

Background

Current estimates suggest that 2.4 million Australian adults are obese and a further 4.9 million are overweight, and that levels of obesity among women have doubled in the last 15 years. Most estimates are based on repeated cross-sectional measures (such as the ABS National Health Surveys). There are few prospective data on weight change for individuals in the Australian population. This gap is being filled by participants in the Australian Longitudinal Study on Women's Health (ALSWH) who have provided data on height and weight in every survey since the study began in 1996. These data give important insights into changes in weight and body mass index, which will be used to clarify relationships between weight, weight change, body mass index (BMI, and its major determinants – energy intake and energy expenditure) and health and illness over the next few years.

Weight and weight change

The average weight of women in each of the three cohorts (for those who reported their weight at every survey) is shown in Figure 1. In 1996 the younger women had the lowest average weight, 62.6 kg, while the mid-age women were the heaviest with an average of 68.6 kg - a difference of 6 kg. By Survey 3, however, the younger women had gained more weight than the mid-age women. Average weight was 67.4 kg for the younger group and 71.0 kg for the mid-age group – a difference of 3.6 kg.

The pattern of weight change was different in the older cohort: their average weight decreased during the first six years of the study. In all three age cohorts, the average weight of women living in rural and remote areas was higher than that of urban women. Young rural women also gained weight faster than any other group.

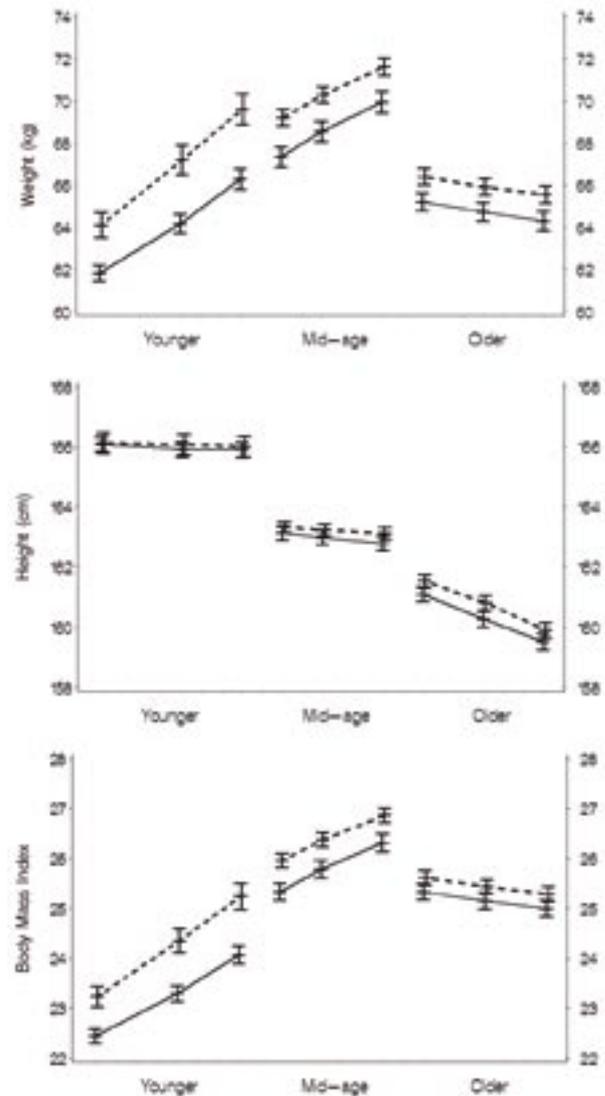


Figure 1. Average weight (top), height (middle) and BMI (bottom) of women who reported these data at every survey. Solid lines show data from urban women; dashed lines show data from rural/remote women. Data were collected from younger women in 1996, 2000 and 2003; from mid-age women in 1996, 1998 and 2001, and from the older women in 1996, 1999 and 2002. Vertical bars indicate 95% confidence intervals.

Height and height change

The average heights of women who responded to all three surveys are also shown in Figure 1. There were only minor differences between women living in urban and in rural or remote areas. Heights remained fairly constant in the younger and mid-age women, but average height of the older women decreased by 1.6 cm over six years.

Changes in Body Mass Index

Figure 1 also includes the average BMI for women who reported weight and height at each survey. In 1996, average BMI of the younger women was 22.7 compared with 25.7 for the mid-age women and 25.5 for the older cohort. Again, in all three cohorts BMI was consistently higher for women in rural and remote areas than for urban women. Average BMI increased with time among the younger and mid-age women, but decreased slightly among the older women. By Survey 3, the average BMI of the younger women in rural/remote areas (25.2) was almost the same as that of the urban mid-age women at Survey 1 (25.3).

