	Number of children
Thin	Low	2.9 (2.2 - 3.6)	21600
Normal range	Average	67.9 (66.2 - 69.6)	503900
Overweight	Increased	20.9 (19.2 - 22.6)	155000
Obese	Substantially increased	8.3 (7.4 - 9.3)	61800

Source: 2006/07 New Zealand Health Survey

Note: \* Only includes health conditions associated with increasing BMI

There was no difference between boys and girls aged 2–14 years in the prevalence of each of the BMI categories, adjusted for age (Figure 2.59).

Figure 2.59: Body mass index (BMI) category of children aged 2–14 years, by gender (age standardised prevalence)



Source: 2006/07 New Zealand Health Survey

One in three New Zealand adults had a BMI in the normal range (Table 2.25). One in three were overweight and a further one in four were obese (all classes).

Table 2.25: Body size of adults, using international cut-off points (unadjusted)

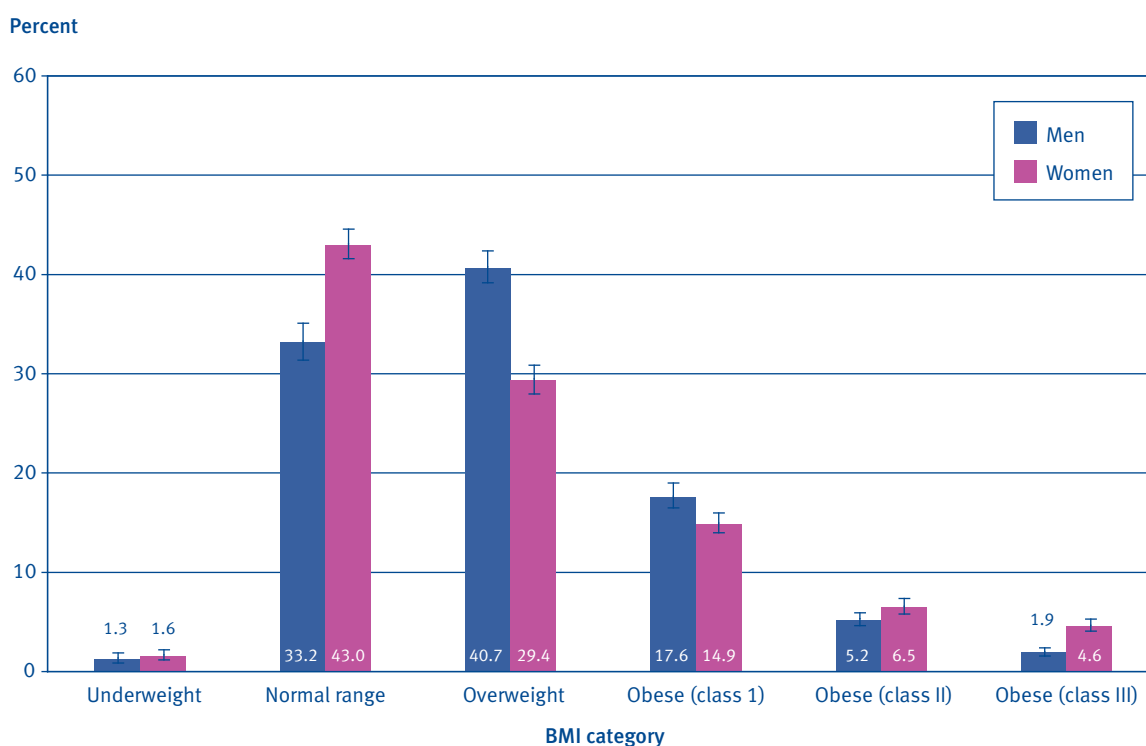
Classification	Risk of health conditions*	Prevalence (95% CI)	Number of adults
Underweight	Low	1.3 (1.0–1.6)	40500
Normal range	Average	36.1 (35.0–37.1)	1125600
Overweight	Increased	36.2 (35.2–37.1)	1128500
Obese (all classes)	Substantially increased	26.5 (25.5–27.5)	826100

Source: 2006/07 New Zealand Health Survey

Note: \* Only includes health conditions associated with increasing BMI

After adjusting for age, women were significantly more likely than men to have a BMI in the normal range, but were also more likely to be extremely obese (class II and class III). Men were more likely than women to be overweight or class I obese (Figure 2.60).

