

The obesity epidemic in Australia

The Australian Longitudinal Study on Women's Health submission to the Select Committee on the obesity epidemic in Australia, Department of the Senate

July 06, 2018



Australian Longitudinal Study
on Women's Health

About the Australian Longitudinal Study on Women's Health

Since its inception in 1996, the Australian Longitudinal Study on Women's health has recorded the rising prevalence of overweight and obese Australian women and tracked the adverse consequences to their health. On behalf of the study staff, and its hundreds of collaborating researchers, we welcome the Senate Inquiry into Obesity in Australia and are grateful for the opportunity to submit our research for consideration.

The study, also known as Women's Health Australia, is a national research resource for the development of policy and practice related to women's health and health services. It is funded by the Australian Government Department of Health and managed by the University of Newcastle and the University of Queensland. It surveys 57,000 women in four cohorts born in 1921-26, 1945-51, 1973-78, and 1989-95. The Mothers and their Children's Health (MatCH) substudy has gathered data on the children of mothers in the 1973-78 cohort. The substudy is funded by the NHMRC to examine the relationships between women's health and wellbeing and their children's health and developmental outcomes. Together, this data offers researchers and policymakers a valuable opportunity to gain insight into the determinants and consequences of obesity in Australian women and to monitor trends across successive cohorts and over time.

Researchers using study data have observed the trend of continuing weight gain across four generations of women, and now their children, with increasing concern. Research using study data has been used as evidence of women's increasing weight and the health effects, in numerous peer-reviewed publications and in reports to government. In addition, the study's data underlie recommendations in the 2010 National Women's Health Policy¹ and 2014 Physical Activity Guidelines². In 2018, the study contributed to an overview of international research on preconception health which was discussed in the UK House of Lords debate on obesity in children³ and has since been incorporated into a Public Health England resource on pre-pregnancy health planning⁴.

Research shows that many women in the study want to lose weight and are aware of public health messages about healthy eating and activity. Moreover, the majority of the 1973-78 and 1945-51 cohorts are actively engaged in efforts to lose weight⁵. Despite this, women mostly do not meet recommendations for healthy eating, or for adequate physical activity, and their weight continues to climb.

It is further apparent from our data that women's weight is not simply a matter of individual behaviour in relation to energy intake and expenditure. Behaviours are influenced by our obesogenic environment, psychological wellbeing, social circumstances and life stage. Efforts to reverse trends in obesity must take a holistic view of women's health. There is an urgent need for strong, targeted policies and programs that provide real support and deliver tangible results.

Response to terms of reference

This submission covers the following topics:

A: The prevalence of overweight and obesity among children in Australia and changes in these rates over time

B: The causes of the rise in overweight and obesity in Australia

C: The short and long-term harm to health associated with obesity, particularly in children in Australia

D: The short and long-term economic burden of obesity, particularly related to obesity in children in Australia

E: The effectiveness of existing policies and programs introduced by Australian governments to improve diets and prevent childhood obesity

F: Evidence-based measures and interventions to prevent and reverse childhood obesity, including experiences from overseas jurisdictions

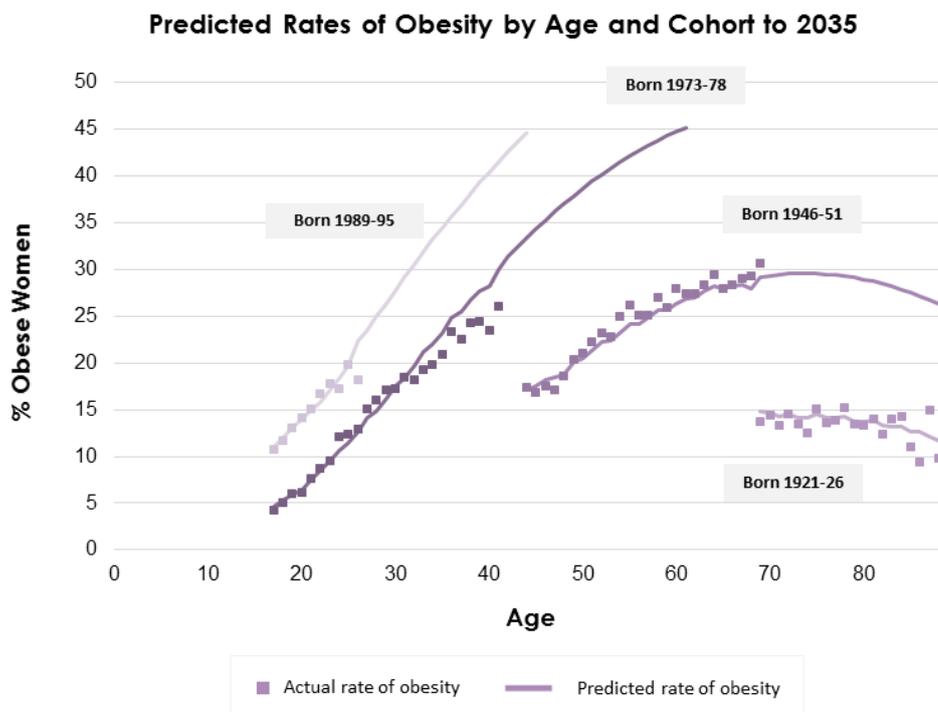
G: The role of the food industry in contributing to poor diets and childhood obesity in Australia

H: Any other related matters.

