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Future predictions of body mass index and overweight prevalence in Australia, 2005–2025

MICHELLE M. HABY[1*], ALISON MARKWICK[1], ANNA PEETERS[2], JONATHAN SHAW[3] and THEO VOS[4]

[1]*Department of Health, Prevention and Population Health Branch, 50 Lonsdale Street, Melbourne, VIC 3000, Australia* [2]*Department of Epidemiology and Preventive Medicine, Monash University, VIC, Australia* [3]*Baker IDI Heart and Diabetes Institute, 99 Commercial Road, Melbourne, VIC 3004, Australia* [4]*School of Population Health, University of Queensland, Herston, QLD, Australia*
**Corresponding author. E-mail: michelle.haby@health.vic.gov.au*

SUMMARY

To predict current and future body mass index (BMI) and prevalence of overweight and obesity in Australian children and adults based on sex, age and year of birth (cohort). These predictions are needed for population health planning and evaluation. Data were drawn from 11 cross-sectional national or state population surveys conducted in Australia between 1969 and 2004. These included representative population samples of children (n = 27 635) and adults (n = 43 447) aged 5 years or older with measured height and weight data. Multiple linear regression analyses of measured log-transformed BMI data were conducted to determine the independent effects of age and year of birth (cohort) on ln(BMI) for males and females, respectively. Regression coefficients for cohort obtained from these analyses were applied to the National Nutrition Survey 1995 data set to predict mean BMI and prevalence of overweight (BMI 25–29.99 kg/m^2) and obesity (BMI ≥30kg/m^2) in 2005, 2015 and 2025. Based on past trends, BMI is predicted to continue to increase for both males and females and across the age span. This would result in increases in the prevalence of overweight and obesity of between 0.4 and 0.8% per year, such that by 2025 around one-third of 5–19 year olds will be overweight or obese as will 83% of males and 75% of females aged 20 years and over. The increases in prevalence and mean BMI predicted in this study will have significant impacts on disease burden, healthcare costs and need for prevention and treatment programmes.

Key words: body mass index; forecasting; overweight; prevalence; Australia

INTRODUCTION

It is now well recognized that the prevalence of overweight and obese children and adults is increasing around the world (World Health Organization, 2000; Magarey *et al*., 2001; AIHW *et al*., 2003; Booth *et al*., 2003; Wang and Lobstein, 2006). However, the likely future trends have not yet been well estimated using measured body mass index (BMI) in many countries, including Australia. The UK is a notable exception, with the publication of the Foresight report in 2007 (Foresight, 2007a). In Australia, current data on measured BMI and prevalence of obesity across the age span were also lacking until the 2007–08 National Health Survey, which was released recently (Australian Bureau of Statistics, 2009). The last representative survey including both children and adults was conducted in 1995 (Australian Bureau of Statistics and McLennan, 1998).

Estimates of both current and future numbers of people with overweight or obesity are needed for population health planning and resource allocation, planning of health promotion and obesity prevention programmes, and to help evaluate whether the programmes and policies being put in place have an impact. Further, they will also give both policy-makers and the community an idea of the potential scale of the obesity epidemic if effective interventions are not put in place and the growth in obesity prevalence continues unchanged.

We analysed a series of Australian surveys of measured BMI in children and adults to predict current and future BMI and prevalence of overweight and obesity. The results of these regression analyses have been used to predict future BMI in children and adolescents for the Assessing Cost-Effectiveness in Obesity (ACE-Obesity) project so that the effectiveness and cost-effectiveness of obesity prevention interventions could be assessed with greater accuracy (Haby *et al*., 2006). They have also been used in the Australian Burden of Disease Study 2003 to determine expected changes in future diabetes incidence due to obesity and the subsequent impact on total disease burden (Begg *et al*., 2007) and healthcare costs (Begg *et al*., 2008).

METHODS

Data

We obtained unit record data from 11 surveys of Australian children and adults where weight and height had been measured (Table 1). These were combined into two data sets—one for children and adolescents, and one for adults—and analysed in Stata (Intercooled Stata, version 8.2, StataCorp). Children younger than 5 years old were excluded from analyses as were subjects with incomplete data for sex, weight or height, or for calculation of age or year of birth. Data from pregnant women were excluded. For the 1980 Risk Factor Prevalence Survey procedures for measuring height in Adelaide deviated from the study protocol, and these data were excluded (Bennett and Magnus, 1994).