Figure 2.60: Body mass index (BMI) category of adults, by gender (age standardised prevalence)



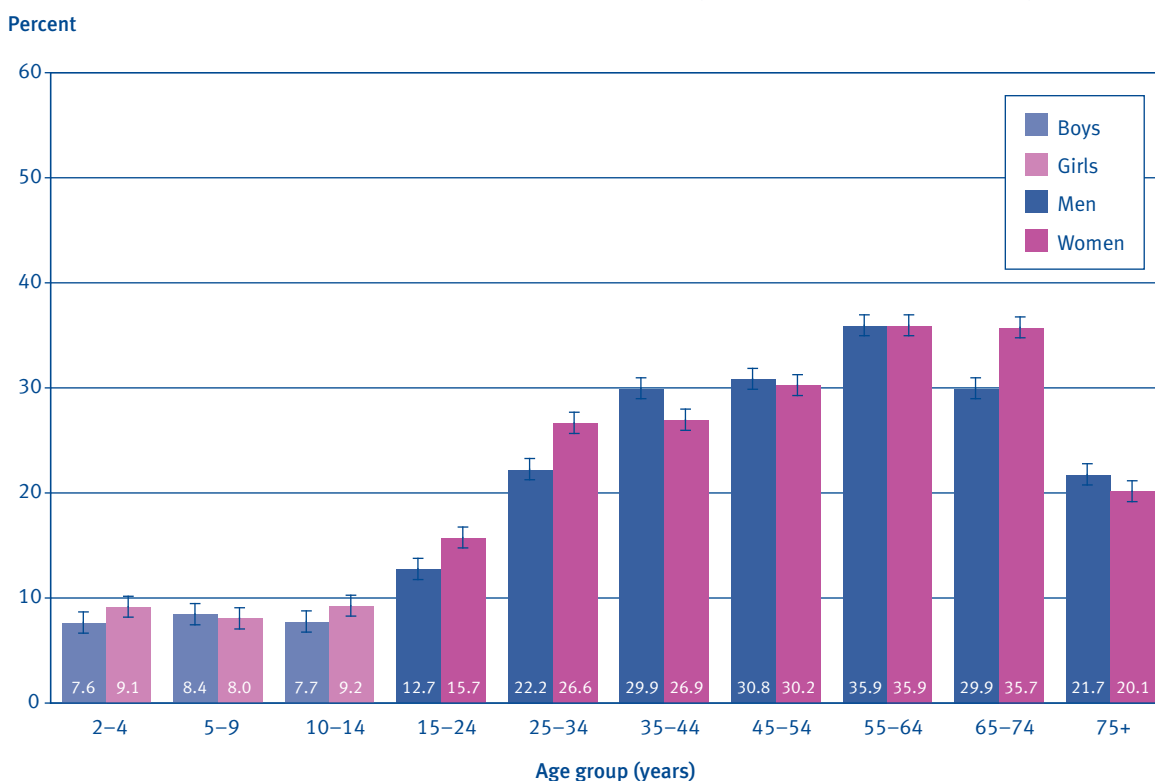
Source: 2006/07 New Zealand Health Survey

The remainder of this section focuses on obesity (all classes).

## Obesity for children and adults, by age group

The prevalence of obesity was relatively low and stable in childhood, and then increased as age increased, until a decline in men aged 65 years and over and in women aged 75 years and over (Figure 2.61). Men aged 55–64 years and women aged 55–74 years had the highest prevalence of obesity.

Figure 2.61: Obesity for children and adults, by age group and gender (unadjusted prevalence)



Source: 2006/07 New Zealand Health Survey

## Obesity, by ethnic group

Table 2.26 gives an indication of the burden of obesity for children in New Zealand’s main ethnic population groups.

Table 2.26: Obesity for children aged 2–14 years, by ethnic group (unadjusted)

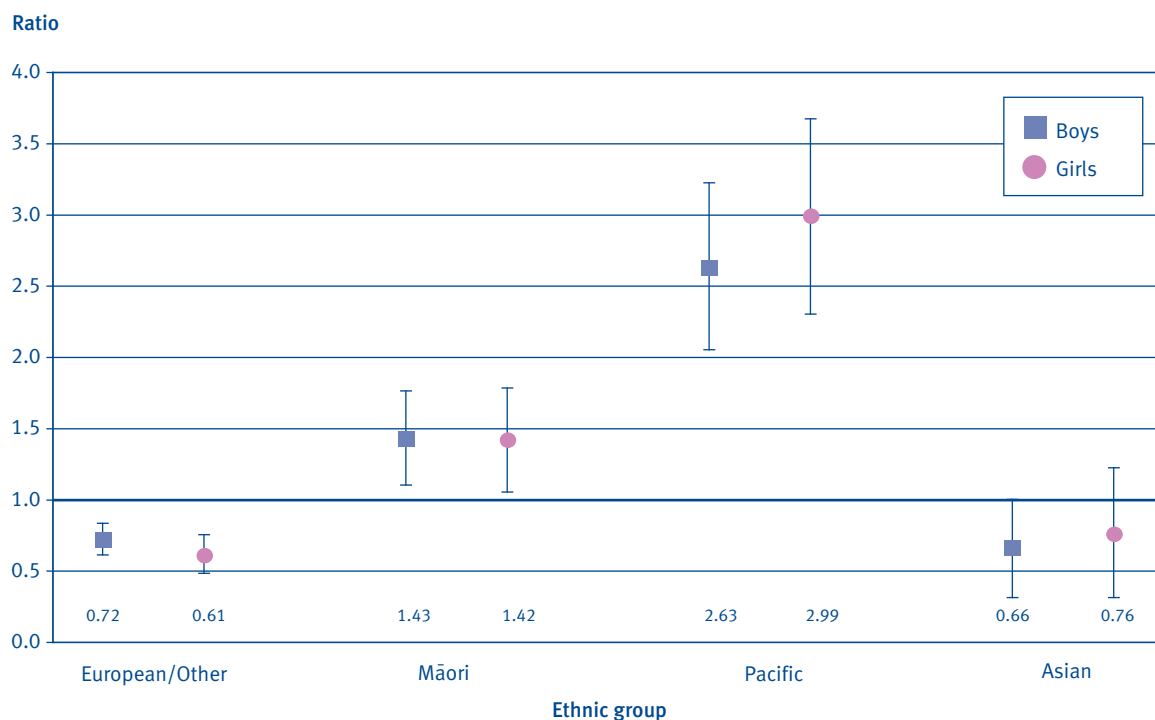
Ethnic group	Prevalence (95% CI)	Number of children
European/ Other	5.5 (4.3–6.7)	31000
Māori	11.8 (9.9–13.7)	19900
Pacific	23.3 (19.7–26.8)	19700
Asian	5.9 (3.5–8.3)	3900

