

## Results – Māori Population

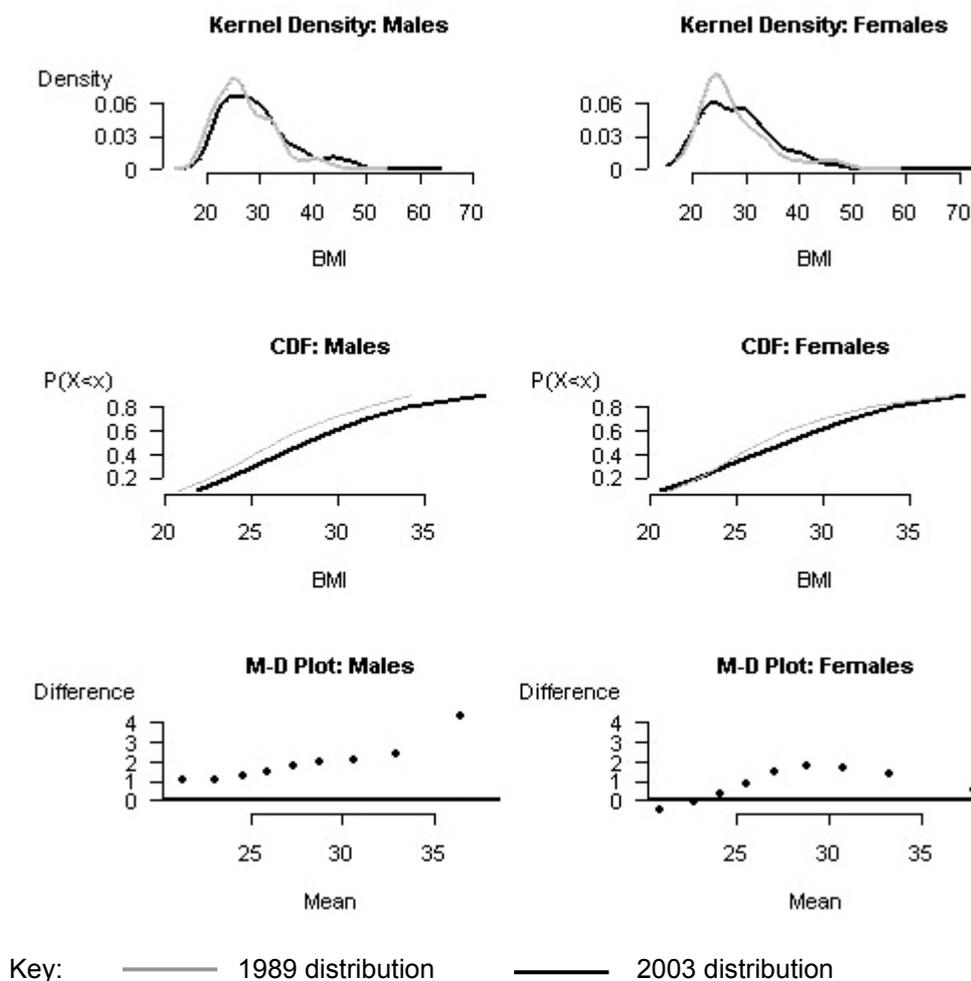
Changes in the distribution of BMI in the Māori population from 1989 to 2003 are presented in this section (the 1977 survey included too few Māori respondents to permit analysis by ethnicity). Even in the 1989 and 1997 surveys, the sample sizes for Māori were too small to allow age-specific analysis, so only overall estimates (crude and age standardised) are presented here. *Due to small Māori samples sizes in the 1989 and 1997 surveys, and changes in the definition of ethnicity over time, care should be taken when interpreting these results.*