A: The prevalence of overweight and obesity among children in Australia and changes in these rates over time

The increasing prevalence of obesity amongst successive cohorts of Australian women and the rapid increase within each cohort is alarming. Figure 1, taken from a 2016 report prepared for the Australian Government Department of Health⁶, shows the dramatic changes in weight gain between generations and predictions for obesity rates to 2035. Each generation of women in the study is heavier than the one before, and gaining weight faster. In less than 20 years, the prevalence of adolescent obesity (before women enter the study) has increased rapidly. In 1996, 4.2% of 18-year-olds entering the study were obese. By 2013, 10.7% of 18-year-olds from the 1989-95 cohort were already obese when they entered the study⁶.

Figure 1: Predicted Rates of Obesity by Age and Cohort to 2035.



Note. From "Future health service use and cost: Insights from the Australian Longitudinal Study on Women's Health.", 4.3, p33 (Mishra G, et al., 2016)

In the Mothers and their Children's Health (MatCH) substudy, only a small proportion of children were obese (4.3% of 2-14 year-olds and 3.6% of 5-12-year-olds), but a much larger proportion were overweight and at risk of later obesity (see Table 1)⁷. According to the Australian Bureau of Statistics report, 27.4% children between the ages of 5 and 17 years were overweight or obese in 2014-15⁸.

Table 1: BMI of Children from the Mothers and their Children substudy

	2-4 years		5-12 years	
	N	%	N	%
Body Mass Index				
Underweight	92	11.5	399	11.6
Acceptable	561	70.2	2503	72.9
Overweight	112	14.0	406	11.8
Obese	34	4.3	124	3.6

Note. From "MatCH (Mothers and their Children's Health) Profile: offspring of the 1973-78 cohort of the Australian Longitudinal Study on Women's Health, Longitudinal and Life Course Studies" (Mishra G, et al., 2018, pre-press)

B: The causes of the rise in overweight and obesity in Australia

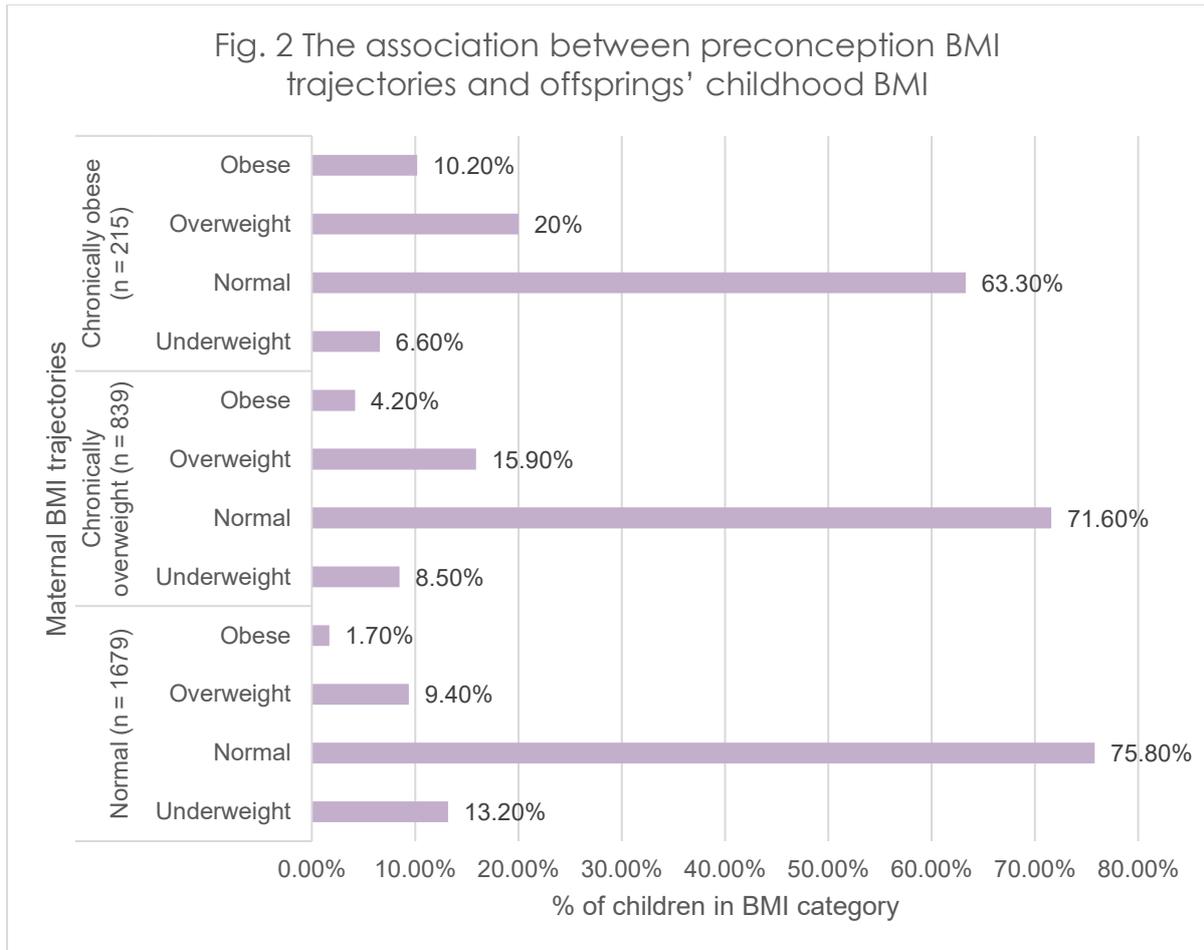
The study draws on longitudinal data from four generations of women to investigate the myriad factors influencing women's weight gain. Women's physical and mental health, nutrition, physical activity, socioeconomic status and life stage also influence weight gain and obesity.

The role of preconception health in childhood obesity

An accumulating body of evidence indicates that women's health and wellbeing in the months and years leading up to conception play an important role in their children's health outcomes. Obese children in the Mothers and their Children's Health (MatCH) substudy were more likely to have mothers who were current smokers or had low levels of education (less than year 12)⁹.