Source: 2006/07 New Zealand Health Survey

Note: Total response standard output for ethnic groups has been used.

Adjusted for age, Pacific boys and girls were at least 2.5 times more likely to be obese than boys and girls in the total population. Māori boys and girls were approximately 1.5 times more likely to be obese than boys and girls in the total population (Figure 2.62).

Figure 2.62: Obesity for children aged 2 to 14 years, by ethnic group and gender (age standardised rate ratio)



Source: 2006/07 New Zealand Health Survey

Notes: Age standardised to the WHO world population. Reference group, with a rate ratio of 1.0 (indicated by the bold line), is the total male or female population aged from 2-14 years. Total response standard output for ethnic groups has been used.

Table 2.27 gives an indication of the burden of obesity for adults in New Zealand's main ethnic population groups.

Table 2.27: Obesity for adults, by ethnic group (unadjusted)

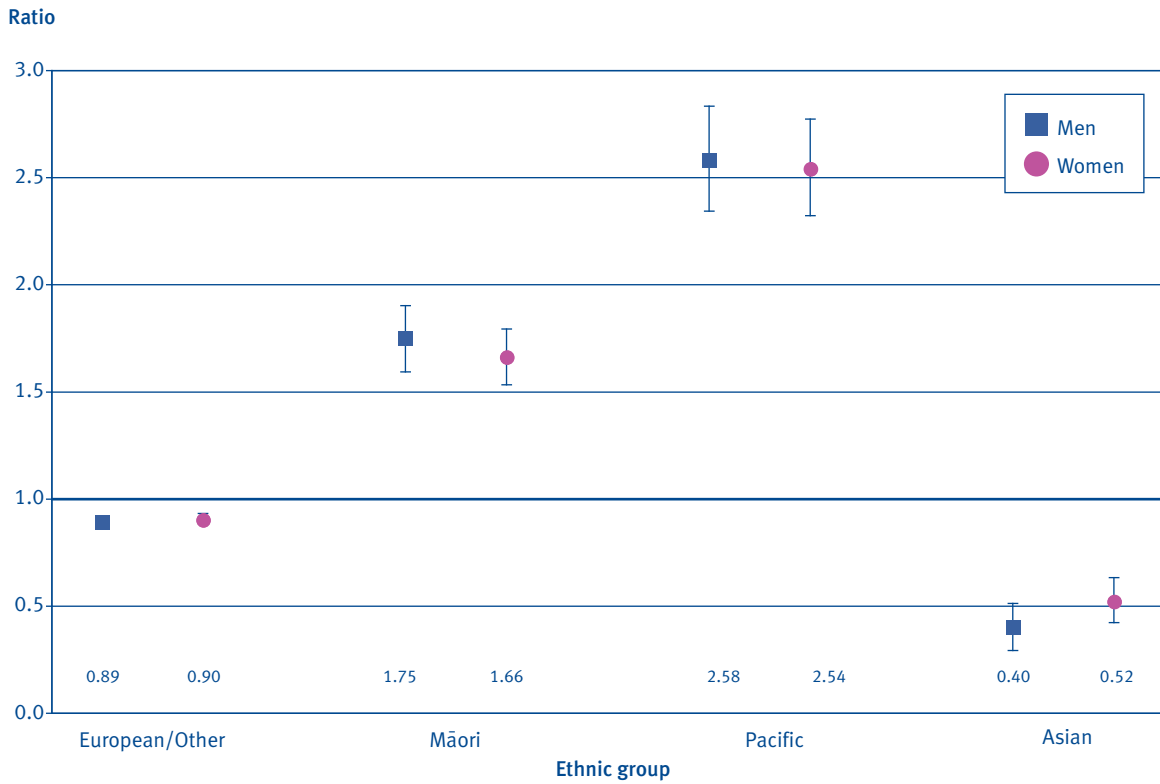
Ethnic group	Prevalence (95% CI)	Number of adults
European/ Other	24.3 (23.1–25.5)	619200
Māori	41.7 (39.8–43.7)	148300
Pacific	63.7 (60.0–67.5)	104900
Asian	11.0 (9.0–13.0)	30800

