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Misperceptions of Body Mass:

Analysis of NSW Health Survey 2003

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CHERE WORKING PAPER 2009/7

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Faculty of Business
University of Technology, Sydney

First Version: October 2009
Current Version: October 2009

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Executive Summary

Objectives

To describe the relationship between perceived weight status and i) BMI and ii) socio-demographic variables amongst residents of NSW.

Abstract

Overweight and obesity continue to contribute to increased risk of chronic diseases, including higher lifetime health expenditures and impacting on individuals' quality of life. Whilst international studies have compared individuals' perceptions of their body mass with more objective measures such as Body Mass Index (BMI) few Australian studies have examined this relationship in any detail.

This study uses unit record data from the 2003 NSW Health Survey to identify factors associated with the accuracy of adults' perceived body mass. Descriptive methods and logistical models are used to quantify the effects of a number of demographic, socio–economic, behavioural and health–related variables on the accuracy of self–assessed body mass.

The results support earlier findings that there are large gender differences in perception of body mass. Women are most likely to report they are overweight. In contrast there is a pattern of underestimation of weight amongst men, particularly at the higher BMI deciles. Clearly these results have different policy implications. This information may be useful for public health programs to take into account the issue of whether individuals accurately perceive themselves at risk of developing weight–related health conditions.

Keywords

Obesity, BMI, perceived weight.

*We acknowledge funding from the. Also we thank participants at presentations given population Health congress 2008 and at various seminars and workshops for helpful comments. Finally, we are grateful to the NSW Health Department for the use of confidential unit record data .

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1. Introduction

Overweight and obesity increase the risk that an individual will develop one or more chronic diseases in Australia and as a result is considered a National Health Priority. The health consequences of overweight and obesity have been well documented, ranging from a general decrease in quality of life to an increased risk of premature death from diseases such as hypertension, high cholesterol and increased risk of diabetes [1].

In Australia and most industrialised countries, the prevalence of overweight and obesity in adults has increased considerably over the last 20 years and in many countries overweight is the new 'normal' weight [1]. Between 1989-90 and 2001, the percentage of Australian adults classified as obese increased from 9.5% to 16.7%, while the percentage classified as overweight but not obese increased from 30.5% to 34.4% [2]. Data on the public's perception of weight is important. A study by Fala et al (2005) [3] found that increasing BMI was negatively associated with self predicted survival probabilities. They found that while obese participants recognised an increased risk due to premature death, they underestimated this risk. As overweight and obesity levels increase a greater understanding of perceptions of weight is needed. If a considerable proportion of overweight and obese people misclassify their weight, they may ignore messages about modifying their lifestyle.

A study by Johnson et al (2008) [4] examined the changes in self perceived weight in two population surveys in Great Britain over an eight year period from 1999 to 2007. They found that while trends in obesity levels are increasing, accurate perception of body mass is declining. Johnson and colleagues attributed this pattern to an increasing stigma towards overweight and obese people, which may discourage them from identifying themselves as overweight or obese. In addition, the increased prevalence of obesity may have 'normalised' overweight, leading to an increased acceptance of higher levels of body fat.

In Australia there is limited research that examines these relationships between body mass and how it is perceived. In a study of Australian adults, 5 it was found that among people with a measured BMI $\geq$25, 49.3% of men (95% CI, 48.1%-50.5%) and 72.0% of women (95% CI, 70.8%-73.1%) considered themselves overweight. Older women were less likely to perceive themselves as overweight than younger women [6]. In an analysis of National Health Survey data from 1999 to 2005 found that overweight men are most likely to under perceive their body mass. To reduce the prevalence of overweight and obesity in the adult population, public health programs may need to better address the issue of whether individuals accurately perceive themselves at risk of developing weight–related health conditions. This paper uses data from the NSW Health Survey 2003 to investigate the relationship between perceived body mass and BMI calculated from self–reported height and weight and socio-demographic factors. It investigates the spatial differences in perception of body weight across NSW, utilizing the boundaries set by NSW Area Health Services.

2. Methods

The NSW Health Survey was conducted in 2003, and prior to that in 1997, and collects information on health risk factors, long–term conditions and use of health services. It also includes a number of other health status indicators including self–assessed health, as well as demographic and socio–economic information.

This paper uses unit data collected in the 2003 NSW Health Survey conducted by the NSW Department of Health, in conjunction with the 17 area health services (AHS) in the State. This survey was the second of an ongoing program of surveys designed to assess the health of people in NSW. The surveys are conducted using computer assisted telephone interviewing (CATI).

