

# Are all Australians gaining weight?

## Differentials in overweight and obesity among adults, 1989–90 to 2001

### Highlights

The problem of overweight, and in particular obesity, is widespread among Australian adults. Increases in the prevalence of overweight and obesity occurred in virtually all sociodemographic groups examined for this report. These results are based on self-reported data, and so are likely to underestimate the true extent of the problem.

#### *Trends between 1989–90 and 2001*

- The prevalence of obesity increased considerably (from 9.5% to 16.7%), a much greater rise than that for the overweight but not obese group (from 30.5% to 34.4%).

#### *Demographic characteristics (2001)*

- Men were more likely than women to be overweight (58.9% versus 43.2%).
- However, women were just as likely as men to be obese (17.4% and 16.0% respectively).
- Analysis of obesity by age group showed that prevalence was highest among 45–64 year olds (20.8%) and lowest among 20–24 year olds (9.5%).

#### *Place of residence (2001)*

- Queensland had the highest rate of obesity (18.5%) and the ACT the lowest (13.5%).
- Adults living outside the major cities showed higher rates of overweight than other Australians.

# Bulletin

## CONTENTS

Highlights	1
Introduction	2
Statistical analysis	3
Trends and differentials in overweight and obesity	4–10
Discussion	12
Conclusion	13
References	14
Appendix 1: Methods and data sources	16
Appendix 2: Statistical tables	18

# Are all Australians gaining weight?

## *Socioeconomic status (2001)*

- Women in the most disadvantaged socioeconomic group had nearly double the rate of obesity (22.6%) of those in the most advantaged group (12.1%).
- Men in the most disadvantaged group were also more likely to be obese than those in the most advantaged group (19.5% compared with 12.7%).
- Australians who were employed were more likely than those who were not in the labour force to be overweight.

## *Aboriginal and Torres Strait Islander people (1995 and 2001)*

- Indigenous Australians living in non-remote areas showed almost double the rate of obesity of other Australians living in similar locations.

## *Ethnic background (2001)*

- Australian-born adults showed a higher prevalence of overweight and obesity than their overseas-born counterparts.

## **Introduction**

Overweight, and in particular obesity, is an escalating public health problem in Australia, with analysis of survey data collected over the period 1980 to 2001 showing an alarming increase in prevalence (AIHW: Dixon & Waters 2003).

Overweight is a condition of excess body fat that results from a sustained energy imbalance (WHO 2000). This occurs when dietary energy intake exceeds energy expenditure over a period of time, resulting in weight gain. Excess body fat increases the risk of developing a range of health problems, including Type 2 diabetes, cardiovascular disease, high blood pressure, certain cancers, sleep apnoea, osteoarthritis, and psychological and social problems. Recent estimates suggest that levels of overweight and obesity have increased alarmingly not only in Australia but also in many other industrialised countries over the past two decades (AIHW 2002; Freedman et al. 2002; Schoenborn et al. 2002). While the international literature demonstrates a consistent trend towards increasing overweight and obesity, there are clear differences in the sociodemographic groups at risk (Paeratakul et al. 2002).

While obesity is associated with a moderate to very severe risk of comorbidities, being overweight but not obese is also associated with an increased risk of comorbidities (WHO 2000). This continuum of risk can be illustrated by the relationship between the relative risk of mortality and the degree of overweight (measured using body mass index (BMI)). That is, there are continuous graded increases in the relative risk of mortality as BMI increases. More people are affected by being overweight but not obese than by obesity, and so these groups both have a significant public health impact. Therefore, in this report we have analysed overweight but not obese and overweight (which includes obesity) in addition to obesity (see Box 1).

This bulletin presents the results of analyses of the prevalence of overweight and obesity for a range of different subgroups of Australian adults over the period 1989–90 to 2001. These comparisons between subgroups are referred to as differentials. The characteristics examined include basic demographic details (age and sex), place of residence, socioeconomic status, Aboriginal and Torres Strait Islander status and ethnicity. Some of the questions addressed are: Are all major population subgroups affected by overweight and obesity? Are some groups affected more than others? Have any groups escaped the epidemic or have rates remained steady? Understanding sociodemographic

patterns in the prevalence of overweight and obesity helps to focus policy and programs when addressing this increasing problem.

This bulletin complements other work produced by the Australian Institute of Health and Welfare (AIHW) on overweight and obesity in Australia. A previous bulletin examined trends among Australian adults and compared these results with international data (AIHW: Dixon & Waters 2003). A future bulletin will examine the health-related characteristics of overweight and obesity. Together, these bulletins provide data on the growing problem of overweight and obesity in Australia and its distribution across the population.

## Statistical analysis

The statistics presented here are based on BMI (see Box 1), calculated using self-reported height and weight collected in the 1989–90, 1995 and 2001 Australian Bureau of Statistics (ABS) National Health Surveys (NHS). The NHS are a series of surveys of representative samples of the household population of Australia, and include questions on reported height and weight.

### Box 1: Classifying overweight and obesity

The most common population-level measure of overweight and obesity is the body mass index (BMI). BMI is an index of weight relative to height, and is calculated by dividing weight in kilograms by the square of height in metres ( $\text{kg}/\text{m}^2$ ).

For adults (people aged 18 years and over), overweight is defined as a BMI of 25 or more, with obesity defined as a BMI of 30 or more. These classifications are based primarily on the association between BMI and mortality, and are the standard recommended by the World Health Organization (WHO) (for more information, see AIHW: Dixon & Waters 2003).

In this bulletin, we have analysed:

- overweight (BMI  $\geq 25$ )
  - overweight but not obese ( $25 \leq \text{BMI} < 30$ ) (known as preobese by WHO)
  - obese (BMI  $\geq 30$ ).

For children and adolescents, a separate classification of overweight and obesity based on age and sex is recommended as height and body composition are continually changing.

Source: WHO 2000.

The limitations of self-reported height and weight data are well recognised. In particular, respondents tend to under-report their weight and over-report their height, leading to an underestimation of the true prevalence of overweight and obesity. Also, self-reported height and weight depend on a respondent's knowledge of current height and weight, and these vary over time. Despite these limitations, BMI calculated from self-reported height and weight has proven useful for examining trends as well as the distribution of overweight and obesity across different population subgroups (ABS 1998a; AIHW: Dixon & Waters 2003; AIHW: Waters 1993; Flood et al. 2000; Schoenborn et al. 2002).

The ability of BMI to accurately reflect body fatness should also be considered when interpreting BMI results in population studies (Gallagher et al. 1996). While BMI is reasonably correlated with body fat in most people, it does not distinguish between

# Are all Australians gaining weight?

weight due to muscle and weight due to fat (WHO 2000). As a result, a given BMI may not correspond to the same degree of fatness in different individuals and populations.

Since the NHS are a series of cross-sectional surveys, movements in estimates over time could be partly due to changes in the survey design. Although it is possible to identify statistical associations between variables, causal relationships cannot be inferred on the basis of these cross-sectional data alone. The primary purpose of the analyses reported here is to document differences in the prevalence of overweight and obesity for adult Australians across various population characteristics.