For adults, a person with a BMI of 25–29.99 kg/m^2 was classified as overweight, while one with a BMI 30 kg/m^2 or above was classified as obese. For children up to the age of 18 years, the International Obesity Task Force age- and sex-specific BMI cut-offs were used (Cole *et al*., 2000) and weight category calculated using the zbmicat function in Stata. Where exact age was not available, or could not be calculated from date of birth, we used the mid-year BMI value (e.g. for those aged 11 years, we used the cut-off at 11.5 years). BMI was log-transformed for all analyses and then exponentiated for display and reporting. BMI is not normally distributed and, when conducting the regression analysis, the regression diagnostics showed that the three main assumptions of linear regression, i.e. linearity, normality and homoscedasticity (constant variance), were not met for BMI but were acceptable for lnBMI. The use of log-transformed BMI is also supported by others (Penman and Johnson, 2006).

Regression analysis

The changes in log-transformed BMI with age and year of birth (cohort) were determined using multiple linear regression analysis of serial cross-sectional surveys. The regression analyses were done separately for children and adults (due to the different relationship between age and BMI) and for males and females. Data from the age group of 15–19 years from the National Nutrition Survey 1995 were used in both the child and adult analyses. For children, data were combined from seven data sets (Table 1), with a final sample of 27 635 children contributing to the regression analysis. For adults, five data sets (Table 1) were combined, with a final sample size of 43 447. Survey weights were not consistent between data sets and were not applied for the regression analysis of the combined data. However, this is not a problem since the aim of the analyses was to look at relationships between variables. The outcome variable was the natural log (ln) of BMI, a continuous variable.

Children and adolescents (age 5–18)

Plots of BMI and age (controlling for cohort) showed a linear relationship and therefore age was included in the model as a continuous variable. Year of birth (cohort) was tested as both a categorical (in 10-year groupings) and continuous variable. The best-adjusted R^2 values were obtained with cohort as a continuous variable and plots of BMI and cohort (controlling for age) suggested that a linear relationship was a reasonable assumption. Interactions of age and cohort showed a statistically significant but very small negative interaction in both males and females, such that in later cohorts the impact of age on BMI would have been slightly larger in younger children and lower in older children.

Table 1: Data sets used in the regression analyses

Survey	*n*	Age (years)	Response rate (%)	Representative sample	Adult or child analysis
National surveys					
1980 Risk Factor Prevalence Survey (Risk Factor Prevalence Study Management Committee, 1981; Anon, 2001a)	5603	25–64	~75	Capital cities only	Adult
1983 Risk Factor Prevalence Survey (Risk Factor Prevalence Study Management Committee, 1984; Anon, 2001b)	7615	25–64	~75	Capital cities only	Adult
1985 Australian Health and Fitness Survey (Pyke, 1987)	8498	7–16	~68	Yes	Child
1989 Risk Factor Prevalence Survey (Risk Factor Prevalence Study Management Committee, 1990; Anon, 2001c)	9 279	20–69	~75	Capital cities only	Adult
1995 National Nutrition Survey (NNS95) (Australian Bureau of Statistics and McLennan, 1998)	13 858	2+	61	Yes	Adult and child
AusDiab 1999–2000 (Dunstan *et al.*, 2002)	11 247	25+	37	Capital cities only	Adult
State surveys					
1969 Australian Schools Fitness and Physical Activity Survey (Booth *et al.*, 2003)—only South Australian data available	1004	12–18	72	Yes	Child
1997 New South Wales Schools Fitness and Physical Activity Survey (Booth *et al.*, 1998)	5518	5–17	71–90	Remote areas excluded	Child
1997 Health of Young Victorians Growth Study (Lazarus *et al.*, 2000)	3365	5–13	75	Yes	Child
2003 Western Australian Child and Adolescent Physical Activity and Nutrition Survey (Hands *et al.*, 2004)	2275	7–16	56	Yes	Child
2004 New South Wales Physical Activity and Nutrition Survey (Booth *et al.*, 2005)	5407	4–17	65	Yes	Child

The impact on BMI results of including the interaction was minimal and so, for simplicity, the interaction terms were not included in the final models (Table 2).