A mother's pre-pregnancy obesity is linked to obesity in her children. In the first research to consider mothers' weight trajectories before pregnancy, researchers used data from the (MatCH) substudy to compare women's pre-pregnancy BMIs with their children's BMIs (See Figure 2). Women were classed as being either a normal (healthy) weight or being chronically overweight or obese for the entire 6-7 years before pregnancy. The higher a woman's BMI before pregnancy, the higher her children's BMIs were likely to be. Chronically overweight women were 2.5 times more likely to have obese children than women in a healthy weight range. Chronically obese women were 6.7 times more likely to have obese children⁹.

Fig. 2 The association between preconception BMI trajectories and offsprings' childhood BMI



Note. From "Maternal preconception weight trajectories are associated with offsprings' childhood obesity." (Adane A, Dobson A, Tooth L & Mishra G, 2018)

Weight gain between pregnancies is a concern for women and clinicians. Researchers examined this question for the first time using data from the MatCH substudy. They found an association between high levels of inter-pregnancy weight gain in mothers and obesity in their second-born child. When mothers gained more than four BMI units between pregnancies their second child had twice the risk of being overweight or obese compared to children born to mothers with stable weights. A four BMI unit gain would be equivalent to a woman with an average height (1.66 m) and weight (65 kg) prior to the first pregnancy putting on 11 kg (to 76 kg) between pregnancies. No link was found with childhood obesity when the mother maintained her weight or gained less than four BMI units⁹.

The relationship between a mother's weight and her children's weight is likely to be influenced by a number of factors. Genetic predisposition is a potential consideration. A three-part series on preconception health published in *The Lancet* (in which the study was featured) reviewed animal and human IVF studies. The authors concluded that maternal obesity prior to conception influences child health outcomes at a biological level through alterations to alterations in oocytes (immature egg cells) and embryos^{10, 11}. The child's early environment is also likely to play a part. Unpublished data from the MatCH substudy indicates that the children of overweight and obese mothers eat more junk food than children with healthy weight mothers.

Factors impacting the rise of obesity in Australian women

Framing the issue of weight gain, and women's transition towards obesity in terms of energy inputs versus energy outputs is reductive and ignores the impact of our obesogenic environment and the complex biological, psychological, behavioural and sociodemographic factors in effect at different stages throughout women's lives.

Physical activity

Physical inactivity is a recognised risk factor for weight gain and obesity. In the 1973-78 cohort, researchers found a clear relationship between the amount of physical activity reported by women and their transition from a healthy BMI to the overweight or obese categories¹². High levels of physical activity have repeatedly been found to be a protective factor against weight gain¹².

It is important to recognise that women's levels of physical activity are linked to their life stages. If these significant life events and transitions are not considered during the development of health promotion campaigns, their potential for success could be compromised

Very high levels of physical activity throughout young adulthood significantly reduce the risk of becoming overweight or obese¹³. Over a quarter of 18-23 year-olds from the 1989-95 cohort were in the highly active range¹⁴. From age 28 to 36, women enter a critical period where being very active offers the most protection against weight gain^{12, 13}. However, this is also a life stage where many women face competing demands of caring for young children and working. Women in the study were less likely to stay physically active once they married, had children or were divorced¹³

Physical activity is determined by biological, socio-demographic, work-related and lifestyle factors. In young women the least likely to be active were: born in Asia; had less than 12 years of education; were classified as non or rare drinkers¹⁵; were married, or in a defacto relationship; or had at least one child^{15, 16}. These findings can be used to identify and target groups most in need of intervention and the research should be extended to incorporate other age groups.

In middle age, women tend to increase their physical activity levels. At the age of 50-55, only 50% of women were meeting physical activity guidelines for 150 minutes of at least moderate intensity exercise per week. By age 62-67 the proportion meeting guidelines rose to 64%¹⁷. The increase in activity levels is related to changes in work, or the death of a spouse. However, the birth of a grandchild was associated with a decrease in physical activity levels.

Amongst older women, the trend is for physical activity levels to decline. At ages 73-78, 43% of older women met guidelines for 150 minutes of moderate intensity exercise. Unsurprisingly by ages 85-90, the proportion meeting the guideline fell to 23%¹⁷. Physical activity declined with major illness, injury, surgery and moving into institutional care¹⁴.

Diet

Poor diet is generally accepted as a factor in weight gain and obesity. At a population level, our record for adherence to the Australian Dietary Guidelines is appalling. Poor diet quality is consistently common across all cohorts with very low percentages meeting nutritional guidelines^{14, 18}. Less than 2% of women in their 30s and 50s met the recommended five daily servings of vegetables. Table 2 provides an overview of the percentage of women meeting the 2013 dietary guidelines.

Table 2 Percentages of women meeting the Australian Dietary Guidelines (2013) for different food groups ¹⁸

	Cereal	Vegetable	Fruit	Dairy	Meat
1973-78	7%	1%	32%	12%	28%
1946-51	45%	2%	48%	1%	41%

Note. From “How do women’s diets compare with the new Australian dietary guidelines?” (Mishra G, Schoenaker D, Miharshahi S & Dobson A. 2015)

It should be noted that the 2003 and 2013 Australian Dietary Guidelines have different recommendations for meat and dairy consumption. They also provide different recommendations for older women. Historically, women’s intake of meat was considered quite high; the 2003 guidelines were met by 71% of the 1973-78 cohort and 83% of the 1946-51 cohort. However, under the 2003 guidelines, these figures drop to 28% and 41% respectively¹⁴. These dramatic changes to guideline adherence reflect changed targets, rather than a change in diet¹⁸.