Despite these limitations, the NHS are a valuable resource for analysing patterns in weight distribution between population groups and over time. These nationally representative surveys use similar sampling and reporting methods, and so, in lieu of longitudinal data, give a good indication of the changing weight status of the Australian population. More information on the NHS and the variables analysed is in Appendix 1.

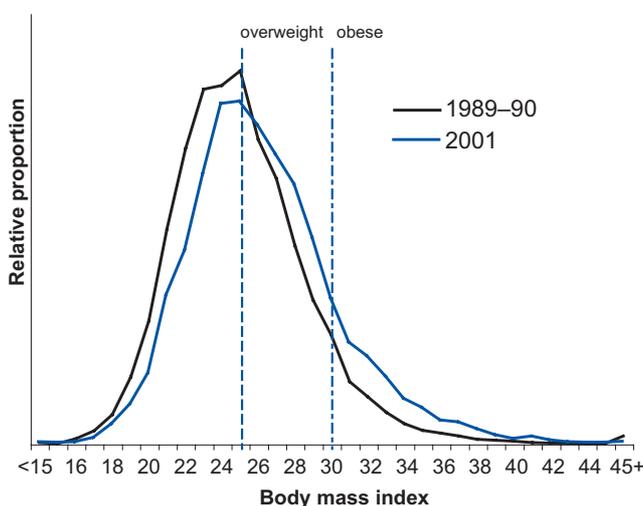
All analyses in this bulletin are for adults aged 20 years and over, with the exceptions of analyses by labour force status (20–64 years) and Aboriginal and Torres Strait Islander status (18 years and over). All results, other than those by age group, are age-standardised to the 2001 Australian population.

## Trends and differentials in overweight and obesity

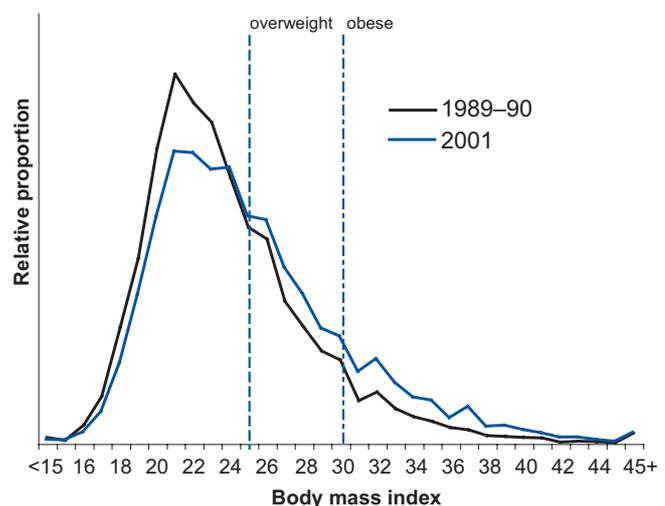
Data from the 1989–90, 1995 and 2001 NHS show an alarming rise in the prevalence of overweight and obesity among Australian adults. In 2001 an estimated 51.1% of Australians aged 20 years and over were overweight. This is a marked increase from 1989–90 when the prevalence of overweight was 40.0%. Of particular concern is the jump in obesity prevalence, from 9.5% in 1989–90 to 16.7% in 2001 (Table A1). Because of the nature of self-reported data, these figures may underestimate the true extent of overweight and obesity in this country.

Between 1989–90 and 2001 the prevalence of overweight increased by more than a quarter (28%). Overweight but not obese rose by 13% (from 30.5% to 34.4%), while obesity increased by 76%. This reflects a shift in the whole distribution of BMI towards

**Figure 1.1: Change in distribution of BMI, males, 1989–90 to 2001**



**Figure 1.2: Change in distribution of BMI, females, 1989–90 to 2001**



higher BMI, as illustrated in Figures 1.1 and 1.2, suggesting that the whole population has gained weight.

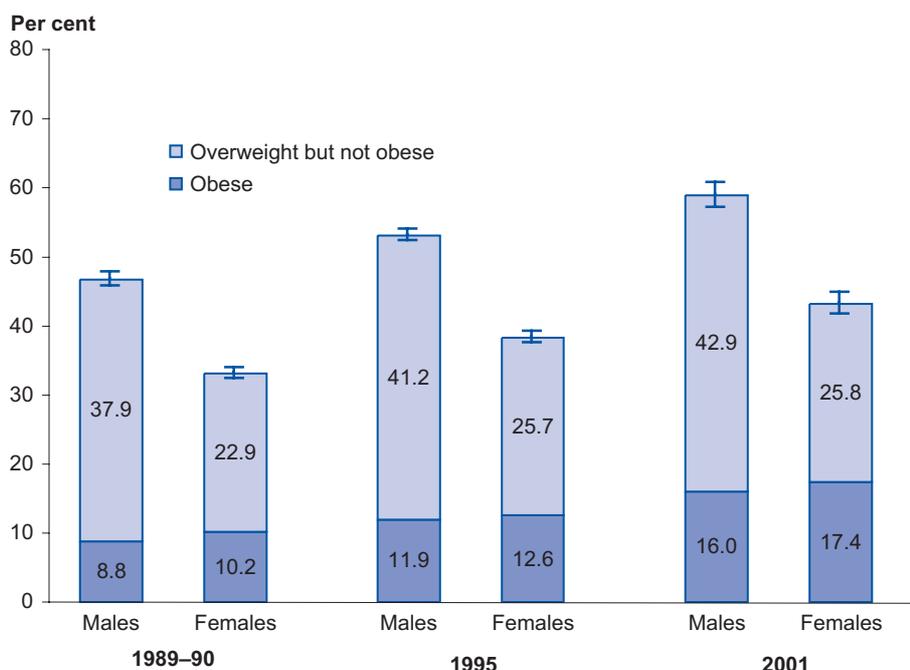
The following analyses show that the problem of increasing overweight and obesity is widespread, but the patterns vary across population subgroups. In addition to sex and age, levels of overweight and obesity vary according to socioeconomic status, Aboriginal and Torres Strait Islander status and ethnic background.

### Comparisons by sex

Between 1989–90 and 2001, levels of overweight and obesity increased in both men and women. Among women, the prevalence of overweight jumped by almost a third, from 33.1% to 43.2%. In comparison, the percentage of overweight men rose by about a quarter, from 46.7% to 58.9% (Table A1). Interestingly, the rise in obesity prevalence over the period was greater for men (an 82% increase) than for women (a 71% increase).

In all three surveys, far more men than women were in the overweight but not obese category. In 2001, 42.9% of men compared with 25.8% of women were overweight but not obese, while in 1989–90 the proportions were 37.9% and 22.9% respectively (Figure 2). However in 1995 and 2001, women were just as likely to be obese as men (about 1 in 6 for both sexes in 2001). These findings are similar to those of recent studies in the United States of America (Flegal et al. 2002; Schoenborn et al. 2002) and Canada (Torrance et al. 2002).

**Figure 2: Prevalence of overweight and obesity among men and women aged 20 years and over, 1989–90 to 2001**



*Notes*

1. Age-standardised to the 2001 Australian population.
2. Error bars indicate 95% confidence intervals for the prevalence of overweight (BMI  $\geq$  25).