Adults (age 15+)

Plots of BMI and age (controlling for cohort) suggested a curvilinear relationship and therefore age was included in the model as a categorical variable, in 5-year age groups, represented by 13 dummy variables. The effect of year of birth was tested by classifying respondents into 10-year groupings according to their year of birth, i.e. born in the 1910, 1920s etc. For adults in the National Nutrition Survey 1995, 10-year cohort was estimated from approximate year of birth by subtracting the middle age of the 5-year age group from the year of study (1995). Thus, for those aged 25–29 years, the middle age is 27 and the year of birth is 1968 (range 1966–1970). These participants were categorized as belonging to the 1960s cohort. Few adult participants were born before 1910 or after 1979; so these were categorized as belonging to the 1910 and 1970s cohorts, respectively. A plot of the coefficients for the dummy cohort variables, while controlling for age, suggested that the relationship between ln(BMI) and 10-year cohort was linear ($R^2 > 0.98$). Thus, 10-year cohort was treated as a continuous variable, with 1 representing the 1910s, 2 the 1920s and so on. Interactions of age and cohort were tested but were not significant and were not included in the model. The best models obtained from the regression analysis are shown in Table 3.

Examination of the residuals for the regression models showed no major violations of the assumptions of linearity, normality and homoscedasticity. There was some evidence of greater variance in ln(BMI), suggesting increased skewing, at older ages and later cohorts in females, though not in males. This was not incorporated into the model.

Table 2: Results of the regression analysis examining the associations with ln(BMI) in children

	Males		Females	
	Regression coefficient	SE	Regression coefficient	SE
Constant	−2.328402	0.28463	−1.003343	0.30266
Age (years)	0.0326239	0.00045	0.0330519	0.00048
Year of birth	0.0024643	0.00014	0.001799	0.00015
Number included in analysis	14 262		13 373	
R^2	0.284		0.290	
RSD	0.145		0.148	

RSD, residual standard deviation—also known as root error mean square. Age and cohort are treated as continuous variables. All coefficients are significant at the $P < 0.0001$ level. The following example, using a male aged 10 years, born in 1970, shows how the BMI for a particular age and year of birth is determined:
$\ln(\text{BMI}) = -2.328402 + (0.0024643 \times \text{year of birth}) + (0.0326239 \times \text{age})$.
$\ln(\text{BMI}) = -2.328402 + 0.0024643 \times 1970 + 0.0326239 \times 10 = 2.852508$.
Mean BMI = exp(2.852508) = 17.33.

Table 3: Results of the regression analysis examining the associations with ln(BMI) in adults

	Males		Females	
	Regression coefficient	SE	Regression coefficient	SE
Intercept	2.929024	0.012	2.845304	0.015
10-year cohort[a]	0.027062	0.001	0.038308	0.002
5-year age group (years):				
15–19[b]	0		0	
20–24	0.078245	0.009	0.0394662	0.011
25–29	0.1270929	0.008	0.0838415	0.011
30–34	0.1633883	0.008	0.1161764	0.011
35–39	0.1932166	0.008	0.1601029	0.011
40–44	0.2187721	0.009	0.1966213	0.011
45–49	0.2455203	0.009	0.2390921	0.011
50–54	0.2716139	0.009	0.2903651	0.012
55–59	0.2809381	0.010	0.3142981	0.012
60–64	0.2925906	0.010	0.3345511	0.013
65–69	0.3006244	0.011	0.359082	0.013
70–74	0.3085108	0.011	0.37477	0.014
75–79	0.3098339	0.013	0.3598676	0.015
80+	0.2802203	0.014	0.3475031	0.017
Number included in analysis	20 854		22 593	
R^2	0.078		0.094	
RSD	0.140		0.179	

RSD, residual standard deviation—also known as root error mean square.
[a]1910s has a value of 1 and 1920s has a value of 2 etc.
[b]Reference category.
All coefficients are significant at the $P < 0.0001$ level. The following example, using a male aged 40–44 born in the 1970s, shows how the BMI for a particular age and year is determined:
$\ln(\text{BMI}) = 2.929024 + (0.027062 \times \text{cohort})$ + age-group-specific co-efficient.
$\ln(\text{BMI}) = 2.929024 + 0.027062 \times 7 + 0.2187721 = 3.3372$.
Mean BMI = exp(3.3372) = 28.14.