### BMI distributions

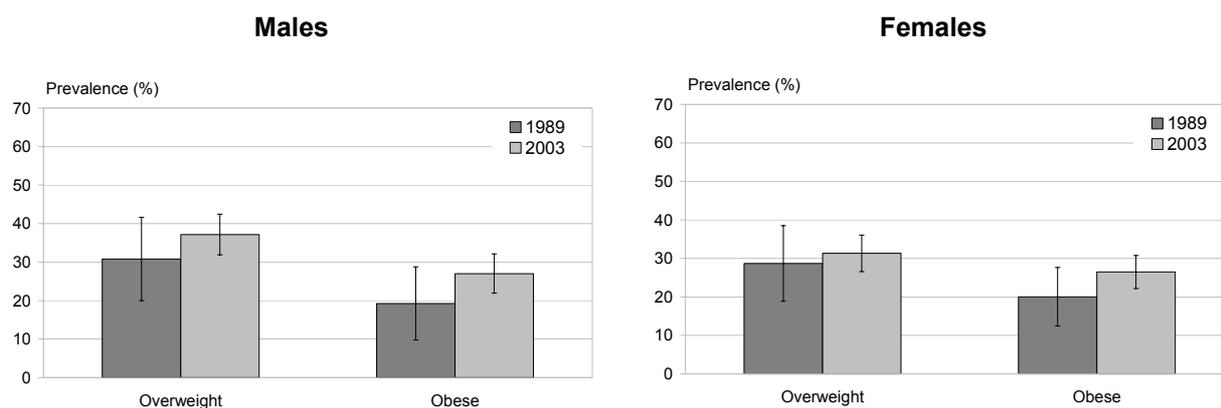
#### Changes in BMI distribution, 1989–2003

We first present an overview of the changes in the BMI distribution over the entire 1989–2003 period (Figures 28 and 29, Table 12).

**Figure 28:** Changes in BMI distribution of Māori population, ages pooled, 1989–2003



**Figure 29:** Prevalence of overweight and obesity (Māori population), ages pooled, 1989–2003



**Table 10:** Selected Māori sample statistics, ages pooled, 1989–2003

	Males			Females		
	1989	2003	AAPC*	1989	2003	AAPC*
Mean BMI	27.2	29.3	0.52	27.8	28.5	0.19
Median BMI	27.8	29.1	0.32	25.9	29.1	0.85
Overweight (%)	30.8	37.2	1.35	28.7	31.3	0.63
Obese (%)	19.3	27.0	2.45	20.0	26.5	2.01

\* Average annual percentage change; assumes linearity.

The epidemic was well advanced among Māori by 1989, with higher rates of obesity than seen among non-Māori<sup>7</sup> at that time. Unlike the non-Māori<sup>7</sup> pattern, among Māori the prevalence of both overweight and obesity in 1989 were similar across genders: 31 percent of Māori males and 29 percent of Māori females were overweight, while 19 percent of Māori males and 20 percent of Māori females were obese.

From 1989 to 2003, Māori males showed a moderately steep increase in obesity prevalence, reaching 27 percent by 2003 – an AAPC of 2.5 percent (assuming log linearity). Over the same period, overweight prevalence increased to 37 percent, a smaller but still substantial AAPC of over 1 percent.

Obesity prevalence among Māori females increased slightly less steeply than it did among males, reaching 27 percent by 2003 – an AAPC of 2 percent. Unlike the male pattern, overweight prevalence increased only to 31 percent, an AAPC of only 0.6 percent.

As with non-Māori, shifts in mean and median BMI have been relatively smaller than those at higher percentiles of the BMI distribution. Among Māori males, mean (median) BMI increased by 2.1 (1.3) units over the study period, corresponding to an AAPC of 0.5 percent (0.3 percent) (assuming log linearity). Females showed a larger shift in median BMI than males (3.3 units of

<sup>7</sup> The non-Māori data are not shown here because of space limitations. However, the non-Māori results are very similar to the results for the total population. Full results for non-Māori are available on request.

BMI corresponding to an AAPC of 0.9 percent), but a smaller change in mean BMI (0.7 units, corresponding to an AAPC of 0.2 percent).

Examining the whole BMI distribution (ie, using the m–d plots), Māori males show a consistent increase in skewness of the BMI distribution until the 90th percentile (approximately), which shows a very large shift (approximately 5 units), suggesting even greater increase in skewness at the heaviest end of the distribution. This is compatible with a mixed model; ie, a continuously distributed person–environment interaction.