A further area of poor adherence to dietary guidelines is in relation to consumption of “extras” in the diet. Under the ADG 2013, foods that are high in energy, saturated fat, added sugars and/or salt or alcohol are listed as ‘Discretionary Choices’ because they are not considered a necessary part of a healthy diet. In the 2003 Guidelines, these were ‘Extras.’ The guidelines suggest that for less active people to maintain weight, there is little room for additional servings beyond the recommended portions. Adults are recommended no more than 2.5 serves of these foods per day. For women in the 1973-78 cohort, an average of more than four serves (4.20) of Extras per day was almost double the guideline of 2.5 serves – and 9 out of 10 women exceeded the guideline. Only one in three (32%) women in the 1946-51 cohort met guidelines for the consumption of Extras¹⁴. Research from the 1973-78 cohort confirms that young women who maintained a healthy weight were less likely to eat takeaway foods¹⁹.

Household composition and life stage is known to influence diet. We found that starting a family is associated with unhealthy changes in women’s diets. Specifically, women who lived with children had a greater energy intake than other women, ate more high-fat foods, high sugar foods, meat, and cooked vegetables. Whereas women living without children had a more Mediterranean style diet and ate less from the high-fat, high-sugar and cooked vegetable groups²⁰. This finding has implications not just for women’s health, but also for their children’s and presents a potential target for intervention programmes.

Although it seems counter-intuitive, we found that perpetual dieters gained significantly more weight over nine years than women who did not attempt weight loss diets.

Research from the study regarding the links between diet quality and weight gain are conflicting. In a number of papers, researchers found no link between diet quality and weight gain^{21, 22, 23}. In another paper, researchers found that better diet quality and higher intake of fruit and vegetables was linked to lower levels of weight gain over six years²⁴.

Sleep

Sleep disruption is recognised as a strong risk factor for obesity. This is especially important for pregnant women and mothers whose sleep patterns may be disrupted for years. Researchers found an association between sleeping patterns and dietary intake in the

women of the 1973-78 cohort²⁵. Women who slept the least (approx. 6 hours per night) and often experienced sleeping difficulties and severe tiredness, took in more of their daily kilojoules from fat and saturated fat.

Alcohol

Alcohol is considered a discretionary food and the Australian Dietary Guidelines recommend drinking no more than two standard alcoholic drinks per day. Researchers reviewed the factors that influence healthy weight maintenance in the 1973-78 cohort over a 16 year period. They found that drinking low levels of alcohol (less than 14 standard drinks per week) was positively associated with maintaining a healthy BMI²⁶.

Sociodemographic factors

Low socioeconomic status is implicated in obesity but the reasons for this increased risk are not yet well understood. Low education level, low income or working in a low status occupation are all factors.

Women in the study who self-defined as working class had significantly higher two-year weight gain than middle and upper class women²⁷. Researchers also found that childhood socioeconomic status impacted adult obesity. Women in the 1989-95 cohort whose fathers had a high socioeconomic status had lower BMIs. However, their mother's education status and the young women's own education status was most predictive of recent weight change. It is important to note that social mobility and improving socioeconomic status were associated with lower body weight and less weight gain than remaining at a low socioeconomic status.

Women from the study with a university degree had consistently lower BMIs compared to women with no formal qualifications²⁸. For example, 40% of 18-23 year-olds with a certificate, diploma, or less than year 12 education were overweight or obese²⁹. In comparison, 27% of women with a university level were overweight or obese.

Low education levels are also recognised factor for weight gain. In the 1973-78 cohort, there was an average 2.3kg difference in weight gain over nine years between low and highly educated women³⁰. Researchers found little difference between women who achieved high levels of education early on and those who continued to upgrade their education over a 13-year period³¹. This suggests that the behavioural characteristics and health knowledge that are associated with attaining high levels of education are related to personality traits like persistence and self-directedness. These traits may make individuals more likely to engage in higher education and more successful at weight management.

There is a clear city-country difference in women's BMI status. In women aged 18 to 23 in 2013 according to their area of residence indicated a clear city-country difference. The proportion of overweight and obese women was lower in the major cities compared to rural, regional and remote areas. In contrast, the highest percentage of women in the underweight category occurred in the major cities²⁹.

Mental health

Psychosocial stress contributes to weight gain. Over nine years, women reporting the most stress gained an additional 2.3 kg relative to those reporting less stress³⁰. Psychosocial stress could be associated with financial strain, harsher living conditions, or as a result of lower social standing. It is thought to contribute to obesity through risk behaviours such as comfort eating, eating convenience foods, reduced participation in leisure time, physical activity, and through biological pathways affecting cortisol.

Findings from our mid-age cohort suggest that depression may cause weight gain over the next three years. However, weight change (loss or gain) did not lead to depression³².

Work

In contrast to other studies, we found that women from the 1973-78 cohort in stable full-time work were more likely to gain weight than women with stable part-time work³³. In middle age, women working regular (35–40), long (41–48) or very long (49) hours was associated with increasingly higher levels of weight gain compared with working part-time hours³⁴. Work-related stress may also play a part in weight gain. Interestingly, research on the 1946-51 cohort showed that sitting time was not associated with weight gain³⁵. These findings suggest a need for changes in the workplace that encourage active transport, physical activity during work hours and access to healthy food options.

Life Stages

Women tend to gain weight as they age, up to a point, after which they lose muscle mass and are at risk of sarcopenia. Weight trajectories plateau around the age of 60-65 and weights decline among and older women.