Predicting future mean BMI and prevalence of overweight and obesity

The ln(BMI) values for people aged 5 and above from the National Nutrition Survey 1995 data set were used as the starting population for our predictions of BMI. The regression coefficient for year of birth (cohort) calculated from the linear regression analysis

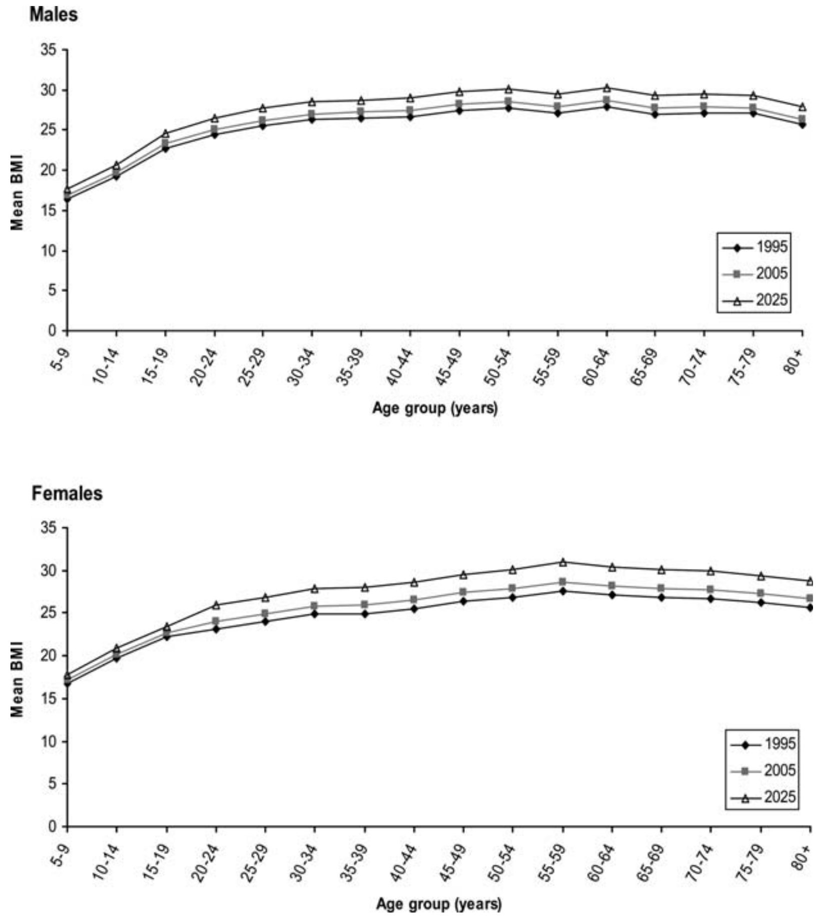

Fig. 1: Predicted mean BMI (kg/m^2) for 2005 and 2025. Values for 1995 are actual values from the National Nutrition Survey 1995.

of the 11 data sets was added to (or subtracted from) individual BMI values to predict ln(BMI) in 1985, 2005, 2015 and 2025. The prevalence of overweight and obesity was calculated from the individual BMI values for 2005, 2015 and 2025. Since only one data set was used for projections, mean ln(BMI) and prevalence of overweight and obesity for different years and age groups were calculated with the survey weights applied. These prevalence figures were applied to the Australian population projections (series B) calculated by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2006) to determine the total number of Australians overweight and obese in 2025.

Comparison of actual and predicted mean BMI and prevalence of overweight and obesity

The results of the 2007–08 National Health Survey (NHS) were used to validate the projections (Australian Bureau of Statistics, 2009). This survey included measured height and weight data collected from a representative sample of ~13 600 Australians aged 5 years and above. While the full survey achieved a response rate of 91%, 71.9% of males and 69.5% of females had both height and weight measured, giving an overall response rate of ~65% for this aspect of the survey. The data were analysed for us by the Australian Bureau of Statistics to determine mean ln(BMI) and

Table 4: Actual and predicted future prevalence (%) of overweight and obesity, by age group and gender