By contrast, Māori females show an unusual pattern of distributional shifting, with modest increases in BMI at the middle percentiles but no change at both light and heavy ends of the distribution. In fact, the 90th percentile shows no change, comparing the beginning and the end of the observation period.

These contrasting gender patterns are reflected in the trend in extreme obesity, which increased over the observation period from 3.2 to 7.8 percent among Māori males, while remaining stable at approximately 7 percent (or possibly declining slightly) among Māori females (see ‘Trends in Extreme Obesity’ section for more detail).

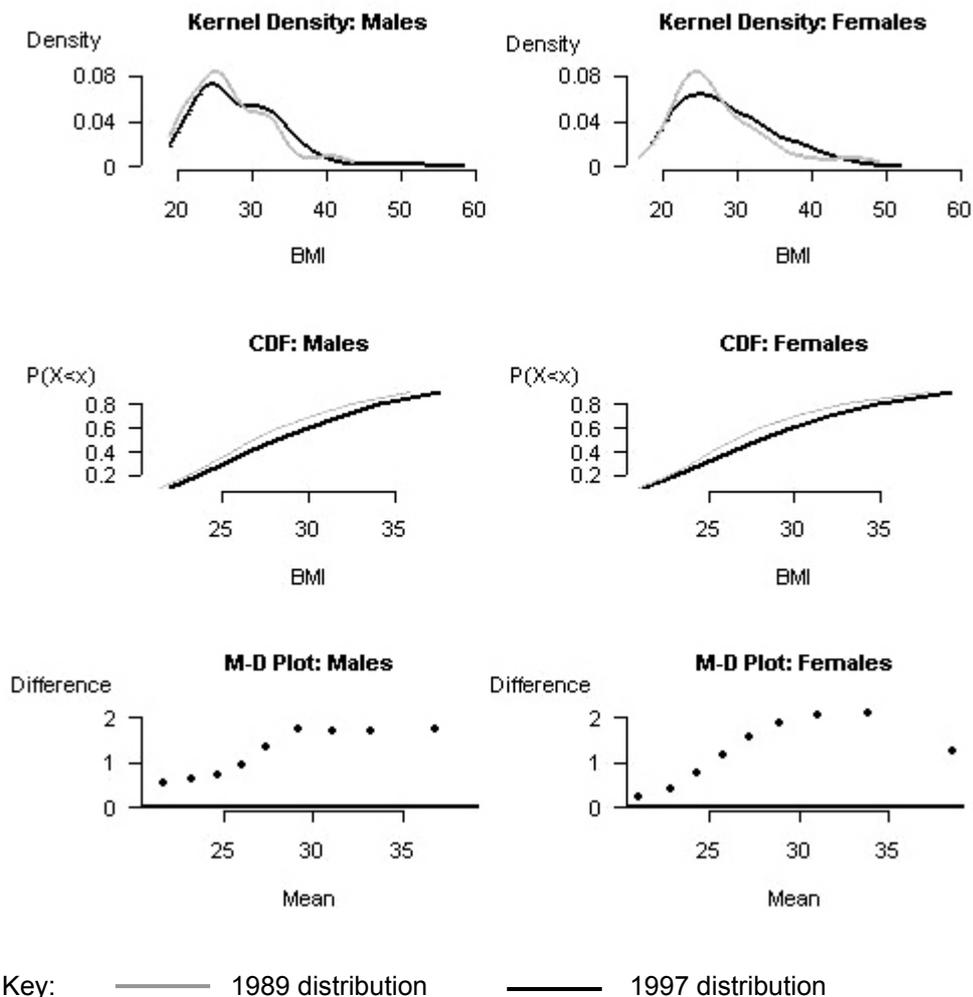
So the epidemic among Māori over the past 14 years has been different to that among non-Māori, in that in the former only males have shown the classic pattern of increasing skewness in their BMI distribution (when the whole 1989–2003 period is considered), and the relative magnitude of the increase in obesity prevalence has also been smaller. Note, however, that confidence intervals are wide because of small numbers of Māori respondents, especially in the earlier surveys.