The survey instrument for the *New South Wales Adult Health Survey 2003* was developed by the Health Survey Program at NSW Health and covered the eight priority areas outlined in *Healthy People 2005: New Directions for Public Health in New South Wales.*

2.1. Survey sample and methods

The target population for the *New South Wales Adult Health Survey 2003* was all NSW residents living in households with private telephones. The target sample comprised approximately 1,000 people in each of the 17 area health services (total sample of 13088).

For analysis, observations in the survey sample were weighted to adjust for differences in the probabilities of selection among subjects. These differences were due to the varying number of people living in each household and the number of residential telephone connections for the household and the varying sampling fraction in each area health service. 'Post-stratification' weights were used to reduce the effect of differing non-response rates among males and females and different age groups on the survey estimates. These weights were adjusted for differences between the age and sex structure of the survey sample and the Australian Bureau of Statistics 2001 mid-year population estimates (excluding people resident in institutions) for each area health service.

Height and weight are recorded in the data in centimetres and kilograms respectively, and used to derive a BMI score. BMI was categorised into the standard WHO cut–offs of thin (BMI less than 18.5), normal (at least 18.5 but less than 25), overweight (at least 25 but less than 30) or obese (30 or over) [1]. Respondents were also asked to assess themselves as being underweight, acceptable weight or overweight.

The dependant variable 'perceive-BMI' was constructed with three levels. This variable indicates a match or mismatch between self–assessed body mass and BMI. Groups of respondents with the following characteristics were recorded with a value of 1 ('match') for the Perceive BMI variable:

- Self–assessed body mass of 'underweight' whose BMI categorised them as 'thin';
- Self–assessed body mass of 'acceptable' whose BMI categorised them as 'normal';

- Self–assessed body mass of ‘overweight’ whose BMI categorised them as either ‘overweight’ or ‘obese’.

Respondents recorded a ‘2’ or ‘mismatch BMI_under’ if they under perceived i.e. assessed themselves as having a lower body mass compared to their calculated BMI and a ‘3‘ or ‘mismatch BMI_over if they assessed themselves as having a higher body mass compared to their calculated BMI . The construction of these variables is shown in Table 1.

Table 1: Construction of BMI- mismatch variables.

Self –assessed body mass	*BMI categories*			
	Thin	Normal	Overweight	Obese
Underweight	match	underperceive	underperceive	underperceive
Acceptable	overperceive	Match	underperceive	underperceive
Overweight	overperceive	overperceive	match	match

Multinomial logit models were specified in which the probability that an individual is in one of three perception categories (Under perceive , Match (base category), Over perceive) is a function of demographic and socio economic, behavioural and health related variables. These included : BMI categories, age, marital status, education, income deciles, language spoken at home, exercise level, alcohol consumption, smoking, 5 levels of disadvantaged (according to post code), self rated health, area health service, and percentage overweight and obese by area health service.

We would expect there to be significant differences between males and females in their perception of body mass. In most of the literature the relationship between BMI and perceived body mass is found to be significantly different in males and females [8]. Initial modeling and log likelihood ratio testing confirmed this, so separate models were estimated for males and females.

Age was included in the model as a continuous variable age and the square of age was entered to allow for any non-linear trend. Ethnicity was captured in the variable ‘language spoken at home’, with two levels ‘English’ and ‘other’, dummy coded.

A strong correlation is often found between health and income or health and wealth [8]. To capture this in the model, we included three variables for socioeconomic status. Income, entered as a series of dummy variables indicating the band of household income; education, which was dummy coded according to tertiary education or not and a socioeconomic index (SEIFA), with ‘1’ being the least disadvantaged and ‘5’ the most disadvantaged. Disadvantage is coded according to postcode. Health is captured using four measures; self perceived health scale ranging from ‘excellent’ to ‘poor’ health, alcohol intake, smoking and exercise levels, which are all dummy coded.

We also wanted to explore the idea of a ‘peer’ effect. Research by Wardle et al (2008) [9] found that ‘peers’ can have an influential affect on people’s perception of their body mass and BMI. We defined ‘peers’ as geographical ‘communities’ and explored the spatial differences in overweight and obesity and mismatching using a categorical

variable calculated as the percentage of overweight and obese in an area health service.

The base outcomes were defined as: BMI in the normal range, age 25-34 years, married, tertiary qualified, household income between $20,000 and $40,000, speaking English at home, least disadvantaged quintile , excellent self rated health, not currently smoker, no risk drinking behaviour, physical activity 3 times or greater per week, Area health service defined by lowest % overweight and obesity.