Source: 2006/07 New Zealand Health Survey

Note: Total response standard output for ethnic groups has been used.

Pacific men and women were at least 2.5 times more likely to be obese than men and women in the total population. Māori men and women were 1.7 times more likely to be obese than men and women in the total population (Figure 2.63).

Figure 2.63: Obesity for adults, by ethnic group and gender (age standardised rate ratio)



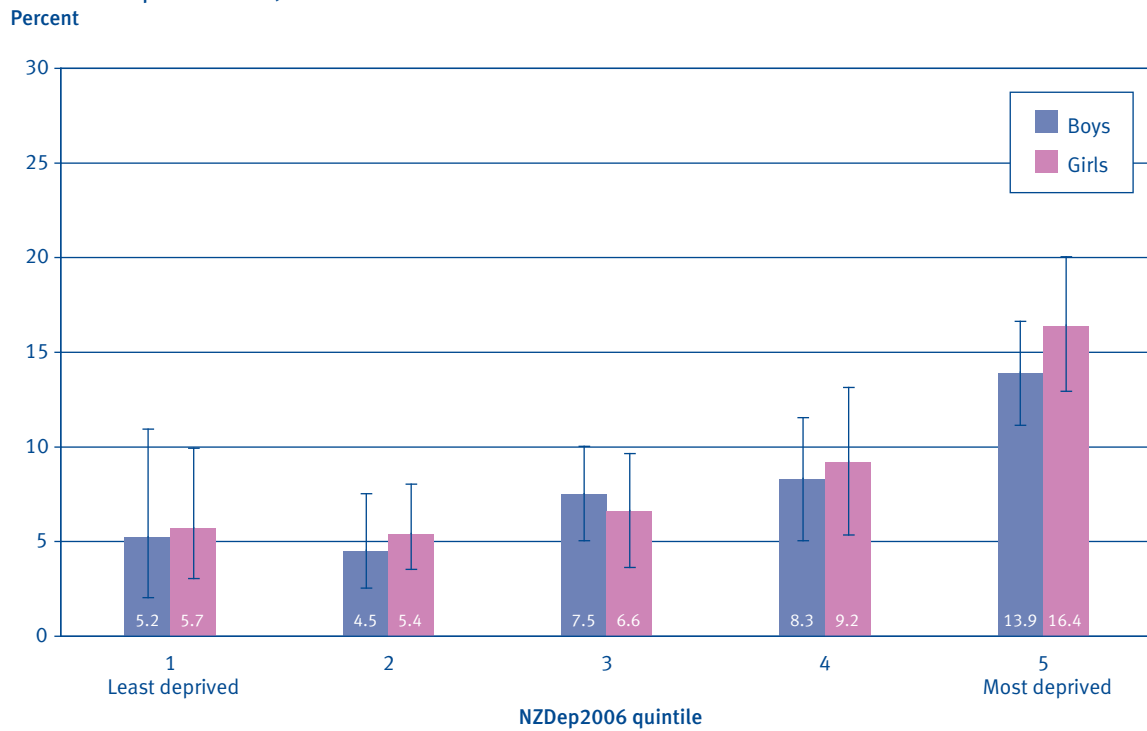
Source: 2006/07 New Zealand Health Survey

Notes: Age standardised to the WHO world population. Reference group, with a rate ratio of 1.0 (indicated by the bold line), is the total male or female population aged 15 years and over. Total response standard output for ethnic groups has been used.

## Obesity, by neighbourhood deprivation

Children living in areas of high neighbourhood deprivation (NZDep2006 quintile 5) were more likely to be obese than children living in all other areas (NZDep2006 quintiles 1, 2, 3 and 4) (p-values < 0.05). This pattern was evident in both boys and girls (Figure 2.64).