Women's 20s and early 30s are a critical point for weight gain. In longitudinal studies, women gain significant weight in young adulthood and pregnancy is often cited as the reason. A 10-year review of women's weight gain after pregnancy found that women who had children put on 4kg more than un-partnered, childless women. While those with a partner but no child put on an average of 1.8kg over the same period³⁶. However, a 16-year review found no significant difference in weight gain between women who had children and those who did not¹². Instead, the researchers found that not having a paid job or having depression were more significant risk factors for weight gain than motherhood.

The transition through menopause is another point where women tend to gain weight. Women from the 1946-51 cohort who were transitioning into menopause were more likely to gain 5kg over five years than pre-menopausal women³⁷.

Hysterectomy was not associated with significant weight gain; however, overweight women were more likely to have a hysterectomy³⁸.

C: The short and long-term harm to health associated with obesity, particularly in children in Australia

Associations with childhood obesity

The Mothers and their Children's Health substudy provides an overview of the health and wellbeing of children aged 0-12 born to mothers in the main study's 1973-78 cohort. Within the MatCH substudy, overweight and obese children had significantly higher rates of ear nose and throat problems, chest infections, ear infections, urinary tract infections, bone problems, autism, anxiety, and learning problems. At present, the MatCH substudy is cross-sectional rather than longitudinal so researchers cannot assess whether obesity is an outcome of these conditions or a potential cause. Additionally, while there are only a small number of obese children within the study, the higher instance of overweight children are at risk of obesity.

Long-term impacts of obesity

Being overweight or obese has a negative impact on physical and mental health, and contributes to poor quality of life. Amongst women in the study, being obese or overweight has been shown to contribute to an increased risk of:

- Cardiovascular disease and hypertension³⁹
- Asthma and breathing difficulties
- Diabetes³⁹⁻⁴⁰
- Leaking urine (due to increased pressure on the pelvic floor)⁴¹
- Lower satisfaction with work/career/study, family relationships, partner relationships, and social activities⁴²
- Dysmenorrhea (painful periods)⁴³
- Polycystic ovary syndrome⁴⁴
- Hysterectomy³⁸
- Pregnancy complications including gestational diabetes^{45, 46} and hypertensive disorders of pregnancy⁴⁷
- Foot problems⁴⁸
- Back pain in young women⁴⁹
- Arthritis³⁹
- Declining physical function in old age⁵⁰
- Hospital admissions⁵¹
- Stroke⁵²

Multimorbidity (having multiple co-existing diseases) is more common in women than in men. Research based on the 1946-51 cohort found that being overweight or obese was a key factor for accumulating conditions over time⁵³.

D: The short and long-term economic burden of obesity, particularly related to obesity in children in Australia

A 2016 report to the Department of Health, *Future health service use and cost: Insights from the Australian Longitudinal Study on Women's Health*⁶, estimates the economic burden of obesity on the public healthcare system for three of the study's four cohorts. The estimates were made by linking women's survey data with the Medicare Benefits Schedule, the Pharmaceutical Benefits Scheme, and Hospital Admissions data. The following sections are excerpts from this report.

Short term costs

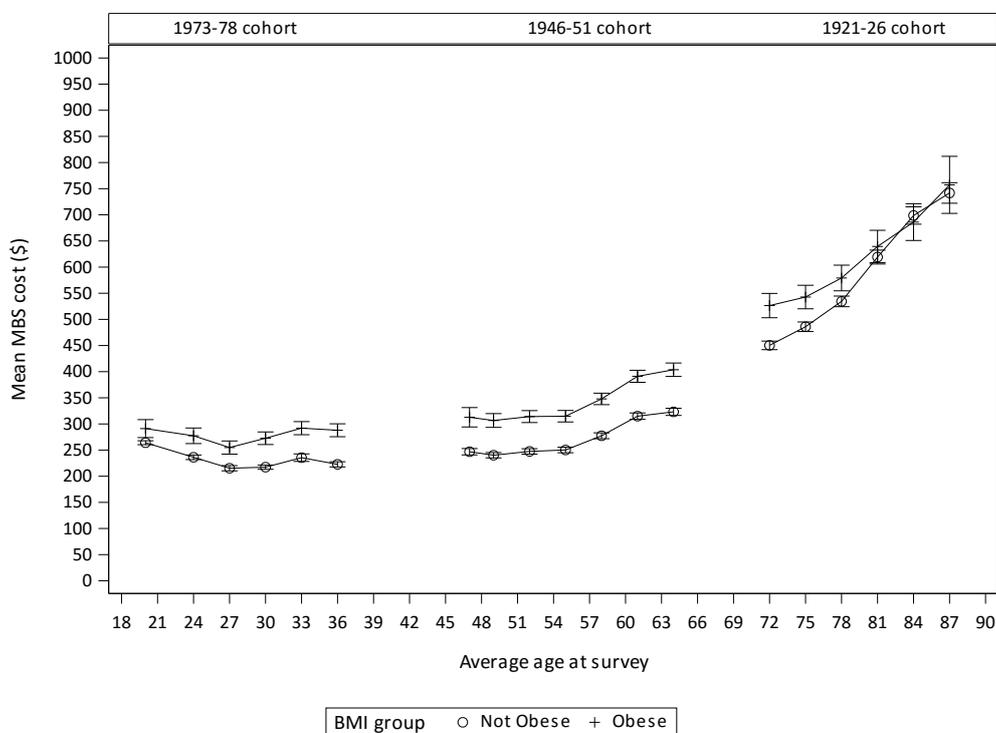
The impact of obesity on healthcare utilisation was examined by comparing the mean number of MBS claims, PBS prescriptions filled, and hospital admissions accrued by women each year, and the cost of these services between obese and non-obese ALSWH participants. Overall, obese women had higher health care expenditure than non-obese women.