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

# Are all Australians gaining weight?

## Comparisons by age

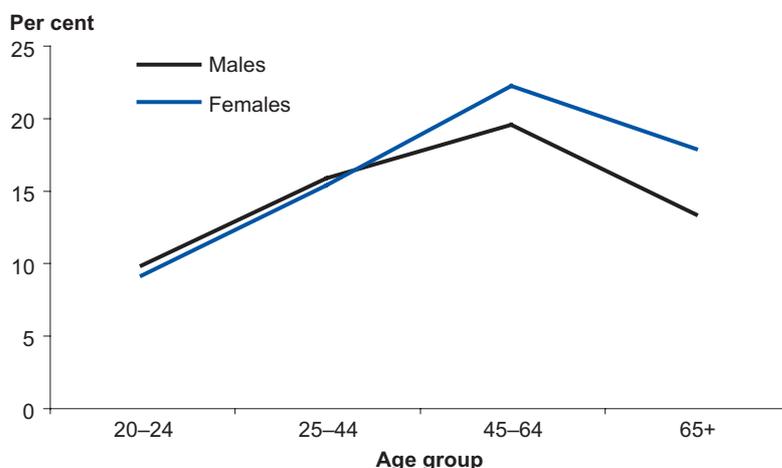
The prevalence of overweight and obesity increases markedly with age through to 64 years in both men and women, with a decrease in later years. A recent study of obesity trends in older Australians also showed overweight and obesity being most common in middle to late adulthood and declining thereafter (AIHW: Bennett in press). Prevalence of overweight was highest among 45–64 year olds and lowest among 20–24 year olds (60.3% compared with 33.2% in 2001)(Table A2). Among adults aged 45–64 years, almost 7 in 10 men (67.2%) and more than 5 in 10 women (53.1%) were overweight in 2001. Similar age patterns have been reported recently in the United States of America (Flegal et al. 2002; Schoenborn et al. 2002).

The prevalence of obesity was also greatest in the 45–64 year age group across the three surveys, with 20–24 year olds showing the lowest rates. In 2001, men aged 45–64 years were almost twice as likely as the youngest men to be obese (19.5% compared with 9.8%). Among women in 2001, the prevalence of obesity in 45–64 year olds (22.2%) was more than twice that reported in 20–24 year olds (9.1%) (Figure 3). Across the age groups, men and women aged 20–24 years were also significantly less likely to be overweight but not obese.

Despite their relatively low levels of obesity, 20–24 year olds had the most striking increase in obesity prevalence over time (more than doubling from 4.4% in 1989–90 to 9.5% in 2001) (Table A2). Similarly, the greatest relative increase in the prevalence of overweight but not obese over the period was among adults aged 20–24 years (from 18.4% to 23.8%).

A longitudinal study of Australian adults aged 35–69 years at baseline found that people gained weight regardless of their sociodemographic characteristics (Ball et al. 2003a). People aged 30–44 years gained the most weight of the age categories considered, while those in the older age groups gained the least. This may in part explain the observed increase in obesity rates up to ages 45–64 years and the subsequent decline for people aged 65 years and over (Figure 3).

**Figure 3: Age-specific rates of obesity by sex, 2001**



Source: AIHW analysis of the 2001 ABS National Health Survey.

## Comparisons by place of residence

Adults in all states and the Australian Capital Territory (ACT) showed similar increases in the prevalence of overweight and obesity from 1989–90 to 2001. Across the three surveys, residents living in the ACT generally had the lowest rates of overweight (Table A3). Note that data for the Northern Territory were not available.

The highest rate of obesity in 2001 was in Queensland, at 18.5%. This was significantly higher than in the ACT, Victoria and Western Australia (WA), with the ACT having the lowest rate at 13.5%. The prevalence of overweight but not obese was similar for all states and the ACT, ranging from 33.9% in New South Wales to 35.2% in WA in 2001.

The regional classification used in this analysis consisted of three categories: major cities of Australia, inner regional Australia and remainder. These categories are derived from the Australian Standard Geographical Classification (see Appendix 1).

Adults living in the major cities were less likely than adults living in inner regional Australia or other areas to be overweight in 2001 (49.6% compared to 54.1% and 55.2% respectively)(Table A4). This difference was more evident for females than males.

Analysis of the Women's Health Australia project found that a greater proportion of women aged 45–49 years living in remote areas were severely obese (BMI > 40) (Brown et al. 1998).

## Comparisons by socioeconomic status

Many characteristics contribute to overall socioeconomic status, such as education, employment status and marital status, and different components may be important in their relationship with obesity (Ball et al. 2002). A literature review of the relationship between socioeconomic status and obesity revealed that they were strongly inversely related for women in developed countries (Sobal & Stunkard 1989). That is, the lower a woman's socioeconomic status, the more likely she is to be obese. However, the same review found inconsistent results for men.

Various methods are used for measuring socioeconomic status and body weight, and these can affect the observed relationship (Ball et al. 2002). In the following analyses of the prevalence of overweight and obesity by socioeconomic status, various characteristics of socioeconomic status have been considered in isolation. It should be noted that these factors are not necessarily independent.

### Socioeconomic disadvantage

In this section, socioeconomic disadvantage has been measured using the area-based Socioeconomic Indexes for Areas (developed by the ABS). These indexes reflect the socioeconomic characteristics of the area in which an individual lives, rather than being a direct measure of each individual's socioeconomic status. The index is presented here in five equal groups, known as quintiles. The first quintile corresponds to the most disadvantaged group and the fifth quintile to the least disadvantaged (or most advantaged) group. An area in the most disadvantaged group would have a smaller proportion of households with high incomes, tertiary education, employees in skilled occupations, and other similar characteristics (ABS 1998b).

Australians in the most advantaged group in 2001 showed the lowest prevalence of overweight (46.3%), which was significantly less than among the three least advantaged

## Are all Australians gaining weight?

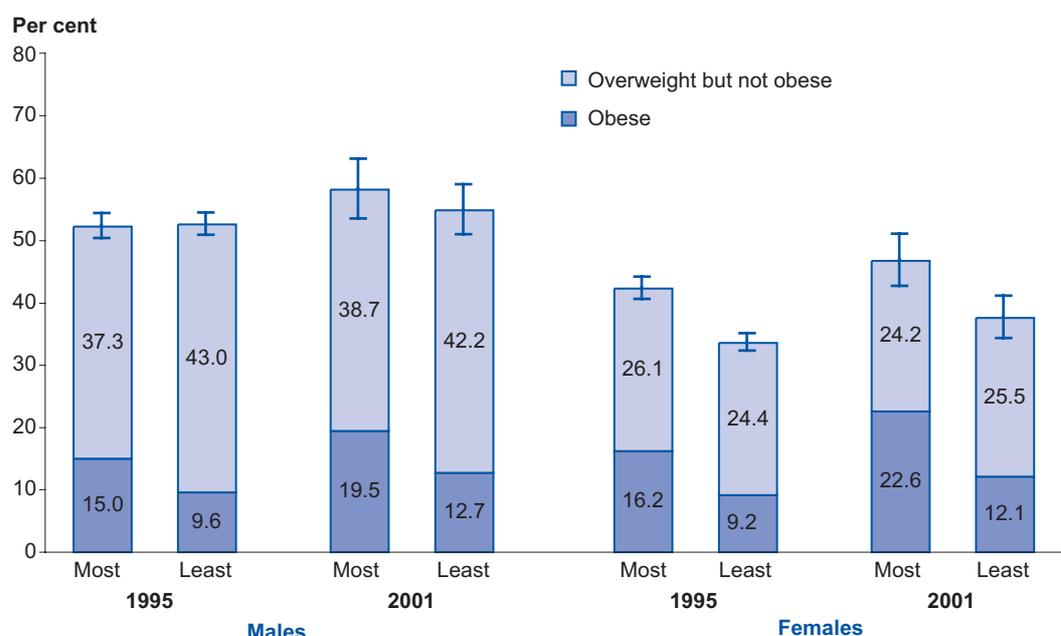
groups. There was little variation between the first (most disadvantaged) to fourth quintiles (Table A5).