Males						Females					
Age group (years)	1995[a]	2005	2007[b]	2015	2025	Age group (years)	1995[a]	2005	2007[b]	2015	2025
5–9	14.7	19.7	21.0 (15.5–26.4)	25.5	33.8	5–9	22.0	27.0	21.7 (16.1–27.2)	31.7	36.6
10–14	22.3	26.0	26.4 (20.4–32.4)	30.3	34.9	10–14	21.8	24.4	23.0 (17.3–28.7)	29.0	31.4
15–19	25.8	29.3	30.8 (24.4–37.3)	33.4	41.0	15–19	19.7	23.1	29.8 (23.8–35.8)	28.5	30.2
20–24	38.4	44.3	44.0 (37.2–50.7)	53.6	62.9	20–24	26.8	34.0	36.3 (29.9–42.7)	44.7	53.5
25–29	54.7	61.1	57.9 (51.7–64.1)	68.7	75.2	25–29	33.1	41.1	40.3 (34.7–45.8)	52.2	61.8
30–34	61.8	72.1	66.4 (61.6–71.2)	77.0	82.5	30–34	41.0	51.1	48.4 (43.0–53.8)	60.3	66.5
35–39	65.4	71.9	70.0 (64.9–75.0)	80.7	84.7	35–39	41.7	53.1	52.0 (46.7–57.3)	60.1	69.0
40–44	68.1	75.1	71.5 (66.5–76.5)	81.6	87.1	40–44	50.2	60.3	58.2 (52.6–63.8)	67.4	78.2
45–49	74.7	80.4	73.8 (69.1–78.4)	85.4	89.4	45–49	54.6	64.0	59.5 (53.8–65.2)	72.8	78.9
50–54	78.5	84.6	79.8 (74.9–84.6)	89.2	91.9	50–54	60.6	70.2	57.8 (52.1–63.6)	80.6	87.0
55–59	75.9	81.8	75.4 (69.2–81.7)	85.8	89.8	55–59	68.4	78.4	69.7 (63.5–75.8)	82.9	88.7
60–64	76.9	83.0	74.4 (68.9–80.0)	86.5	90.9	60–64	68.2	78.0	66.0 (60.3–71.7)	82.1	88.2
65–69	73.0	80.2	79.4 (73.4–85.5)	84.2	87.3	65–69	63.1	71.8	71.9 (66.7–77.2)	77.7	84.1
70–74	71.9	79.1	78.3 (72.3–84.2)	83.6	89.0	70–74	64.4	73.7	70.6 (64.1–77.1)	79.4	85.4
75–79	74.5	78.3	74.3 (69.2–79.4)[c]	83.7	89.9	75–79	60.2	72.8	56.9 (51.3–62.5)[c]	80.8	85.4
80+	57.1	65.5		71.3	77.1	80+	59.2	68.0		75.5	78.7
5–19	20.9	25.0	26.2 (22.5–30.0)	29.7	36.6	5–19	21.2	24.9	24.7 (21.2–28.2)	29.7	32.8
20+	65.0	71.8	69.2 (67.4–71.0)	77.9	83.2	20+	49.6	59.1	55.5 (53.8–57.3)	67.2	74.6

Actual values are shaded.
[a]Actual values from the 1995 National Nutrition Survey.
[b]Actual values from the 2007–08 National Health Survey, including 95% confidence intervals.
[c]Results for 75+.

prevalence of overweight and obesity to allow comparison with predicted values.

RESULTS

Based on past trends and assuming no effective interventions, BMI is predicted to continue to increase for both males and females and across the age span (Figure 1). Between 1995 and 2025, the predicted increases in BMI of children and adolescents that are related to year of birth (cohort) are significantly greater in males than in females (~0.05 vs. 0.04 kg/m^2 per year, for boys and girls, respectively, $P < 0.05$) but the reverse is true for adults (~0.07 vs. 0.10 kg/m^2 per year, for males and females, respectively, $P < 0.05$).

The increases in BMI would result in increases in the prevalence of overweight and obesity such that by 2025 around one-third of 5–19 year olds will be overweight or obese (37% in boys and 33% in girls), compared with 21% in both boys and girls in 1995 (Table 4). The absolute increase in prevalence for 5–19 year olds is 0.5% per year for boys and 0.4% per year for girls. For adults aged 20+ years, 83% of males and 75% of females are expected to be overweight or obese by 2025, up from 65% of males and 50% of females in 1995 (Table 4). This represents an absolute increase in prevalence of 0.6% per year for males and 0.8% per year for females.