Burden on the Medicare Benefits Schedule

During the period 1996 to 2013, the average annual number of unreferral MBS claims and the corresponding unreferral MBS costs increased with age (see Fig. 3). The average

number of unreferral MBS claims and total unreferral MBS costs per year were higher for obese women than for non-obese women until at least 78 years of age.

Figure 3: Comparison of average unreferral MBS costs per participant per year for the 1973-78, 1946-51, and 1921-26 cohorts by obesity status.



Note. From “Future health service use and cost: Insights from the Australian Longitudinal Study on Women’s Health.”, 4.5.1, p39-40 (Mishra G, et al., 2016)

Burden on the Pharmaceutical Benefits Scheme

Study data were also linked to the latest available PBS dataset (2012-13 financial year), which provided a record for each dispensed PBS script and its associated cost for each participant. The average number of scripts filled and cost (in 2012-13 Australian dollars) was then determined by obesity group. Table 3 compares the mean number of PBS claims and costs in obese and non-obese women.

Table 3: Mean PBS claims and costs (in 2012-13 Australian dollars) per participant for the 1973-78, 1946-51, 1921-26 cohorts by obesity status.

		ALSWH Cohort		
		1973-78	1946-51	1921-26
Group	Corresponding survey	Survey 6	Survey 7	Survey 6
	Year	2012	2013	2011
	Average age (years)	36	64	87
Not Obese	Mean number of PBS claims per participant	4.9	19.0	53.0
	Mean PBS cost per participant (\$)	271	810	1949

Obese	Mean number of PBS claims per participant	9.0	32.3	65.4
	Mean PBS cost per participant (\$)	374	1212	2060

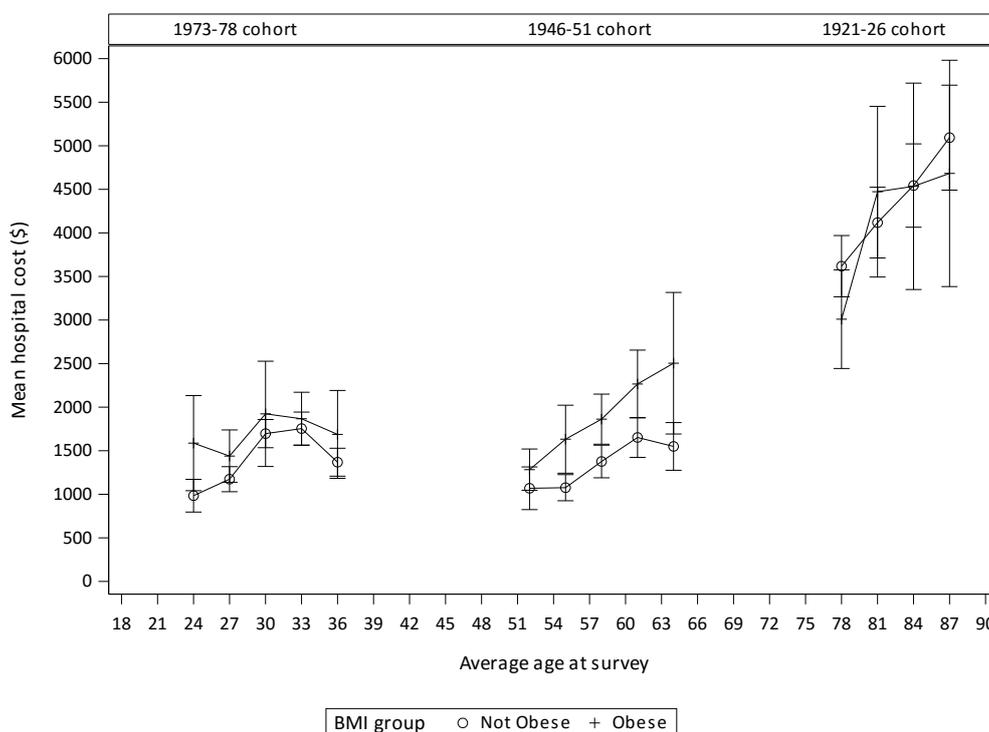
Note. From "Future health service use and cost: Insights from the Australian Longitudinal Study on Women's Health.", 4.5.2, p41 (Mishra G, et al., 2016)

Burden on the public hospital system

Obese women had higher hospital costs than non-obese women in both the 1973-78 and 1946-51 cohorts (see Fig 4). The mean hospital cost for non-obese women in the 1973-78 cohort was \$984 at age 24 and peaked at \$1754 at age 33. The average hospital cost for obese women aged 24 was \$600 (in 2012-13 Australian dollars) higher than for non-obese women. From 27-36 years of age, obese women had approximately \$112-\$320 more hospital costs than non-obese women.

Mean hospital costs for non-obese women in the 1946-51 cohort increased from \$1069 (in 2012-13 Australian dollars) at age 52 to \$1549 at age 64 (Figure 4-10). For obese women in this cohort, the hospital costs were higher, ranging from \$1283 (at 52 years) to \$2504 (at 64 years).

Figure 4 : Comparison of average hospital costs in 2012-13 Australian dollars per participant per year for the 1973-78, 1946-51, and 1921-26 cohorts living in NSW by obese status.



Note. From "Future health service use and cost: Insights from the Australian Longitudinal Study on Women's Health.", 4.5.3, p42 (Mishra G, et al., 2016)

Long-term burden

The increasing prevalence of obesity across successive cohorts, the increase in weight associated with ageing, and the projected changes in population size and structure all lead to a large projected increase in the number of obese women over the next two decades. Our projections show that the number of obese women will double from 2.4 million (or 26.6 per cent) to 4.8 million (or 40.0 per cent) between 2015 and 2035. The proportion of health expenditure for obese women will double and is increasing faster than health care expenditure for non-obese women.