The most marked difference between the fifth (least disadvantaged) quintile and the remaining groups was seen in obesity. In 2001, one in eight people (12.5%) in the fifth quintile were obese compared to one in five people (21.1%) in the first quintile. This compares to 9.4% of persons in the fifth quintile and 15.7% of persons in the first quintile being classified as obese in 1995. These two groups represent the extremes of overweight and obesity in both 1995 and 2001. Rates of overweight but not obese remained fairly steady for each quintile between 1995 and 2001, while the prevalence of obesity increased for each quintile of socioeconomic disadvantage.

Analysis of the results by sex supports previous reports of an inverse relationship between socioeconomic status and obesity in women. Australian women in the most advantaged group in 2001 had markedly lower rates of obesity at 12.1% than women in the most disadvantaged group (22.6%). Similarly for overweight, the prevalence for women in the fifth quintile was 37.6%, and for women in the first quintile 46.8%. The same relationship was observed in rates of overweight for women in 1995 (Figure 4).

The inverse relationship between socioeconomic status and obesity was also evident for males. Men in the most advantaged group had significantly lower rates of obesity (12.7% in 2001) than their counterparts in the most disadvantaged group (19.5% in 2001)(Figure 4). There was little difference in the rates of overweight for men in the five socioeconomic groups, in either 1995 or 2001.

**Figure 4: Prevalence of overweight and obesity among men and women aged 20 years and over in the most and least disadvantaged quintiles of socioeconomic disadvantage, 1995 to 2001**



### Notes

1. Age-standardised to the 2001 Australian population.
2. Error bars indicate 95% confidence intervals for the prevalence of overweight (BMI  $\geq$  25).

Source: AIHW analysis of the 1995 and 2001 ABS National Health Surveys.

## Education

In 2001, 19.0% of Australians without post-school qualifications were categorised as obese compared to 14.9% of those with post-school qualifications (Table A6). This pattern was seen for both males and females, and has continued since 1989–90.

Prevalence rates of overweight for Australians with or without post-school qualifications were similar in 2001 (50.4% and 52.3% respectively). This is a change from 1989–90 when people with post-school qualifications reported a lower prevalence of overweight (37.8%) than those without post-school qualifications (41.9%). There was little difference in the rates of overweight but not obese between the two groups.

The relationship between obesity and level of educational attainment has been noted in several other studies. In the United States of America, the prevalence of obesity in 2001 was highest for people who had the least amount of education (Mokdad et al. 2003). A Spanish study spanning three cross-sectional surveys between 1987 and 1997 found that rates of obesity were greatest for the lowest level of education attained (Gutierrez-Fisac et al. 2002). Similarly, a Finnish study of four cross-sectional surveys between 1982 and 1987 found that education was a strong determinant of obesity, where mean BMI was lowest among people with the highest education. This relationship was more pronounced for women (Lahti-Koski et al. 2000).

## Labour force status

Analysis of overweight and obesity by labour force status used the standard ABS categories of employed, unemployed and not in the labour force (see Appendix 1 for more detail).

Rates of obesity in the three categories were similar in 2001. This was despite obesity in 1989–90 and 1995 being more prevalent among the unemployed and those not in the labour force than among the employed (Table A7). It is not known whether there was a real change in obesity rates between labour force categories, or if the 2001 results were affected by the reduction in the sample size (making it more difficult to observe differences). This is considered in more detail in the discussion.

Australians who were employed in 2001 were more likely than those who were not in the labour force to be overweight, with the difference being mainly due to overweight but not obese. Unemployed persons had a comparable rate of overweight to those not in the labour force (Table A7).

Rates of obesity increased within each of the three categories of labour force status over the three survey periods, with the largest relative increase being seen in the employed (from 8.5% in 1989–90 to 16.2% in 2001).

While Australian data did not demonstrate a significant difference in the rates of overweight and obesity between the employed and unemployed, a Finnish study found that obesity was associated with long-term unemployment in women (Sarlio-Lahteenkorva & Lahelma 1999).

Although out of the scope of this analysis, many other studies that have looked at the relationship between employment status and obesity have focused on the variation between people in different types of jobs. Category of occupation has been found to have a significant relationship with rates of obesity for women in particular. For example, men and women in managerial or professional positions were less likely to be overweight than those in lower status occupations (Ball et al. 2002, 2003b; Galobardes et al. 2000; Wardle et al. 2002).

# Are all Australians gaining weight?

## Income

Analysis of the prevalence of overweight by quintiles of equivalent income in 2001 did not show any important differences between any of the income groups. However, in regard to obesity, the group with the highest equivalent income showed the lowest rate of obesity at 14.3%, this being significantly different from those in the first (least equivalent income) and second quintiles (both at 19.1%) (Table A8).

This is a similar result to those seen in the United States of America and Finland, where overweight and obesity are more common among people with a lower family income (USDHHS 2001; Sarlio-Lahteenkorva & Lahelma 1999).

Analysis of the 1999–2000 Australian Diabetes, Obesity and Lifestyle Study (Cameron et al. 2003) found that women with lower weekly incomes were more likely to be obese. Obesity rates for men did not change with weekly income.

## Comparisons by Aboriginal and Torres Strait Islander status

Analysis of data reported in the *National Health Survey: Aboriginal and Torres Strait Islander Results, Australia, 2001* (ABS 2002), indicated a marked rise in obesity among both Indigenous people and other Australians over the period 1995 to 2001, with no notable change in overweight but not obese (Figure 5). The prevalence of overweight but not obese was similar for Aboriginal and Torres Strait Islander people and other Australians in 2001 (32% and 34% respectively). However, Indigenous people are much more likely to be obese—and this disparity has increased substantially. In 1995, 24% of Aboriginal and Torres Strait Islander people aged 18 years and over were obese, compared with 12% of other Australians of the same age. In 2001, almost one-third (31%) of Indigenous people were considered obese. This compared unfavourably with 16% of other Australians in 2001 (Table A9).

These data are from non-remote areas only and should therefore be interpreted cautiously. In addition, the use of the current BMI references may underestimate the health burden of obesity among Aboriginal and Torres Strait Islander people, especially given their propensity to abdominal obesity. It has been suggested that a healthy BMI range for Indigenous Australians may be as low as 17–22 (WHO 2000).