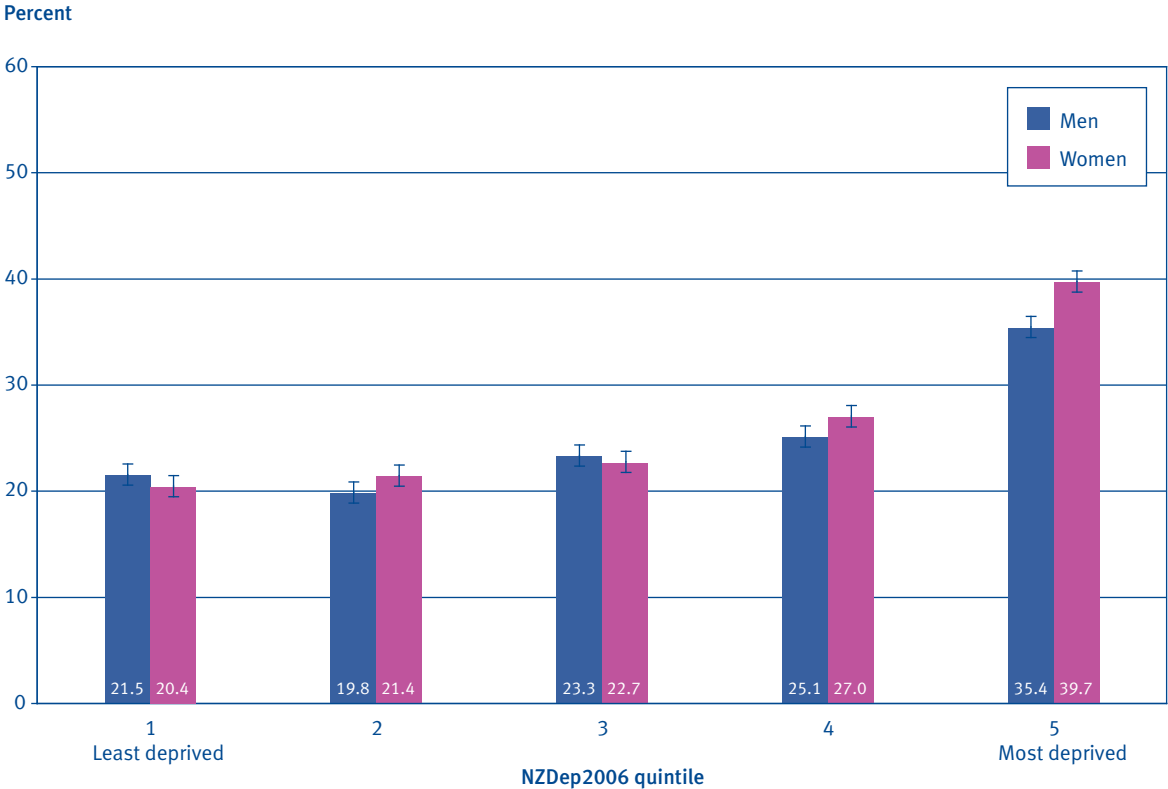
Figure 2.64: Obesity for children, by NZDep2006 quintile and gender (age standardised prevalence)



Source: 2006/07 New Zealand Health Survey

The proportion of adults who were obese was relatively stable across neighbourhood deprivation quintiles 1 to 4, and then increased sharply for adults living in NZDep2006 quintile 5, especially for women (Figure 2.65).

Figure 2.65: Obesity for adults, by NZDep2006 quintile and gender (age standardised prevalence)



Source: 2006/07 New Zealand Health Survey

## Obesity, by DHB area

Children and adults living in Counties Manukau DHB area had a significantly increased prevalence of obesity compared to the total child and total adult populations, respectively. Adults living in Northland / Tairāwhiti / Hawke's Bay / Lakes / Whanganui DHB area were also more likely to be obese than the total adult population (Table 2.28). Children and adults living in Waitemata and children living in Bay of Plenty / Taranaki / MidCentral were less likely to be obese than the total population.

Table 2.28: Obesity for children and adults, by DHB area (unadjusted)

DHB area	Prevalence for children (95% CI)	Number of children	Prevalence for adults (95% CI)	Number of adults
Northland / Tairāwhiti / Hawke's Bay / Lakes / Whanganui	8.9 (6.6–11.2) –	8800	30.2 (27.6–32.9) +	113600
Waitemata	5.9 (3.4–8.3) –	5200	20.5 (17.3–23.7) –	77600
Auckland	9.7 (6.6–12.9)	6300	21.4 (18.2–24.7) –	69200
Counties Manukau	12.7 (9.4–16.0) +	12000	33.0 (29.3–36.8) +	106500
Waikato	9.2 (6.2–12.2)	6000	29.2 (26.1–32.3)	75600
Bay of Plenty / Taranaki / MidCentral	5.2 (3.1–7.3) –	4400	27.5 (24.5–30.5)	96600
Wairarapa / Hutt Valley / Capital and Coast	9.1 (6.0–12.2)	6900	25.3 (22.0–28.6)	87700
Canterbury	6.1 (3.5–9.6)	4800	24.5 (21.7–27.3)	90800
Nelson Marlborough / West Coast / South Canterbury / Otago / Southland	8.2 (4.0–12.3)	7000	27.9 (24.5–31.2)	109400
<b>New Zealand total</b>	<b>8.3 (7.4–9.3)</b>	<b>61700</b>	<b>26.5 (25.5–27.5)</b>	<b>826100</b>