We now turn to an analysis of trends in the Māori BMI distribution, including the prevalence of overweight and obesity, for each period (1989–1997 and 1997–2003) separately.

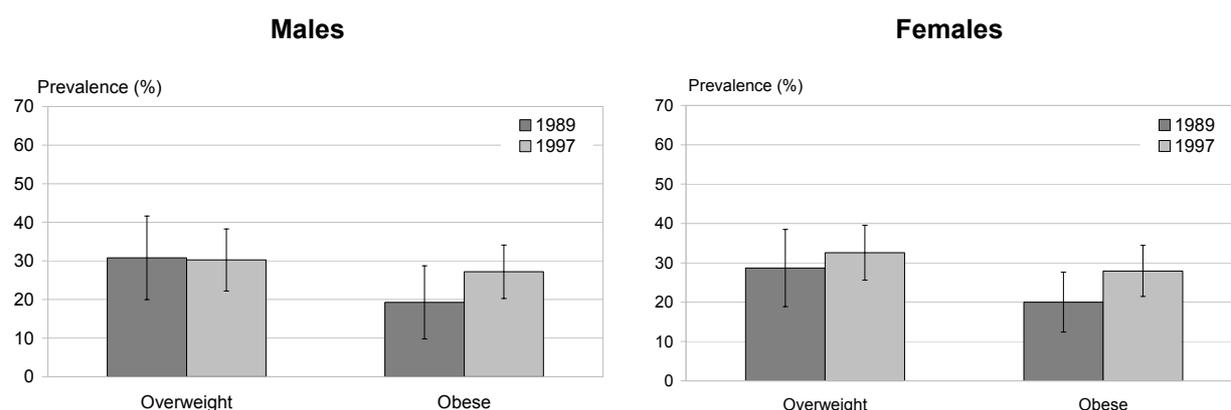
## Changes in BMI distribution 1989–1997

Changes in the distribution of BMI in the Māori population from 1989–1997 are presented below (Figures 30 and 31, Table 13). Sample sizes were too small to allow age-specific analysis so all ages (15–74 years) have been pooled.

**Figure 30:** Changes in BMI distribution (Māori), ages pooled, 1989–1997



**Figure 31:** Prevalence of overweight and obesity (Māori), ages pooled, 1989–1997



**Table 11:** Selected Māori sample statistics, ages pooled, 1989–1997

	Males			Females		
	1989	1997	AAPC*	1989	1997	AAPC*
Mean BMI	27.2	28.7	0.67	27.8	28.7	0.40
Median BMI	25.9	27.7	0.81	25.6	27.5	0.89
Overweight (%)	30.8	30.3	-0.22	28.7	32.6	1.60
Obese (%)	19.3	27.2	4.40	20.0	27.9	4.25

\* Average annual percentage change; assumes linearity.

From 1989 to 1997 the epidemic grew rapidly among Māori (both genders) as it did among non-Māori. The prevalence of obesity increased from 19 percent in 1989 to 27 percent in 1997 among Māori males (an AAPC of 4.4 percent), and from 20 to 28 percent among Māori females (an AAPC of 4.3 percent). At the same time, overweight prevalence remained stable among Māori males (at approximately 31 percent) while increasing slightly among females (from approximately 29 to 33 percent, an AAPC of 1.6 percent).