## Comparisons by ethnic background

Previous studies have noted a relationship between place of birth and weight status (English & Bennett 1985; Goldblatt et al. 1965). Ethnicity has also been found to be related to the prevalence of overweight and obesity (Mokdad et al. 2003; Racette et al. 2003; Wardle et al. 2002). The international literature has attributed some of the rise in overweight and obesity to changes in the racial and ethnic composition of populations due to immigration (Torrance et al. 2002).

Although ethnicity is associated with socioeconomic status, the relationship between these two demographic characteristics is complex, and their components have been shown to be independent factors influencing BMI (Sundquist & Johansson 1998; Wardle et al. 2002).

Australian-born people showed a higher prevalence of overweight (52.6%) than their overseas-born counterparts (46.5%) in 2001. This pattern was also seen in 1995, although the difference was not as marked, and in 1989–90 no difference was observed. These patterns were also seen with regard to obesity (Table A10).

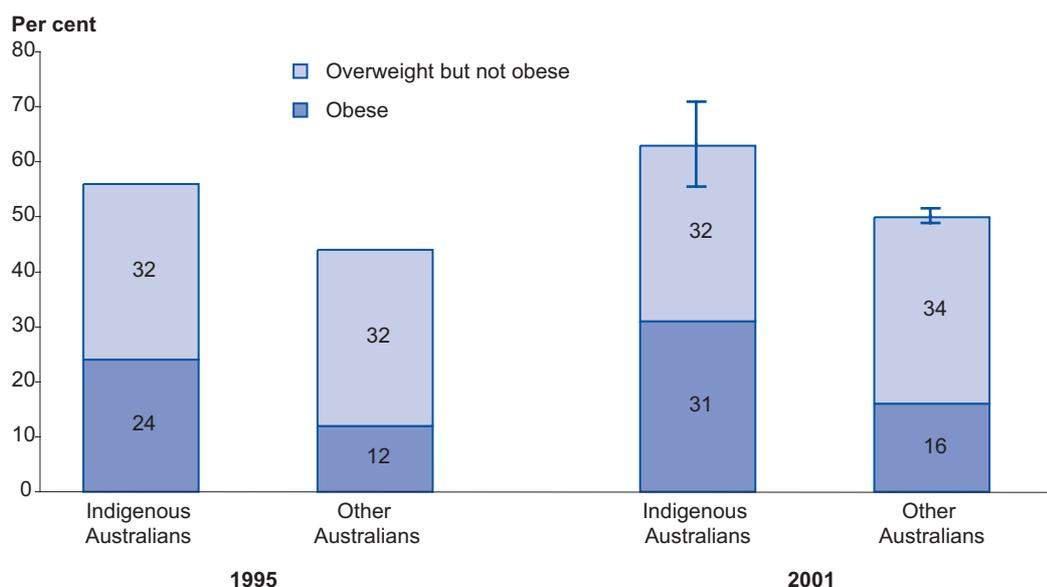
Further analysis of the 2001 NHS showed that Australian-born men and women had a higher prevalence of overweight than people born in non-English-speaking countries (Table A11).

The prevalence of overweight increased both for people born in Australia and those born overseas. However, there was a greater increase among the Australian-born—almost a third from 1989–90 to 2001 compared with one-sixth for the overseas-born. Similarly, rates of obesity increased more for people born in Australia.

The prevalence of obesity among overseas-born Australians was 9.7% in 1989–90, which increased by 5 percentage points to 14.7% in 2001. Research by Cairney & Ostbye (1999) suggested that the time since immigration was an important risk factor for excess weight.

In analysing the results by country of birth, it is important to keep in mind that the category of overseas-born (whether it includes or excludes people born in other English-speaking countries), and indeed the Australian-born group, includes people from diverse ethnic backgrounds. An analysis of the National Heart Foundation Risk Factor Prevalence Surveys, which were conducted in Australia in 1980, 1983 and 1989, found marked differences in obesity among immigrant groups (Bennett 1993; English & Bennett 1985). Men born in Asia and in the United Kingdom had lower average BMI than their Australian-born counterparts, whereas men and women born in Southern Europe and the Middle East had higher average BMI. Furthermore, the grouping of people from various ethnic backgrounds may have implications for the applicability of the BMI categories used in this publication (see Box 2).

**Figure 5: Prevalence of overweight and obesity among Indigenous and other Australians aged 18 years and over, 1995 to 2001**



*Notes*

1. Age-standardised to the 2001 Australian population.
2. Data are for non-remote areas only.
3. Error bars indicate 95% confidence intervals for the prevalence of overweight (BMI  $\geq$  25). Not available for 1995.

Source: ABS 2002.

# Are all Australians gaining weight?

## Box 2: Body mass index for different ethnic groups

Care needs to be taken when interpreting rates of overweight and obesity based on body mass index (BMI) for some ethnic groups. WHO has issued provisional recommendations for setting BMI cut-offs for adult Asians. The cut-offs for overweight ( $\geq 23$ ) and obesity ( $\geq 25$ ) are lower than the standard WHO criteria of 25 and 30 respectively. In Pacific Islander populations, higher cut-offs are required: 26 for overweight and 32 for obesity. In their analysis of the New Zealand 1997 National Nutrition Survey, the Ministry of Health used these higher cut-offs for Maori and Pacific people. However, further validation studies of these cut-offs are required, and WHO recommend the use of the standard BMI cut-offs for meaningful comparisons between or within populations.

Sources: Inoue et al. 2000; Russell et al. 1999; Swinburn et al. 1999; WHO 2000.

## Discussion

Analysis of the 1989–90, 1995 and 2001 NHS found that all of the groups examined showed an increasing prevalence of obesity over time. The prevalence varied between the groups, with obesity being most prevalent among people aged 45–64 years, men and women of low socioeconomic status and Aboriginal and Torres Strait Islander people.

From 1989–90 to 2001, the prevalence of overweight but not obese increased by 13% whereas obesity increased by 76%. Not only did obesity increase considerably more than overweight but not obese over the 12-year period, but more and greater discrepancies were seen in the prevalence of obesity between population subgroups than for overweight but not obese. For example, little difference was observed in the rates of overweight but not obese between quintiles of Relative Socioeconomic Disadvantage, whereas the prevalence of obesity varied considerably between the most and least disadvantaged groups. As noted previously, this is of concern as obesity is associated with a higher risk of morbidity and mortality (WHO 2000).

Interestingly, while a greater relative increase in the prevalence of overweight was seen for women than for men over the period 1989–90 to 2001, the relative increase in obesity was actually greater for men.

The population differentials examined in this bulletin were considered in isolation, and the potential interactions between the variables were not investigated. For example, the lower rate of obesity seen in the ACT may reflect an interplay between high levels of educational attainment, socioeconomic status, and urbanisation among this population (ABS 2001; ABS 2003a).

Despite obesity being more prevalent among the unemployed than the employed in 1989–90 and 1995, we did not observe noteworthy differences in the rates of overweight or obesity between these groups in 2001. This was contrary to expectations, as unemployment is associated with lower socioeconomic status, and this latter characteristic was related to higher rates of obesity. There are a few possible reasons for this. Firstly, the NHS was not designed to produce reliable estimates of unemployment, and small sample sizes were encountered when cross-classifying labour force status with BMI. This is shown by the wide confidence intervals around the estimates of overweight and obesity for the unemployed. Also, the sample size in 2001 was considerably smaller than in the previous two surveys. Another possibility is that the unemployment category includes people who have been looking for work in both the short and the long term, and the time spent unemployed may be important.