Source: 2006/07 New Zealand Health Survey

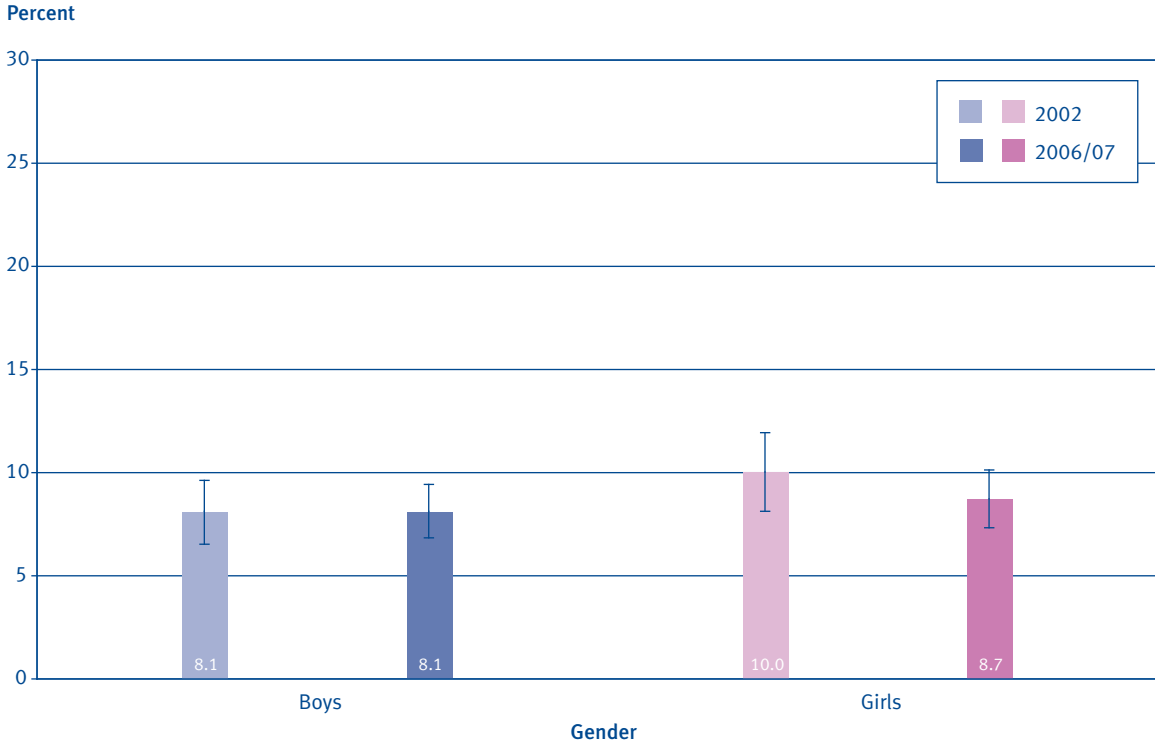
Notes: Estimates indicated with a + are significantly higher than the national rate, and estimates indicated with a – are significantly lower than the national rate. Data are based on direct survey estimates and could be confounded by different population characteristics in each DHB. Due to small sample size, some DHB areas have been combined. Survey population is the estimated resident population living in permanent private dwellings at 31 June 2007.

### Time trends in the prevalence of obesity for children

A time trend is not available for under five-year-olds.

From 2002 to 2006/07 there was no change in the prevalence of obesity for school-aged children, adjusted for age (Figure 2.66).

Figure 2.66: Obesity for children aged 5–14 years, by gender, 2002 and 2006/07 (age standardised prevalence)