E: The effectiveness of existing policies and programs introduced by Australian governments to improve diets and prevent childhood obesity

The Australian Longitudinal Study on Women's Health monitors the impact of government policies and programs at a broad population level by looking at changes in women's health, health-related behaviours and use of health services. While specific programs may be effective within targeted communities there is little evidence from the study to suggest that existing policies and programs have improved diets or prevented obesity in women or children at a national level.

Australian women have had exposure to public state, national, and regional public health campaigns since the late 70s. The Australian Dietary Guidelines were first released in 1982. Active lifestyle campaigns like 'Life Be In it' were supported by the Australian Government in the late 70s and early 80s and the National Physical Activity Guidelines were commissioned in 1997⁵⁴.

Policies and guidelines must be effectively communicated if they are to move change behaviour. From a communications perspective, this involves moving through a hierarchy of effects starting with raising awareness of a topic and moving to recall and understanding of key messages, changing attitudes/beliefs, self efficacy (having confidence in an ability to perform behaviours), intention to act, and finally to short and long-term behaviour changes.

There is evidence to show that young women are aware of the government's broader public health messages about the importance of a healthy diet and increased exercise. At the age of 18-23, the majority of women in the 1973-78 cohort stated they believed that 'I must indulge in physical activity and eat a healthy diet to prevent weight gain' (92%). Three-quarters reported that avoiding weight gain was important to them⁵⁵.

The majority of women from the 1945-51 and 1973-78 cohort have made an attempt at behaviour change by actively trying to lose weight. In 2007, 73.8% of the 1945-51 cohort were trying to control their weight. The majority used weight control practices consistent with public health messages – including exercising, decreasing food quantity, and cutting down on fats and sugars⁵. Despite their efforts, the mean weight of the cohort actually increased over the two years.

In the 1973-78 cohort, 79% of women used some type of weight control practice between 2000 and 2009. Around 40% had been on a diet in the past year, cutting down on meal size, fats and sugars and taking part in vigorous physical activity. Twenty per cent of these women had used a commercial programme. An additional 30% of women

followed public health messages of eating less and do more. Despite their efforts, the cohort gained an average of 700g per year over nine years²¹.

The number of obese adolescents entering the study rose by 11% between 1996 and 2013. The increase was statistically significant in all demographic groups including age, area of residence (major city, inner regional, outer regional, remote and very remote), education, student status, employment status, relationship status; and ability to manage on income⁵⁶.

Adherence to the Australian physical activity guidelines has slowly improved. The guidelines for adults aged 18-65 suggest that all adults should accumulate 150 to 300 minutes (2 ½ to 5 hours) of moderate intensity physical activity or 75 to 150 minutes (1 ¼ to 2 ½ hours) of vigorous intensity physical activity or an equivalent combination of both moderate and vigorous activities, each week⁵⁷. These evidence-based guidelines include research from the Australian Longitudinal Study on Women's Health⁵⁸.

A comparison between the 1973-78 and 1989-95 cohorts shows that young women were more physically active in 2013 than those at a similar age in 2000. Seventy percent of women aged 22 to 23 in 2013 met the threshold level for recommended physical activity in the guidelines, compared with 59% of the women in 2000²⁹. However, there remains significant room for improvement. A quarter of women did not meet the lower recommendation for physical activity and 6% were classed as inactive²⁹. The young women's activity levels did not vary greatly by region but there were socioeconomic differences. Women with less than a year 12 education had the highest proportion of inactivity²⁹.

While women are aware of the importance of a healthy diet in weight loss, the vast majority have not managed to significantly change their behaviour and are failing to meet the Australian Nutritional Guidelines. Nine out of 10 women from the 1973-78 cohort exceed the recommended daily intake of discretionary or extra foods¹⁴. These foods are high in energy, saturated fat, added sugars and/or salt or alcohol. While less than 2% of women from the 1973-78 and 1945-51 cohorts met the guidelines for vegetables.

Women have an awareness of public health messages and are trialling behavioural changes with the intention of losing weight but with no overall success. The rising number of overweight and obese women and children highlights the need for a re-evaluation of our public health programmes and the supporting infrastructure and policy. Women may lack specific knowledge about what constitutes a 'serve' of vegetables or an appropriate amount of discretionary foods. Or, they may face social and cultural barriers or have issues accessing healthy food options. There is an opportunity for further research study to assess women's awareness of public health messages, change in attitudes and beliefs, intention, and barriers to behavioural change.

F: Evidence-based measures and interventions to prevent and reverse childhood obesity, including experiences from overseas jurisdictions

Being overweight or obese in the years leading up to conception increases the risk of having obese children. Improving women's pre-conception health and supporting the maintenance of a healthy weight from adolescence through the childbearing years is of crucial importance

not just for women's long-term health, but also for the next generation. This is underscored by the fact that the next generation of mothers have higher BMIs and are gaining weight faster than the generation before them⁶. With the result that the prevalence of obese children as a result of maternal obesity will rise.

In a series of three papers on preconception health published in the Lancet, the authors reviewed current research on the impact of health and diet interventions during pregnancy – including data from the Australian Longitudinal Study on Women's Health. They found that programs targeting nutrient deficiencies and weight gain during pregnancy were too little, and too late to improve pregnancy or child health outcomes¹⁰. The final paper in the Lancet series focused on recommended interventions to improve preconception health. The authors noted that globally, 40% of pregnancies are unplanned. Current interventions target the period during pregnancy and focus on personal responsibility. They do not address the obesogenic environment and complex social and cultural influences.

The authors recommend public health education to raise awareness of the importance of preconception health and suggested that the food industry and retailers work alongside government, NGOs and research organisations. They further recommended that education programs start in the school years when adolescents are cementing health-related behaviours and attitudes⁵⁹.