A greater disparity in the prevalence of obesity was seen between the most and least disadvantaged socioeconomic groups (as categorised using the Socioeconomic Indexes for Areas) than for some of the variables that contribute to this measure (e.g. income, education and employment status). There are a few issues to keep in mind when interpreting these results. Firstly, indicators of socioeconomic disadvantage may have an interactive effect, and their interactions are likely to be complex. However, these interactions should be partially addressed by the socioeconomic index used, due to the way it is derived. Secondly, the Index of Relative Socioeconomic Disadvantage applies to areas rather than individuals. That is, the relative characteristics of the population in an area are used to assign individuals to quintiles of socioeconomic disadvantage.

People born overseas (in countries other than the main English-speaking countries) showed a lower prevalence of overweight than people born in Australia. Country of birth is one way of measuring ethnicity; however some Australian-born people whose parents were born overseas may have lifestyles influenced by their cultural background. Country of birth cannot account for any effects on the second generation.

Some further limitations of these data should be noted. As discussed previously, results presented here are based on self-reported height and weight and may be underestimates. Also, there may be unknown biases in the way that different population subgroups report height and weight. Analysis of the 1995 National Nutrition Survey, which collected both self-reported and measured height and weight, found that BMI was generally underestimated by a similar magnitude across age groups, although people aged 65 years and over tended to over-report their height (leading to underestimated BMI) more than others (ABS 1998a). Another limitation is the smaller sample size of the 2001 NHS compared with the 1989–90 and 1995 NHS. This reduces the ability to observe statistically significant differences either within the 2001 survey or when comparing with the previous surveys.

## **Conclusion**

This analysis adds to the knowledge gained from other Australian studies by describing population trends in overweight and obesity according to demographic and socioeconomic characteristics, such as age, sex and education. The problem of increasing overweight is widespread—affecting people from a range of different backgrounds—and it is particularly prevalent among men, 45–64 year olds, women of low socioeconomic status, Aboriginal and Torres Strait Islander people and Australian-born residents. In terms of obesity alone, the most affected groups are 45–64 year olds, men and women in the most disadvantaged socioeconomic group, people without post-school qualifications, those with the lowest equivalent income, and Indigenous people. These findings identify groups that could be the focus of prevention or intervention strategies.

# Are all Australians gaining weight?

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# Are all Australians gaining weight?

## Appendix 1: Methods and data sources

### Rates

Age-standardised rates are used to remove the influence of age when comparing populations with different age structures. The 2001 Australian population has been used as the standard population for all age-standardised estimates.

### Confidence intervals

Estimates in this document are presented with 95% confidence intervals. Confidence intervals are an indication of the amount of variation associated with an estimate. These are shown as error bars on each column of the graphs or alongside the estimates in the tables. These confidence intervals indicate that if the process that led to the estimated value were repeated many times, in 95% of cases the true population value would fall within that confidence interval. Estimates in this bulletin are considered to be statistically significantly different if their confidence intervals do not overlap.

Due to the large amount of data presented here, more rigorous tests for statistical differences were not applied. If two confidence intervals do overlap, the estimates may still be statistically significantly different in some cases. Readers should note that confidence intervals were not adjusted to compensate for multiple comparisons. It is possible that some observed statistically significant differences may be due to chance.

### Data sources

*National Health Surveys*, conducted in 1989–90, 1995 and 2001 by the ABS, were designed to obtain national information on the health status of Australians, their use of health services and facilities, and health related aspects of their lifestyle. In each survey, information on self-reported height and weight was collected from respondents aged 15 years and over. The 1989–90 survey collected information from a sample of about 54,250 respondents (of whom 37,250 were aged 20 years and over) over the period from October 1989 to September 1990. The 1995 survey collected information from a sample of approximately 53,850 respondents (of whom 37,650 were aged 20 years and over) over the 12-month period from January 1995 to January 1996. The 2001 survey collected information from approximately 26,900 respondents over the period from February to November 2001 (of whom 17,450 were aged 20 years and over).

### Notes on differentials analysed

*State and territory* analyses excluded the Northern Territory (NT). The 2001 NHS collected sufficient sample in the NT to ensure appropriate representation of the NT in national estimates, but insufficient to support reliable NT estimates.

The analysis by *geographic region* was restricted to 2001, as the Australian Standard Geographical Classification (ASGC) was used to classify records on the 2001 NHS. The 1989–90 and 1995 NHS used the RRMA classification, which did not provide compatible categories with 2001 for analysis. The three categories available were: 'Major cities of Australia'; 'Inner regional Australia'; and 'Remainder'. For more information on the ASGC, see the ABS publication *Australian Standard Geographical Classification* (catalogue number 1216.0) or ABS (2003b).

Socioeconomic status was measured using *quintiles of relative socioeconomic disadvantage*, which were available only for 1995 and 2001. Quintiles are formed using the area-based Socioeconomic Indexes for Areas (SEIFAs), in this case using the Index of Relative Socioeconomic Disadvantage. The index includes attributes such as income, educational attainment,

unemployment and job skill levels. These reflect the socioeconomic characteristics of the area in which an individual lives, rather than being a direct measure of each individual's socioeconomic status. The index is presented here in five equal groups, or quintiles. The first quintile corresponds to the most disadvantaged group and the fifth quintile to the least disadvantaged group. An area in the most disadvantaged group would have a smaller proportion of households with high incomes, tertiary education, employees in skilled occupations, and other similar characteristics. (See ABS (1998b or 2003b) for more information).

For consistency over the three surveys, *highest level of education attained* was coded as 'Post-school qualifications' or 'No post-school qualifications'. Post-school qualifications included university qualifications, undergraduate and associate diplomas, and basic/skilled vocational qualifications.

The three categories of *labour force status* were 'Employed', 'Unemployed' and 'Not in the labour force', and were available for all survey years. The analysis by labour force status was restricted to persons aged 20–64 years. Employed persons were those who had a job in which they worked at least one hour in the week preceding interview, or had a job but were absent. A person is considered unemployed if they were not employed, were actively seeking work and available to start work. Persons who did not meet the criteria for employed or unemployed were classified as not in the labour force.

*Income quintiles* in 2001 were formed using OECD equivalence scales. These allow the income of a household to be standardised so that the actual buying power of each household can be compared. The first quintile refers to the group with the least equivalent income and the fifth quintile to the group with the most. (For more information, see ABS (2003b)). Income quintiles for previous surveys were derived using the Hendersen equivalence scales, and are not comparable with 2001. It should be noted that income quintiles were coded as not known or not stated for just over 17% of people aged 20 and over who had valid BMI data.

Results for *Aboriginal and Torres Strait Islander people* were extracted from ABS (2002).

The *country of birth* classification on the 2001 NHS was restricted to 'Australia', 'Other main English-speaking countries' and 'All other countries'. The group 'Other main English-speaking countries' comprises New Zealand, England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, Ireland, Canada, United States of America and South Africa. This group could not be created from the categories available on the 1989–90 or 1995 NHS, so the analysis over the three survey years was restricted to 'Australia' and 'All other countries'. For 2001, the three available groups were analysed.