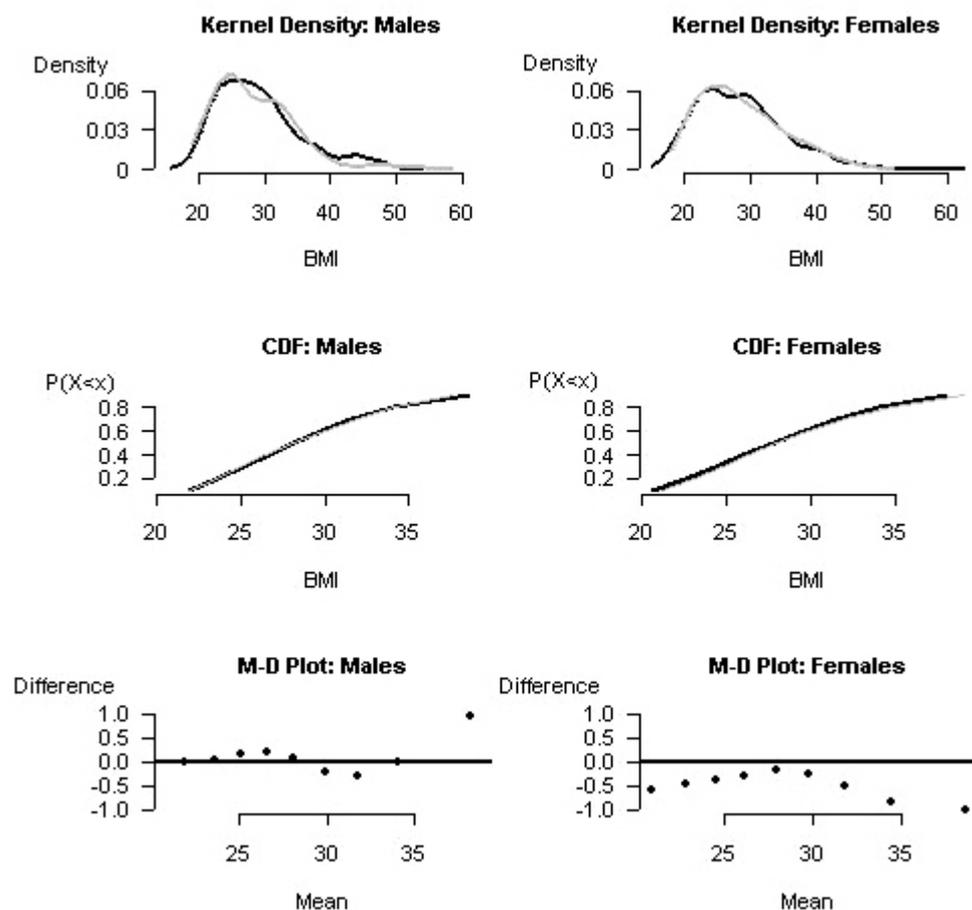
Examining the whole BMI distribution, both Māori males and females show progressive increases in BMI at light percentiles. This is replaced by a constant upward shift (of about 1.5 BMI units) from the 60th percentile onwards. Among females the extent of change declines again (to about 1 unit) at the heaviest (90th) percentile.

In summary, the overall pattern over the 1989–1997 period is one of increasing skewness, leading to a rapid growth in obesity prevalence (albeit relatively less than for non-Māori – an AAPC of approximately 4 percent versus over 5 percent), with little change in overweight prevalence. Increases in mean and median BMI are substantial, if less dramatic. Beyond the middle percentiles, the progressive increase in skewness ceases, and among females the shift at the heavier percentiles is actually (and unusually) less than that at the middle percentiles.

## Changes in BMI distribution, 1997–2003

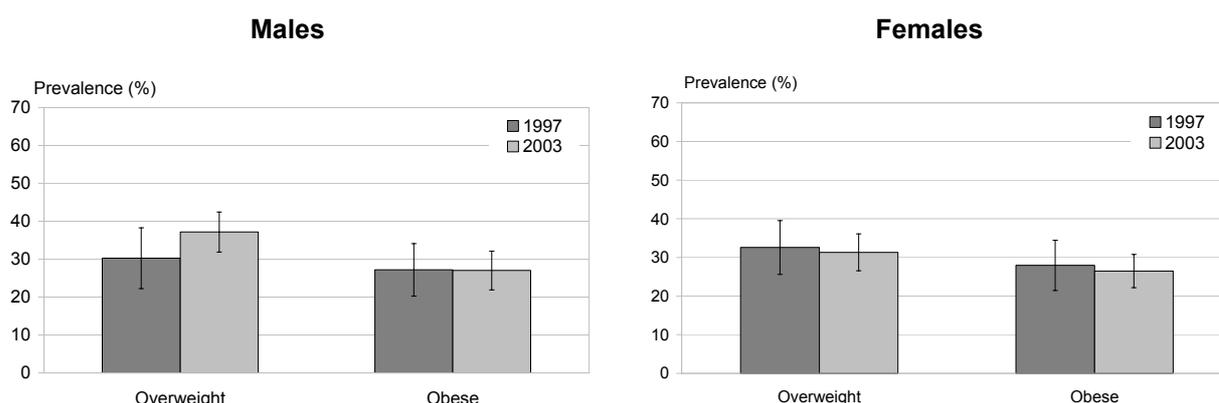
Changes in the distribution of BMI in the Māori population from 1997 to 2003 are presented below (Figures 32 and 33, Table 14). Sample sizes were too small to allow age-specific analysis so all ages (15–74 years) have been pooled.