Numerous international successful trials and programs were described including:

- **The LifeLab programme** (University of Southampton, UK): engages school aged children through hands-on sciences lessons, to understand their own health, and the health of their future children⁵⁹.
 - In 2014, as a part of National Science Week, the Menzies School of Health Research trialled the LifeLab program on more than 750 Territorians with 96 per cent reporting better understanding of their health⁶⁰.
- **The Ntshembo (Hope) intervention** (South Africa): works directly with multiple levels of community and social support groups to influence the diet and exercise habits of young adults and parents⁵⁹.
- **Healthy conversation skills** (developed at Medical Research Council Lifecourse Epidemiology Unit at The University of Southampton, UK). These theory-based skills are an easy to learn tool kit for health-care professionals to use during one on one consultations with individuals, to encourage understanding and goal setting for nutrition and physical activity⁵⁹.
 - New Zealand has adapted this program and it has been made available free-of-charge to all health practitioners and promoters⁶²

G: The role of the food industry in contributing to poor diets and childhood obesity in Australia

To simply state that women fail to meet the recommended guidelines for healthy foods while overindulging in discretionary 'junk' foods places an unfair burden of responsibility on women. The issue of poor nutrition and weight gain must be addressed in the context of our obesogenic environment. In recent years the tobacco and alcohol industries have been forced to accept a level of responsibility for the products they sell. In the same way, the food industry must also accept some level of corporate responsibility for the role it plays in contributing to poor diets and obesity.

The food industry, from growers associations through to supermarkets and food and beverage retailers can all play a part by offering Australian women and families affordable, accessible, healthy options that are as creatively and extensively advertised as their unhealthy counterparts.

H: Any other related matters.

Clarifying public health messages

How much weight gain is too much?

Women's weight gain is slow, sometimes imperceptibly so. Once gained, it is also difficult to lose. Preventative public health messages need to include concrete numbers to help women and clinicians identify appropriate rates of weight gain at different life stages. This will help women make small lifestyle changes to prevent weight gain before they transition into the overweight or obese BMI categories.

Over 16 years of the study, researchers found young women's weight gain was remarkably consistent.

- Women who maintained a healthy BMI gained an average of 0.2 to 0.3 kg/year from their early-twenties into their mid-thirties.
- Women who transitioned from a healthy weight into an overweight category gained an average of 0.8kg per year.
- Women who transitioned to the obese BMI category gained an average of 1.7kg per year²⁶.

Importantly, the rates at which women gained weight appear to be established in their 20s. This means that clinicians can identify whether a woman who is currently within a healthy weight range is at risk of becoming overweight or obese and can make an early recommendation for a weight gain prevention program.

In the 1946-51 cohort, the women gained an average of 0.5kg per year. This small amount added up to an average weight gain of 2.4kg over five years. This small change equates to an energy imbalance of only 10kcal/40kj per day, which suggests that small changes in behaviour could prevent further weight gain³⁷.

Based on study findings, researchers have recommended that women should maintain their weight within a 2kg range across the adult lifespan^{62, 63}. This is based on research from the mid-age cohort which found that women who gained more than 2.25 kg over two years had poorer physical well-being than women who maintained weight⁶³.

Are older women different?

Older women are at risk of losing muscle mass, and so consideration must be given to maintaining weight in these women. Moreover, obese older women may still be at risk of losing muscle mass, a condition known as sarcopenic obesity.

Researchers analysed healthy life expectancy amongst women in the 1921-26 cohort⁶⁴. At age 75, overweight women had similar total life expectancy compared to women in the normal weight range. However, they had fewer years of healthy life expectancy and more years unhealthy. Women who were obese at age 75 lived fewer years in total than normal-weight women and had more unhealthy years. Underweight women had the lowest total life expectancy and the fewest years of healthy life. Women should aim to enter old age at a normal weight and in good health, as the slight benefit on mortality of being overweight is offset by spending fewer years healthy.

Middle of the road prevention strategies

In considering prevention strategies, it is worth considering the principles advocated by Geoffrey Rose⁶⁵. His work suggests that strategies focusing on high-risk individuals (such as weight loss for the obese) may not have the greatest impact on the total burden of disease. This is because there are numerous risk-factor-related health problems that will also arise in people in the middle of the risk distribution. Lowering the risk across the whole population will reduce the total number of cases of disease that can be attributed to the risk. However, for some diseases, the incidence only rises sharply in the overweight and obese categories of BMI so a whole population shift may not be the most efficient approach⁶⁶.

Using data from the 1945-51 cohort, researchers investigated what would happen to the incidence of hypertension and diabetes if the women's BMI's were reduced between one and three units. The whole population strategy shifted the BMI distribution of the whole cohort by one unit. This resulted in a 10.3% reduction in the incidence of hypertension, and a 13.4% reduction in the incidence of diabetes. The high-risk strategy focused only on women with the greatest risk – the top 20% with a BMI >29. Reducing their BMIs by three units resulted in a 7.3% reduction in hypertension and 16.8% for diabetes⁶⁶.

A middle of the road approach provided the optimal reduction in both diseases. The researchers modelled a two-unit BMI reduction in the top 50% of the BMI distribution (equal to a BMI >24). This led to a 12.3% reduction in hypertension and 23% for diabetes. This level of BMI reduction can be achieved with an additional 20 minutes (or 2000 steps) of brisk walking and reducing energy intake by the equivalent of one chocolate biscuit every day for a year⁶⁶.

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A detailed description of the background, aims, themes, methods, and representativeness of the sample and progress of the study is given on the project website. Copies of surveys are also available on the website, along with contact details for the research team, abstracts of all papers published, papers accepted for publication, and conference present