A comparison of actual and predicted BMI and prevalence values for three age groups is shown in Figures 2 and 3 and for all age groups in Table 4. For mean BMI, the predictions for 2005 were very close to the actual values for the 2007–08 NHS for all age groups and all were well within the 95% confidence intervals—shown for three 5-year age groups in Figure 2. For overweight and obesity prevalence, the predictions for 2005 for 5–19 year olds are close to actual values (Table 4 and Figure 3). For adults aged 20+, however, the predictions for 2005 suggest higher overweight and obesity prevalence than was actually measured in the 2007–08 NHS—as indicated by a predicted value for 2005 greater than the upper confidence interval of the 2007–08 actual values (Table 4 and Figure 3). This was seen for some age groups (30–34, 45–64 for males; 50–64, 75+ for females) but not all.

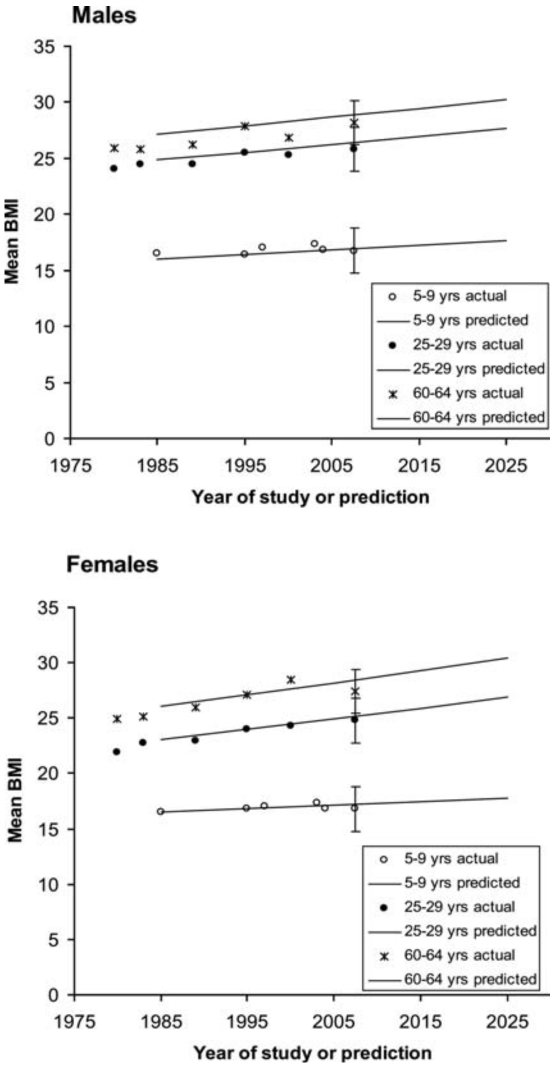

Fig. 2: Mean BMI (kg/m^2)—actual and predicted. 2007 figures are also actual and include 95% confidence intervals.