The proportion of women in each BMI category (see Box 1) is shown in Figure 3. The proportion of younger women in the underweight category decreased with successive surveys. During the same time period (1996-2003), the proportion in the overweight and obese categories increased. The proportion of mid-age women in the overweight and obese categories also increased over time. By Survey 3, 54.3% of the mid-age women had a BMI >25, compared with 45.7% in 1996. In contrast, BMI in the older cohort remained largely unchanged apart from a slight increase in the proportion who were underweight. This probably reflects the changes in bone and muscle mass which occur with ageing, as well as increased illness in this group.

Box 1: Body Mass Index is calculated as:
 $\text{weight (kg)/height}^2(\text{m}^2)$.

Underweight	BMI <20
Healthy weight	BMI 20 - <25
Overweight	BMI 25 - <30
Obese	BMI >30

How much weight is gained?

Average weight changes (in grams per year) for women who reported their weight at every survey are shown in Figure 2. On average, the younger women gained 649g per year, compared with 494g per year in the mid-age women, while the older women lost 162g per year. Average weight gain was significantly higher in younger than for mid-age women, and significantly higher among younger women living in rural or remote areas than the younger urban women.

	Number of women	Average annual weight change (grams per year) (95% confidence interval)
Younger women		
Urban	3676	606 (571, 641)
Rural/remote	2094	725 (676, 775)
Total	5770	649 (620, 678)
Mid-age women		
Urban	3360	515 (476, 555)
Rural/remote	5582	477 (446, 509)
Total	8942	492 (467, 516)
Older women		
Urban	2939	- 157 (- 190, - 125)
Rural/remote	3838	- 166 (- 197, - 136)
Total	6777	- 162 (- 185, - 140)

Figure 2. Average annual weight change in grams

	Under-weight	Healthy Weight	Over-weight	Obese
Young S1	25.7	52.5	16.0	5.9
Young S2	20.0	50.9	19.2	10.0
Young S3	15.5	50.2	20.4	13.9
Mid-age S1	7.0	47.3	28.0	17.7
Mid-age S2	6.1	43.6	31.0	19.4
Mid-age S3	5.1	40.6	31.5	22.8
Older S1	6.7	44.9	34.8	13.7
Older S2	4.8	44.1	34.3	13.2
Older S3	10.0	44.2	32.8	13.0

Figure 3. Proportion of women in each BMI category

Who gains weight?

Longitudinal analyses of weight gain among younger and mid-age women in the ALSWH have shown that weight gain is occurring across all socio-economic groups. After adjustment for all potential confounders, the factors found to be independently associated with weight gain among younger women are shown in Box 2.

Box 2: Factors associated with weight gain among younger women 1996 – 2000

- Having BMI outside the healthy weight range at the beginning of the study in 1996
- Sitting more than 4.5 hours/day
- Eating take away food
- Restrictive eating practices

The association between weight gain and pregnancy in the younger women is currently being investigated, and will become clearer when data from Survey 4 of the younger cohort are available.

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In the last survey I completed, I had recently had my first baby. I was about 3-5kgs heavier than pre-pregnancy weight. I joined a gym, ate anything and piled on another 9kg's!!! Nine weeks ago, I changed my eating habits for good ... My new eating habits and lifestyle simply incorporate low fat foods, and a knowledge of how low fat, moderate calories and moderate exercise can make the difference ... I have dropped 3kg's, 3cm's off everything & have more energy. I still go to the gym 3-4 times a week and it is all paying off. By next summer, I hope to wear the swimmers without board shorts. I feel fantastic .. - perhaps the hardest thing was swapping the full cream milk in coffee to skim milk - but you do get used to it.

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Factors associated with weight gain among the mid-age women are shown in Box 3. The data suggest that some factors other than those traditionally associated with energy balance also contribute to weight gain at this life stage.

The challenge of quitting smoking and gaining weight is highlighted in this comment from one participant:

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I am generally feeling a lot happier about my health. I've quit smoking after approximately 10 years. On the other hand I have put on almost 10 kilos. I hate this. I never had to worry about weight I know that I really need to exercise to maintain my weight, however this is a habit I am having trouble starting. Overall the positives I have done for my health do very much outweigh (joke) the negatives.