3. Results

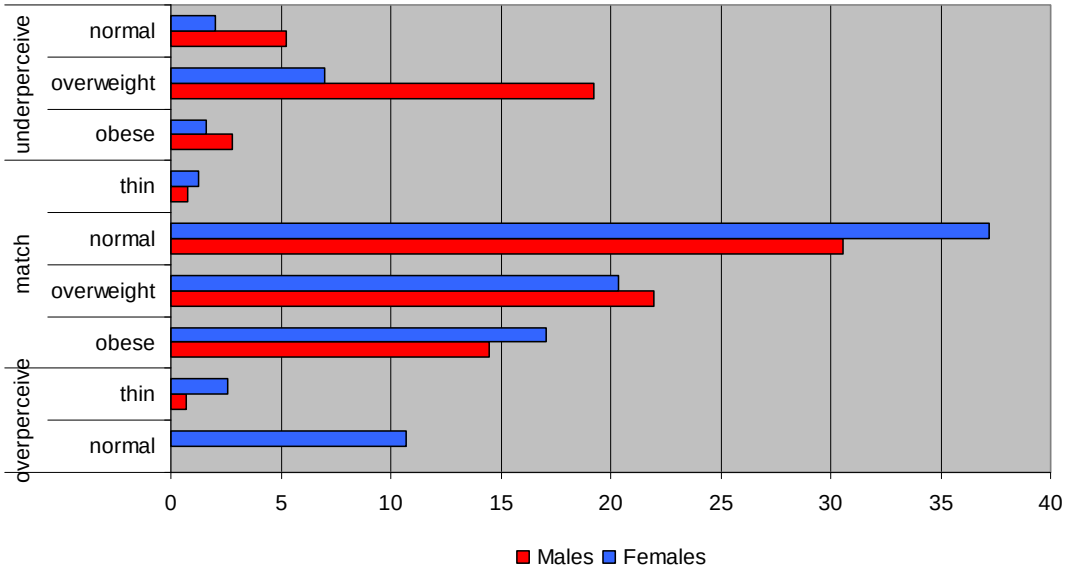
3.1. Descriptive statistics

In total, 15,837 interviews were conducted, with at least 837 interviews in each AHS. Of these, 13,088 were conducted with individuals aged 16 years or over. Almost 60% of respondents were female, over half were married and approximately a quarter were tertiary qualified. The majority of respondents were English speaking and born in Australia. Respondents were most likely to be of normal weight and of good or very good health. They are not regular exercisers, are non-smokers and not heavy drinkers. Appendix A1 lists the variables used in the analysis and their means by sex and mismatch group.

Females more accurately assessed their body mass than males, with 75% of females correctly assessing their own body mass compared to 67% of males. Of those males and females who misclassified their BMI status, males were most likely to under perceive (27% for males compared with 10% for females) and females were most likely to over perceive (13.5% for females compared with 5% for males).

Figure 1shows the perceived body mass according to calculated BMI for males and females in NSW in 2003.

Figure 1 Perceived Body mass by BMI category for males and females in NSW in 2003.



In the matched groups both males and females were more likely to be married, of normal body mass and rate their health as good, very good or excellent. Males in this group were slightly younger than females (42 years for males compared with 46 years for females. In the under perceiving group, males were on average 39 years old, married and most likely to be overweight. In the over perceiving group females were on average 43yrs old, married and most likely to be of normal BMI. When compared to the matched group over perceivers were more likely to have never have been married (28% compared with 23%).

Males in the over perceiving group are more likely to be tertiary qualified than their counterparts in other groups. They rate their health higher, are more likely to be regular exercisers and are older than males in the matched group.

Multinomial logit models were used to investigate the perceived mismatch for males and females allowing for a number of socio-demographic variables. Results show that age, BMI and self rated health are significant factors in the risk of under perception in males and females. Of particular note is that the group most at risk of under perceiving is the overweight. This group has a relative risk of under perceiving of 6.47 in females and 6.33 in males when compared than those with a normal BMI. Similarly, but less marked, is the obese group with a relative risk of 1.82 for females and 1.44 for males. Table 2 shows selected results of the MNL model for males and females.

Age, disadvantage, BMI, alcohol and self rated health were found to be significant factors associated with the risk of over perceiving in females. Of note underweight females have a 9.4 relative risk of over perceiving when compared to females in the matched group. Age plays a significant role, although the relative increased risk is small (0.94/1.00 in females, 0.92/1.00 in males). Non drinking females are also at a significantly higher risk of over perceiving than their matched counterparts.