**Figure 32:** Changes in BMI distribution of Māori population, ages pooled, 1997–2003



Key: — 1997 distribution      — 2003 distribution

**Figure 33:** Prevalence of overweight and obesity (Māori), ages pooled, 1997–2003



**Table 12:** Selected Māori sample statistics, ages pooled, 1997–2003

	Males			Females		
	1997	2003	AAPC*	1997	2003	AAPC*
Mean BMI	28.7	29.3	0.33	28.7	28.5	-0.10
Median BMI	28.7	29.1	0.24	29.0	29.1	0.08
Overweight (%)	30.3	37.2	3.48	32.6	31.3	-0.65
Obese (%)	27.2	27.0	-0.10	27.9	26.5	-0.90

\* Average annual percentage change; assumes linearity.

From 1997 to 2003, a substantial slowing in the rate of growth of the epidemic occurred among Māori, more marked than that seen among non-Māori over the same period. The prevalence of obesity remained stable at approximately 27 percent among males. More dramatically, the prevalence of obesity appears to have declined slightly among Māori females, from 27.9 to 26.5 percent (corresponding to an AAPC of -0.9 percent).

In contrast, overweight prevalence increased significantly among Māori males (from 30.3 to 37.2 percent) while remaining stable or possibly declining slightly among Māori females (from 32.6 to 31.3 percent).

Mean and median BMI both increased among Māori males, but only slightly (AAPCs of < 0.5 percent), while showing little change among females (AAPCs of 0.2 percent or less). Note that wide confidence intervals – the result of small numbers of survey respondents – make it difficult to identify trends in the Māori BMI distribution with any precision.

Examining the whole BMI distribution (eg, using the m–d plot), Māori males showed only very small increases at all percentiles, except for a substantial increase in BMI at the high end of the distribution (90th percentile). By contrast, Māori females showed a small but uniform *decrease* (of about -0.5 BMI units) at low and middle percentiles and even greater decreases at high percentiles (reaching -1.5 units at the 90th percentile).

This pattern is consistent with a slowing in the rate of growth of the epidemic among Māori males, although the growth rate remains positive. However, among Māori females, the growth

rate appears to have become negative (whereas among non-Māori females it has declined sharply but still remains positive; that is, the epidemic is still growing in the latter ethnic group). This raises the possibility that among Māori females (but not non-Māori), the epidemic may have already peaked and the prevalence of obesity among this group may now actually be (slowly) declining once again. However, the wide confidence intervals mean that we cannot exclude the possibility of chance fluctuation (ie, the trend of obesity prevalence among Māori females does not reach conventional levels of statistical significance). Also, changes in the concept and definition of ethnicity create additional sources of potential bias for the ethnic analysis, not relevant to the total population analysis. Caution is therefore necessary in interpreting the ethnic-specific trend estimates in particular.

## Overview of BMI distributional shifting among Māori, 1989–2003

Inadequate statistical power in earlier surveys precludes the sort of analysis by period and age group presented above for the total New Zealand population. However, trends in the epidemic growth rate, and assessment of the influence of change in the population age structure on the BMI distribution, are summarised for Māori below.