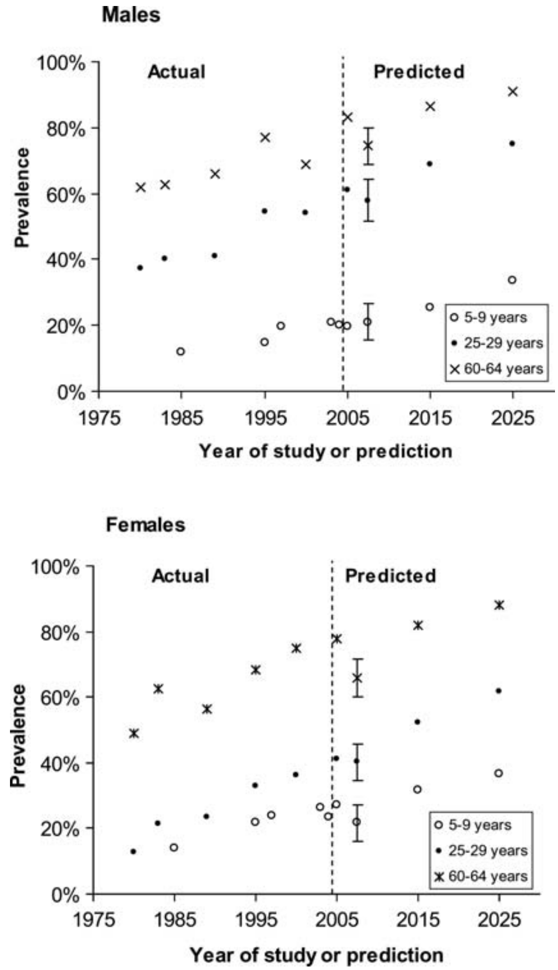

Fig. 3: Prevalence (%) of overweight and obesity—actual and predicted. 2007 figures are also actual and include 95% confidence intervals.

When the prevalence figures from Table 4 are applied to projected population numbers for Australia, it would result in 16.9 M Australians in 2025 (total population 24.7 M) being overweight or obese, up from 10.2 M in 2005 (total population 20.3 M).

DISCUSSION

The increase in BMI shown in these analyses would result in increases in the prevalence of overweight and obesity in Australia of between 0.4 and 0.8% per year, such that by 2025, 83% of males and 75% of females aged 20 years and older will be overweight or obese. For children aged 5–19 years, the corresponding figures are 37% for boys and 33% for girls. The impact is such that an extra 6.7 M Australians would be overweight or obese in 2025 compared with 2005.

Strengths of these analyses include the use of multiple cross-sectional surveys, treatment of BMI as a continuous variable and the log-transformation of BMI values (Penman and Johnson, 2006). Multiple cross-sectional surveys were used because this is the only way to separate out the effects of age and year of birth (cohort) on BMI and, thus, enable projections into the future. We chose to base our modelling on the full population distribution of BMI values (i.e. BMI is treated as a continuous variable) because obesity-related disease risks occur along a continuum and begin at BMIs as low as 20–21 kg/m^2, not at an arbitrarily defined cut-off of 25 kg/m^2 as use of overweight and obese categories imply (James *et al.*, 2004). Treatment of BMI as a continuous variable also makes more sense from a public health point of view where interventions are often aimed at shifting the population distribution of BMI rather than specifically targeting overweight or obese individuals (Rose and Day, 1990).

A strength of modelling studies such as this one is that projections based on past trends provide a best estimate of what will happen if no changes occur. Thus, they can also be used as a benchmark against which the impact of any future events or interventions can be compared. Examples of relevant future events for obesity include the considerable investment the Australian Government has made in obesity prevention—$872.1 million over the 6 years from 2009–10 to 2004–15 (for more details see: http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-prevention-np) and other population level influences such as the global financial crisis. Measurement of actual changes in BMI and prevalence of overweight and obesity in the future can then be used to assess the true collective impact of investments and events such as these.

One limitation of these analyses is that not all data sets were representative, with some studies conducted in capital cities only (Table 1). Since this was most likely to be the case in the older data sets, this could have the effect of overestimating the future rise in obesity if rural areas have higher obesity rates than capital cities, as some studies have shown (Department of Human Services, 2006). Another limitation is that BMI is not a perfect measure of overweight and obesity as it does not account for the heavier weight of muscle mass compared with fat and this can vary by age, gender and ethnicity. Despite these limitations, BMI provides the most useful, albeit crude, population-level measure of obesity because it is most commonly collected in population health surveys, has high subject acceptance and good reliability and validity (World Health Organization, 2000; Lobstein *et al.*, 2004).

One weakness of these analyses was the inability to fully explore and account for all of the increased variance in BMI over time in females at older ages. The potential impact of increasing obesity levels on future mortality has also not been considered. While predictions have been calculated to 2025, it is important to note that the further out the prediction, the greater the likelihood of variations from actual. The results from future surveys will allow the predictions presented here to be validated and updated.