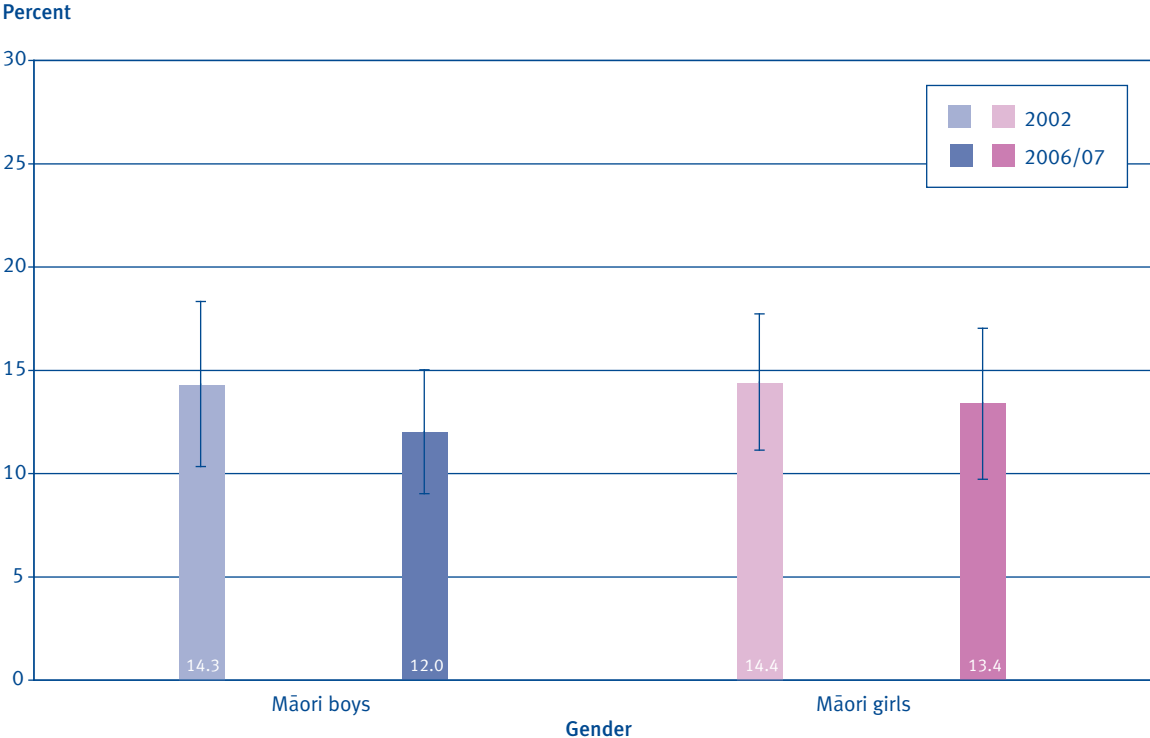


Source: 2006/07 New Zealand Health Survey and 2002 National Children’s Nutrition Survey

Note: Data from previous years have been reanalysed to allow for comparability.

For Māori boys and girls, there was also no significant change in the prevalence of obesity for school-aged children, adjusted for age (Figure 2.67).

Figure 2.67: Obesity for Māori children aged 5–14 years, by gender, 2002 and 2006/07 (age standardised prevalence)



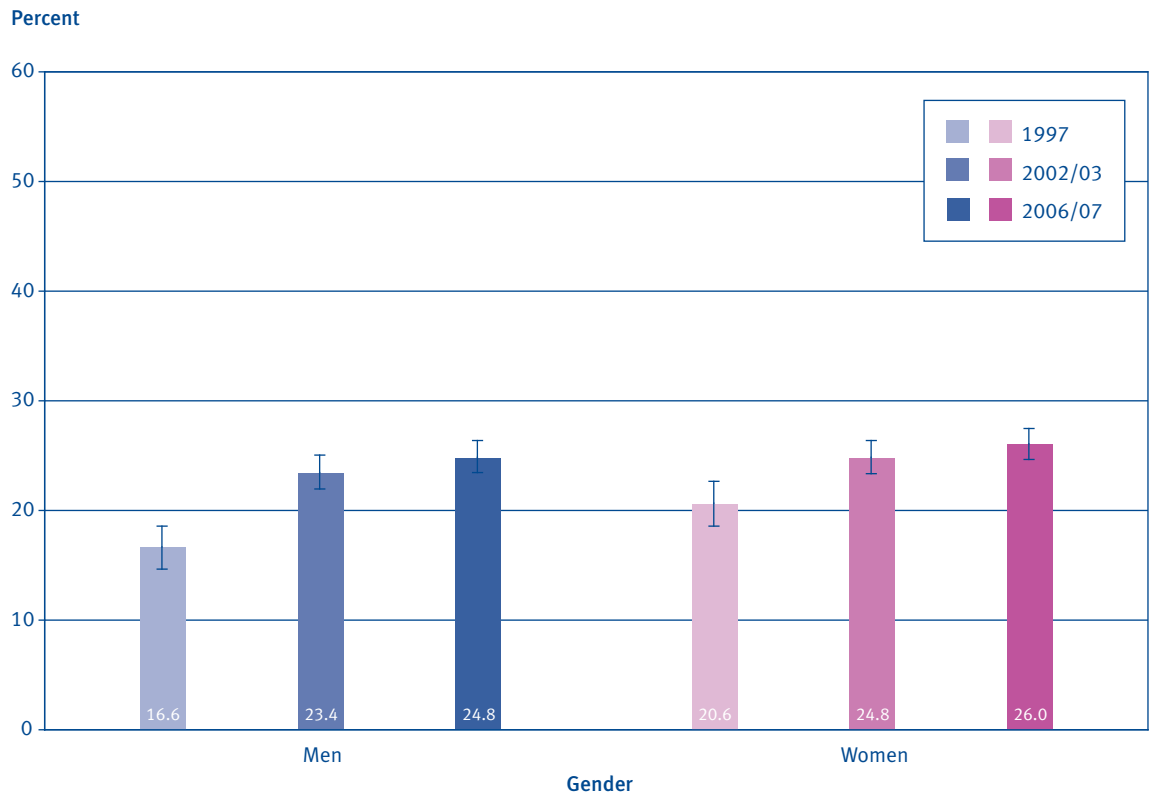
Source: 2006/07 New Zealand Health Survey and 2002 National Children’s Nutrition Survey