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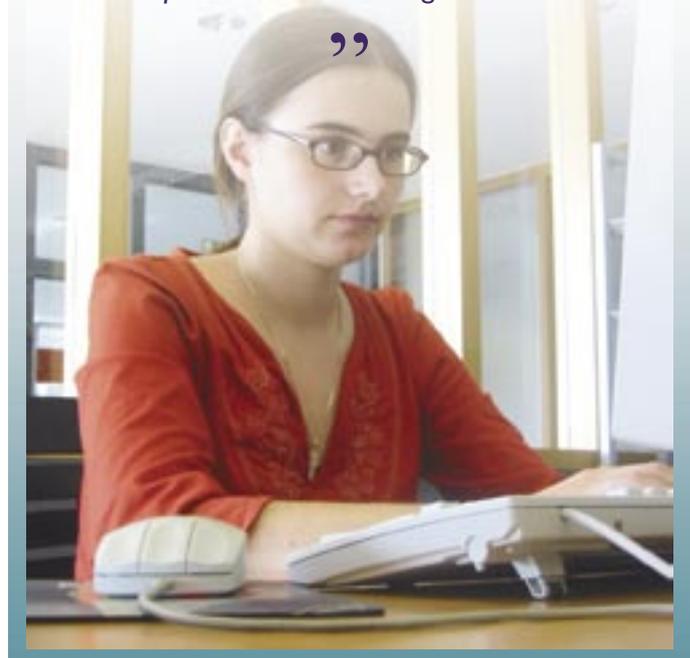
Box 3: Weight gain among mid-age women is associated with:

- Quitting smoking
- Hysterectomy
- Menopause
- Low levels of physical activity (less than 150 minutes/week)
- High sitting time (more than 4.5 hours/day)
- Being overweight or obese in 1996, and with high energy intake

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The hours I work plus the time I spend getting to work make it difficult to maintain any decent level of exercise. I leave home at 6.45am and get home around 6pm. It is dark when I get up and dark when I get home. At night I can either prepare a meal or I can have fast food or an instant meal (I don't like either) and go to the pool and do laps. I don't have enough time to do both.

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Health consequences of weight gain

Although many previous studies have shown cross-sectional relationships between BMI and health problems, the ALSWH is the first study in Australia to be able to demonstrate the prospective relationships between weight gain and a range of health problems. Health problems associated with BMI in the mid-age women are shown in Box 4.

Box 4: Health problems associated with weight gain among the mid-age cohort

- Stiff and painful joints
- Back pain
- Tiredness
- Incontinence
- Hypertension
- Diabetes
- Heart disease

Did you know?

Assuming that each kg of weight gained represents 7,700 kcal, the amount of weight gained reflects a positive energy accumulation on average of only about 14 kcal (58 kJ) a day in the younger cohort and about 10 kcal (40 kJ) a day in the mid-age cohort. While the health effects of this weight gain are likely to be significant in the long term, these data suggest that only small changes would be required to reverse these trends.

The Australian Longitudinal Study on Women's Health is a landmark study funded by the Australian Government Department of Health and Ageing and conducted by a team of researchers at the Universities of Newcastle and Queensland.

The study:

- is designed to monitor and document the health and wellbeing of Australian women in urban, rural and remote areas
- aims to provide policy relevant information to contribute to health and welfare planning
- began in 1996 with a representative sample of 40,000 Australian women in three age groups
- includes younger women born 1973-78, middle-aged women born 1946-51, and older women born 1921-26
- has the capacity to link Medicare data on service usage with survey information
- collects data on physical and emotional health, health service use, life course events, demographics, and social and behavioural factors
- is planned to run for twenty years or more.

Policy Issues

- As health problems caused by excess weight accumulate over time, the large numbers of 'baby-boomer' (mid-age) women who are already overweight or obese, and the continuing weight gain in this group, pose an escalating health threat for the future. Major efforts to control weight gain among middle aged people are needed if Australia is to avoid substantial increases in chronic disease, loss of productivity and declining well-being in the next 10-20 years.
- At the same time average BMI among the younger rural women is now approaching that of women who are 25 years older. It is therefore likely that the health problems associated with overweight will start to appear much earlier in this generation of women, especially in rural areas.
- Women who are quitting smoking, going through menopause, have sedentary jobs, or live in rural areas, should all be targeted by efforts to increase energy expenditure and decrease energy intake. Small but consistent changes in physical activity and diet are needed to reverse the energy imbalance and halt the weight gain which underlies the current obesity epidemic.



Find out more

Background information on the entire project can be found in the companion report in this series:
Australian Longitudinal Study on Women's Health: The First Decade.

For surveys, details of scientific publications, and other information see the project website:
<http://www.newcastle.edu.au/centre/wha>

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