### Trends in the prevalence of obesity

As with non-Māori, the AAPCs for mean and median BMI, and for overweight prevalence, have been relatively small. AAPCs for obesity prevalence have been much larger and are of most policy relevance, so these are highlighted here to illustrate the changes that have occurred from the earlier to the later half of the observation period (Figure 34).

**Figure 34:** AAPC in obesity prevalence, Māori population, by period and gender

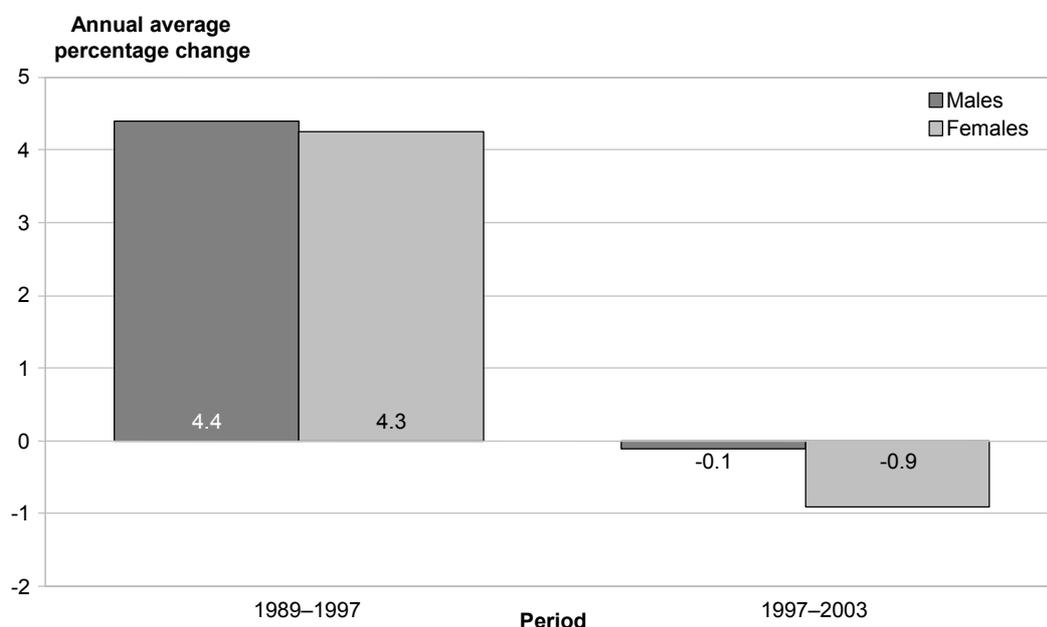


Figure 34 demonstrates that the growth rate of the epidemic has varied markedly over time, so the average rate calculated over the whole 14-year observation period disguises substantial differences between periods. Instead, the epidemic grew rapidly from 1989 to 1997, at an annual

average of over 4 percent per year (both genders) – although this is still slower than the 5.5 percent average annual rate of growth for non-Māori over the same period.

As with non-Māori, the rate of growth then slowed from 1997 to the present (2003) – but this slowing was far more dramatic than for non-Māori. Among Māori males, the epidemic appears to have stabilised (virtually no change in obesity prevalence from 1997 to 2003). Among Māori females, the epidemic may have actually peaked and begun to decline, with the prevalence of obesity possibly shrinking at an average rate of almost 1 percent per year. However, the latter trend does not reach conventional levels of statistical significance, possibly due to small numbers, and so should not be over-interpreted.

### **Age-standardised analysis**

As for the total population, we have repeated the analyses with the Māori BMI distributions at each point in time age standardised to the WHO world population. Standardising for age does make a larger difference to the Māori than to the total population BMI distributions, perhaps because of the particular reference population selected. Briefly, once adjusted for variation in the age structure of the Māori population over the past quarter century, the underlying growth rate of the epidemic in this ethnic group appears even smaller than when not so adjusted, especially for Māori males (data not shown). Nevertheless, as for the total population, changes in the age structure of the Māori population over time account for relatively little of the trend in the BMI distribution.