Note: Data from previous years have been reanalysed to allow for comparability.

### Time trend in the prevalence of obesity for adults

There has been an increase in the prevalence of obesity for men and women from 1997 to 2006/07, adjusted for age. However, the rate of increase appears to be slowing, with no statistically significant increase between 2002/03 and 2006/07 for both men and women (Figure 2.68).

Figure 2.68: Obesity for adults, by gender, 1997, 2002/03 and 2006/07 (age standardised prevalence)

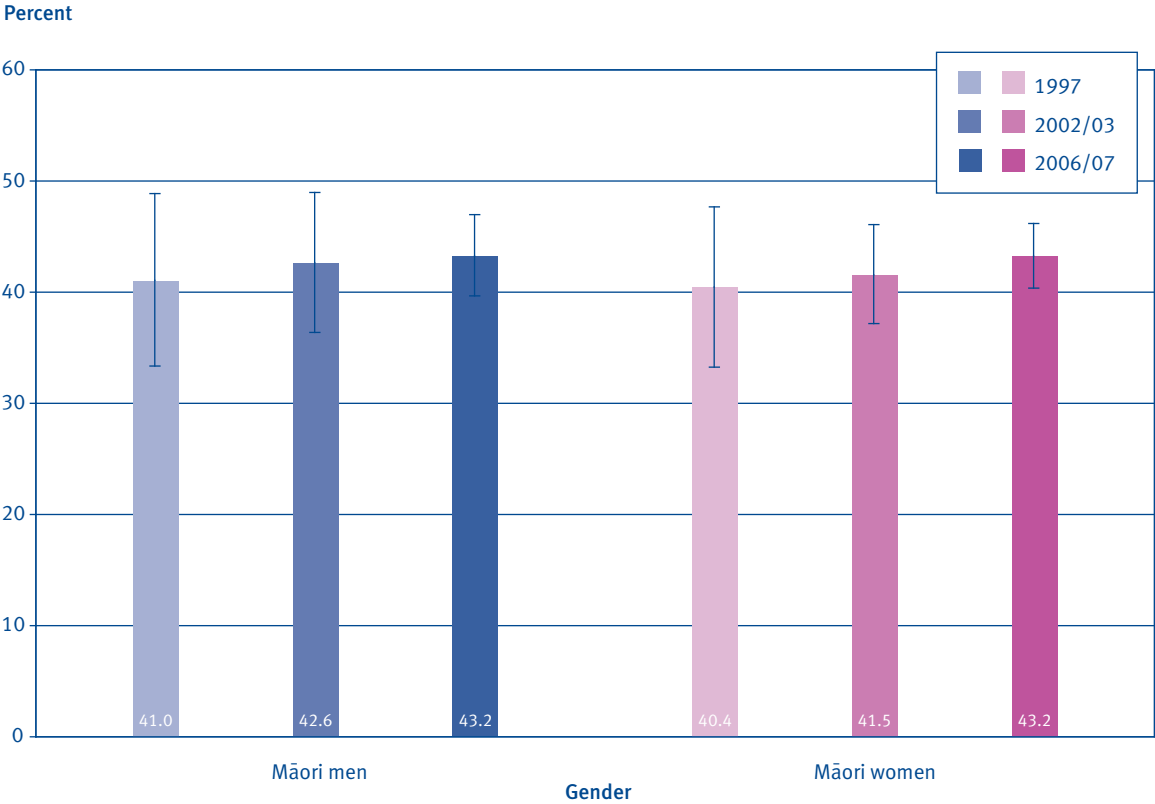


Source: 2002/03 and 2006/07 New Zealand Health Surveys, 1997 National Nutrition Survey

Note: Data from previous years have been reanalysed to allow for comparability.

For Māori adults there was no significant change from 1997 to 2006/07 in the prevalence of obesity for both men and women, adjusted for age (Figure 2.69).

Figure 2.69: Obesity for Māori adults, by gender, 1997, 2002/03 and 2006/07 (age standardised prevalence)



Source: 2002/03 and 2006/07 New Zealand Health Surveys, 1997 National Nutrition Survey

Note: Data from previous years have been reanalysed to allow for comparability.