# Are all Australians gaining weight?

## Appendix 2: Statistical tables

Detailed statistical tables can be found on the AIHW web site <[www.aihw.gov.au](http://www.aihw.gov.au)>. Tables presented here, other than A1, give estimates for persons only.

**Table A1: Prevalence of overweight and obesity among men and women aged 20 years and over, 1989–90 to 2001**

Sex	Year	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
Males	1989–90	46.7 (45.8–47.7)	37.9 (37.1–38.8)	8.8 (8.4–9.3)
	1995	53.2 (52.3–54.0)	41.2 (40.5–41.9)	11.9 (11.5–12.3)
	2001	58.9 (57.2–60.6)	42.9 (41.4–44.4)	16.0 (15.0–17.0)
Females	1989–90	33.1 (32.3–33.9)	22.9 (22.2–23.6)	10.2 (9.7–10.7)
	1995	38.3 (37.5–39.0)	25.7 (25.1–26.3)	12.6 (12.2–13.0)
	2001	43.2 (41.7–44.7)	25.8 (24.6–27.0)	17.4 (16.4–18.4)
Persons	1989–90	40.0 (39.4–40.6)	30.5 (30.0–31.0)	9.5 (9.2–9.8)
	1995	45.9 (45.3–46.4)	33.6 (33.1–34.0)	12.3 (12.0–12.6)
	2001	51.1 (50.0–52.1)	34.4 (33.5–35.3)	16.7 (16.0–17.4)

Note: Age-standardised to the 2001 Australian population.

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

**Table A2: Age-specific prevalence of overweight and obesity among persons, 1989–90 to 2001**

Year	Age group	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
1989–90	20–24	22.7 (21.5–24.0)	18.4 (17.2–19.6)	4.4 (3.7–5.0)
	25–44	35.9 (35.2–36.6)	27.5 (26.9–28.1)	8.4 (8.0–8.8)
	45–64	49.6 (48.6–50.7)	37.1 (36.1–38.0)	12.5 (12.0–13.1)
	65+	41.2 (39.8–42.6)	31.8 (30.5–33.0)	9.4 (8.6–10.2)
1995	20–24	26.7 (25.5–27.9)	20.8 (19.7–21.9)	5.9 (5.3–6.5)
	25–44	42.5 (41.7–43.2)	31.3 (30.6–31.9)	11.2 (10.8–11.6)
	45–64	56.3 (55.3–57.3)	39.9 (39.0–40.8)	16.4 (15.8–17.0)
	65+	45.2 (43.9–46.5)	34.4 (33.2–35.5)	10.9 (10.2–11.5)
2001	20–24	33.2 (30.3–36.2)	23.8 (21.2–26.4)	9.5 (7.7–11.2)
	25–44	47.1 (45.8–48.4)	31.5 (30.4–32.6)	15.6 (14.7–16.4)
	45–64	60.3 (58.7–61.9)	39.5 (38.0–40.9)	20.8 (19.7–22.0)
	65+	53.6 (51.2–56.0)	37.9 (35.6–40.1)	15.7 (14.2–17.3)

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

**Table A3: Prevalence of overweight and obesity by state/territory among persons aged 20 years and over, 1989–90 to 2001**

Year	State/territory	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
1989–90	New South Wales	39.0 (37.9–40.0)	29.8 (28.9–30.7)	9.1 (8.6–9.7)
	Victoria	41.1 (40.0–42.2)	31.0 (30.0–32.0)	10.1 (9.5–10.7)
	Queensland	40.3 (38.8–41.8)	30.3 (28.9–31.6)	10.0 (9.2–10.8)
	Western Australia	39.4 (37.6–41.3)	30.2 (28.6–31.9)	9.2 (8.2–10.2)
	South Australia	41.8 (40.1–43.5)	32.1 (30.6–33.7)	9.7 (8.7–10.6)
	Tasmania	40.0 (38.0–42.0)	31.6 (29.8–33.4)	8.4 (7.3–9.4)
	Australian Capital Territory	35.6 (31.8–39.4)	27.5 (24.1–30.8)	8.1 (6.1–10.2)
1995	New South Wales	45.3 (44.0–46.6)	32.9 (31.7–34.1)	12.4 (11.6–13.2)
	Victoria	45.9 (44.9–46.9)	33.9 (33.1–34.8)	12.0 (11.4–12.6)
	Queensland	46.1 (44.7–47.5)	33.5 (32.3–34.8)	12.6 (11.8–13.5)
	Western Australia	44.7 (43.2–46.3)	33.9 (32.5–35.3)	10.9 (9.9–11.8)
	South Australia	47.8 (46.6–49.1)	34.3 (33.2–35.3)	13.6 (12.8–14.4)
	Tasmania	48.0 (45.7–50.2)	35.3 (33.4–37.2)	12.7 (11.4–14.0)
	Australian Capital Territory	44.9 (43.2–46.5)	34.0 (32.5–35.5)	10.9 (9.9–11.9)
2001	New South Wales	50.8 (48.7–52.9)	33.9 (32.0–35.7)	16.9 (15.6–18.3)
	Victoria	50.1 (47.9–52.3)	34.6 (32.7–36.5)	15.5 (14.2–16.8)
	Queensland	52.9 (50.4–55.4)	34.5 (32.4–36.6)	18.5 (16.9–20.0)
	Western Australia	50.3 (47.3–53.2)	35.2 (32.7–37.7)	15.1 (13.4–16.8)
	South Australia	52.7 (49.4–55.9)	35.1 (32.4–37.8)	17.6 (15.5–19.6)
	Tasmania	50.8 (46.5–55.2)	34.3 (30.6–38.0)	16.5 (13.9–19.1)
	Australian Capital Territory	47.6 (43.9–51.3)	34.0 (30.8–37.3)	13.5 (11.5–15.6)

*Notes*

1. Age-standardised to the 2001 Australian population.

2. Results for the Northern Territory were not available.

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

# Are all Australians gaining weight?

**Table A4: Prevalence of overweight and obesity by ASGC Remoteness classification among persons aged 20 years and over, 2001**

Region	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)			
Major cities of Australia	49.6 (48.3–50.9)	33.5 (32.3–34.6)	16.1 (15.2–16.9)
Inner regional Australia	54.1 (51.3–57.0)	36.1 (33.8–38.5)	18.0 (16.3–19.7)
Other areas	55.2 (51.3–59.1)	36.7 (33.5–39.8)	18.6 (16.3–20.8)

*Notes*

1. Age-standardised to the 2001 Australian population.
2. Data by ASGC Remoteness classification available for 2001 only.

*Source:* AIHW analysis of the 2001 ABS National Health Survey.