Comparison of the predictions for 2005 with actual data from the 2007–2008 NHS showed a close match for mean BMI, suggesting that the predictions are robust. While the prevalence of overweight and obesity was overestimated for some adult age groups, this could be due to a number of reasons. The mostly likely reasons include: (i) a true slowing of the increase in overweight and obesity prevalence in these age groups; or (ii) greater response bias in the 2007–08 NHS than in previous surveys, such that overweight or obese adults were less likely to participate—something that cannot be ruled out given a response rate for the survey of ~65% and the increasing media attention given to obesity. Like projections, surveys can only estimate actual population values unless the entire Australian population were surveyed rather than a sample, as is the case for BMI. More frequent and representative surveys are urgently needed to ensure robust estimates of BMI, for use in projections, and to evaluate the impact of current prevention efforts. However, work is needed to overcome the declining response rates, such as the 40% response rate achieved in the 2007 National Children's Nutrition and Physical Activity Survey (CSIRO Preventative Health National Research Flagship and University of South Australia, 2008). A change to opt-out consent for surveys of children and adolescents would help.

These analyses are the first of their kind in Australia, and one of the few in the world, to predict future BMI and overweight prevalence using measured BMI in both children and adults. Most previous analyses have been limited to showing current trends (World Health Organization, 2000; AIHW *et al.*, 2003; Booth *et al.*, 2003), have used self-reported BMI or limited the analyses to either adults or children (Norton *et al.*, 2006; Wang and Lobstein, 2006; Allman-Farinelli *et al.*, 2007; Ruhm, 2007). Self-reported BMI data, while more frequently collected, is known to underestimate true BMI as people tend to overestimate height and underestimate weight (Flood *et al*., 2000; Wang *et al*., 2002). And it is important to include both children and adults because the age effects and trends, as these analyses show, are different.

Similar prediction analyses were conducted as part of the 'Foresight Tackling Obesities: Future Choices Project', however, separate regression models were used for different categories of BMI (e.g. BMI 20–25, BMI >40) and also for sub-categories of social class, ethnicity and geographical region (Foresight, 2007a,b). The Foresight modelling also used repeated cross-sectional data sets but had the advantage of 12 years of annual data from the Health Survey of England, with consistent methods and measurement of social class, ethnicity and geographical region. In contrast, the data sets we were able to access were not consistent but had the advantage of spanning a greater time period—18 years for children, 35 years for adolescents and 20 years for adults. Analysis of the effects of social class, ethnicity and geographical region are not possible with our data set.

Comparison of the predictions shown here with other studies are consistent in that they all predict an increase in BMI and obesity (James *et al*., 2004; Norton *et al*., 2006; Wang and Lobstein, 2006), with the exception of data from Japan that show a decrease in adult females in some age groups (James *et al*., 2004). However, they differ in the size of the increase predicted. Other prevalence predictions for Australian children have been higher than shown here, at ~1% per year (Wang and Lobstein, 2006) and predicted to reach a prevalence of overweight and obesity of 60% by 2035 (Norton *et al*., 2006). Comparisons of mean BMI in Australian adults have shown lower values than reported here (James *et al*., 2004), with the current analyses more consistent with values for the USA and Canada (James *et al*., 2004; Ruhm, 2007).

The increases in prevalence and mean BMI found in this study will have significant impacts on disease burden, healthcare costs (Begg *et al*., 2008) and need for prevention and treatment programmes. The results of these regression analyses have already been used for cost-effectiveness analyses of potential interventions and for predicting future disease burden and healthcare costs (Haby *et al*., 2006; Begg *et al*., 2007; Begg *et al*., 2008; Sacks *et al*., 2010; Forster *et al*., 2011). For example, in the Assessing Cost-Effectiveness in Obesity project, they contributed to the calculation of the cost-effectiveness of interventions such as reduction in TV advertising of high-fat and/or high-sugar foods to children. The results, as presented here, also have wider application for policy-makers and planners to determine the need for obesity-related health services in years to come and the expected impact of new programmes and policies. They can also help, in the absence of ongoing monitoring data, to assess whether the health promotion and prevention programmes being implemented now are having any impact in changing the predicted trajectory of BMI.

These analyses show the degree to which the obesity epidemic will continue to get worse if left unchecked. By 2025, one-third of children and three-quarters of adult Australians would be affected in some way. The impact on our health system will be enormous if we do not act now. As well as implementing interventions with known effectiveness now, research is urgently needed to design and test further interventions, and combinations of interventions, that will be capable of reversing the trend.

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DISCLAIMER

The findings and conclusions in this report are those of the author and do not necessarily represent the views of the Victorian Government Department of Health.

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