**Table A5: Prevalence of overweight and obesity by quintiles of Relative Socioeconomic Disadvantage among persons aged 20 years and over, 1995 to 2001**

Year	SEIFA quintile	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
1995	First	47.5 (46.1–48.9)	31.8 (30.7–32.9)	15.7 (14.9–16.5)
	Second	47.6 (46.3–48.8)	33.9 (32.9–35.0)	13.6 (12.9–14.3)
	Third	45.7 (44.4–47.1)	33.4 (32.2–34.5)	12.3 (11.7–13.0)
	Fourth	46.2 (44.9–47.4)	34.4 (33.4–35.5)	11.7 (11.1–12.3)
	Fifth	43.3 (42.1–44.4)	33.9 (32.9–34.9)	9.4 (8.9–9.9)
2001	First	52.4 (49.3–55.4)	31.3 (28.9–33.7)	21.1 (19.1–23.1)
	Second	52.2 (49.3–55.0)	34.9 (32.5–37.3)	17.3 (15.6–18.9)
	Third	53.7 (50.8–56.6)	36.8 (34.3–39.2)	16.9 (15.3–18.6)
	Fourth	51.3 (48.7–53.9)	34.4 (32.3–36.5)	16.9 (15.4–18.5)
	Fifth	46.3 (43.7–48.8)	33.8 (31.6–36.0)	12.5 (11.1–13.8)

*Notes*

1. Age-standardised to the 2001 Australian population.
2. Socioeconomic Indexes for Areas (SEIFA). The first quintile corresponds to the most disadvantaged group and the fifth to the least disadvantaged group.

*Source:* AIHW analysis of the 1995 and 2001 ABS National Health Surveys.

**Table A6: Prevalence of overweight and obesity by level of educational attainment among persons aged 20 years and over, 1989–90 to 2001**

Year	Level of education	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
1989–90	Post-school qualifications	37.8 (36.9–38.7)	30.2 (29.4–31.1)	7.5 (7.1–8.0)
	No post-school qualifications	41.9 (41.0–42.7)	30.7 (29.9–31.4)	11.2 (10.7–11.7)
1995	Post-school qualifications	43.6 (40.0–47.1)	33.6 (30.5–36.7)	10.0 (8.5–11.5)
	No post-school qualifications	47.1 (43.7–50.5)	33.4 (30.5–36.2)	13.7 (11.9–15.5)
2001	Post-school qualifications	50.4 (48.8–52.0)	35.5 (34.1–36.9)	14.9 (14.0–15.8)
	No post-school qualifications	52.3 (50.6–54.0)	33.3 (31.8–34.8)	19.0 (17.9–20.2)

Note: Age-standardised to the 2001 Australian population.

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

**Table A7: Prevalence of overweight and obesity by labour force status among persons aged 20–64 years, 1989–90 to 2001**

Year	Labour force status	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
1989–90	Employed	40.2 (39.4–41.0)	31.7 (30.9–32.4)	8.5 (8.1–9.0)
	Unemployed	39.6 (35.7–43.4)	28.4 (25.2–31.7)	11.1 (9.1–13.2)
	Not in the labour force	38.0 (36.4–39.6)	25.8 (24.5–27.1)	12.2 (11.2–13.1)
1995	Employed	46.5 (45.7–47.2)	34.8 (34.2–35.4)	11.7 (11.3–12.0)
	Unemployed	47.0 (43.9–50.1)	33.3 (30.6–35.9)	13.8 (12.2–15.3)
	Not in the labour force	44.8 (43.4–46.2)	29.0 (27.9–30.1)	15.9 (15.1–16.7)
2001	Employed	51.4 (50.0–52.9)	35.2 (34.0–36.5)	16.2 (15.3–17.1)
	Unemployed	46.4 (39.0–53.7)	28.0 (22.5–33.5)	18.4 (14.0–22.7)
	Not in the labour force	46.0 (43.1–49.0)	27.4 (25.1–29.6)	18.7 (16.8–20.6)

Note: Age-standardised to the 2001 Australian population.

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

# Are all Australians gaining weight?

**Table A8: Prevalence of overweight and obesity by quintiles of equivalent income among persons aged 20 years and over, 2001**

Income quintile	Overweight	Overweight but not obese	Obese
First	49.7 (46.2–53.1)	30.5 (27.9–33.2)	19.1 (16.9–21.3)
Second	50.5 (46.9–54.1)	31.4 (28.6–34.2)	19.1 (16.9–21.4)
Third	51.8 (48.4–55.2)	35.9 (33.0–38.8)	15.9 (14.0–17.7)
Fourth	51.6 (48.0–55.2)	36.0 (33.0–39.0)	15.6 (13.7–17.5)
Fifth	50.7 (47.0–54.5)	36.4 (33.2–39.6)	14.3 (12.3–16.3)

*Notes*

1. Age-standardised to the 2001 Australian population.
2. The first quintile corresponds to the least equivalent income and the fifth to the most.

Source: AIHW analysis of the 2001 ABS National Health Survey.

**Table A9: Prevalence of overweight and obesity among Indigenous and other Australians aged 18 years and over, 1995 to 2001**

Year	Indigenous status	Overweight	Overweight but not obese	Obese
1995	Indigenous	56	32	24
	Non-Indigenous	44	32	12
2001	Indigenous	63.7 (55.9–71.5)	32.4 (27.2–37.6)	31.3 (25.5–37.0)
	Non-Indigenous	49.7 (48.4–51.0)	33.6 (32.5–34.6)	16.1 (15.3–16.9)

*Notes*

1. Data are for non-remote areas only.
2. Age-standardised to the 2001 Australian population.
3. Confidence intervals available for 2001 results only.

Sources: ABS 2002; AIHW analysis of 2001 National Health Survey data (provided by the ABS).

**Table A10: Prevalence of overweight and obesity by country of birth among persons aged 20 years and over, 1989–90 to 2001**

Year	Country of birth	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)				
1989–90	Australia	39.9 (39.2–40.6)	30.5 (29.8–31.1)	9.4 (9.0–9.8)
	All other countries	39.9 (38.7–41.1)	30.2 (29.1–31.3)	9.7 (9.1–10.3)
1995	Australia	46.4 (45.8–47.0)	33.6 (33.1–34.2)	12.8 (12.4–13.1)
	All other countries	44.3 (43.3–45.3)	33.2 (32.3–34.1)	11.1 (10.6–11.5)
2001	Australia	52.6 (51.3–53.9)	35.3 (34.2–36.4)	17.3 (16.5–18.2)
	All other countries	46.5 (44.3–48.6)	31.7 (30.0–33.5)	14.7 (13.5–16.0)

Note: Age-standardised to the 2001 Australian population.

Source: AIHW analysis of the 1989–90, 1995 and 2001 ABS National Health Surveys.

**Table A11: Prevalence of overweight and obesity by country of birth among persons aged 20 years and over, 2001**

Country of birth	Overweight	Overweight but not obese	Obese
per cent (95% confidence interval)			
Australia	52.6 (51.3,53.9)	35.3 (34.1,36.4)	17.4 (16.5,18.2)
Other main English-speaking countries	49.1 (45.3,52.9)	33.5 (30.4,36.6)	15.6 (13.5,17.8)
All other countries	45.1 (42.4,47.9)	30.8 (28.5,33.1)	14.3 (12.7,15.8)

Notes

1. Age-standardised to the 2001 Australian population.

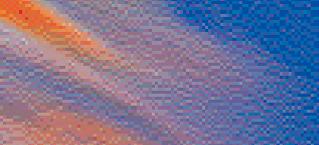
2. Other main English-speaking countries include: New Zealand, England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, Ireland, Canada, United States of America and South Africa.

Source: AIHW analysis of 2001 National Health Survey data (provided by ABS).

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