Results indicated that spatial differences did exist, however with no obvious trends. The South East Metropolitan Area Health Service had the highest relative risk of under perceiving (although not significant), across all metropolitan areas. (females 1.36 (0.44), males 1.04 (0.29)). Similarly rural areas showed a general trend towards a higher relative risk of under perceiving for both male and female groups (not significant). The Mid Western and Greater Murray Area Health Services showed some of the highest levels of overweight and obesity as well as the highest risk of under perceiving. However, as overweight and obesity levels increased across all Area Health Services, there was little evidence of an increased risk in under perceiving.

Table 2 lists the relative risk ratios of under perceiving in males and females across area health services according to the level of overweight and obesity in that district (from lowest to highest).

Table 2: MNL Model – RRR (Relative Risk Ratios) for male and female

	Women (n=7661)				Men (n=5347)			
	Under perceive		Over perceive		Under perceive		Over perceive	
Variable	RRR	St.Err	RRR	St.Err	RRR	St.Err	RRR	St.Err
Age (years)	**0.94**	0.02	**1.06**	0.02	**0.92**	0.02	1.04	0.03
Income (base=$20,000-$40,000)								
< $10,000	1.07	0.24	1.00	0.25	0.80	0.16	1.21	0.53
$10,000-$20,000	1.01	0.19	1.28	0.24	0.94	0.14	0.84	0.27
$20,000-$40,000								
$40,000-$60,000	1.18	0.24	1.25	0.24	0.76	0.12	1.02	0.35
$60,000-$80,000	**0.56**	0.15	0.89	0.20	0.82	0.15	1.11	0.44
>$80,000	1.11	0.27	0.96	0.19	0.83	0.14	1.19	0.42
Disadvantage (base = least disadvantaged)								
1 least disadvantaged								
2..	1.11	0.30	1.00	0.21	0.86	0.20	1.61	0.73
3..	1.21	0.33	1.14	0.26	0.97	0.24	2.06	1.00
4..	1.51	0.43	**1.62**	0.39	0.86	0.21	1.41	0.69
5 Most disadvantaged	1.68	0.47	1.42	0.38	1.30	0.33	1.95	0.96
Born in Australia (base = yes)								
No	0.96	0.26	1.04	0.27	1.21	0.26	**2.11**	0.76
BMI (base = 18.5 ≤ BMI ≤ 25)								
< 18.5 BMI	**0***	0.00	**9.40**	1.83	0.00	0.00	9.57*	4.02
18.5 ≤ BMI ≤ 25								
25 ≤ BMI ≤ 30	**6.47**	1.00	**0.00**	0.00	6.34	0.75	**0.00**	0.00
BMI ≥ 30	**1.82**	0.38	**0.00**	0.00	1.44	0.23	**0.00**	0.00
Self rated health (base = excellent)								
Excellent								
Very good	**0.70**	0.12	1.08	0.16	0.81	0.10	**1.85**	0.51
Good	**0.68**	0.12	1.26	0.19	**0.65**	0.09	1.75	0.55
Fair	1.07	0.20	**1.45**	0.27	**0.68**	0.11	1.45	0.53
Poor	0.98	0.27	1.32	0.38	1.08	0.28	2.17	1.48

	Very poor	**0.44**	0.17	0.62	0.30	0.56	0.19	0.32	0.29
Alcohol (base = Not at risk alcohol consumption)									
	At risk alcohol consumption								
	Not at risk alcohol consumption	1.05	0.14	**1.30**	0.15	0.98	0.09	1.18	0.21
Smoking (base = Occasional /daily smoking)									
	Occasional /daily smoking								
	Not occasional/daily smoking	1.13	0.18	1.09	0.16	**1.40**	0.16	0.94	0.23
% overweight and obesity by Area Health Service (base = Northern Sydney)									
	Northern Sydney								
	Central Sydney	0.99	0.35	0.73	0.19	1.00	0.28	0.44	0.24
	South East Sydney	1.36	0.44	0.71	0.18	1.04	0.29	0.44	0.22
	Northern Rivers	0.60	0.23	0.58	0.18	1.01	0.30	0.54	0.29
	Western Sydney	1.02	0.34	0.80	0.22	0.87	0.24	0.44	0.24
	Central Coast	0.83	0.29	0.62	0.18	0.90	0.27	0.56	0.30
	Mid North Coast	0.85	0.31	**0.48**	0.15	1.27	0.37	0.56	0.33
	Wentworth	1.07	0.37	**0.55**	0.16	0.97	0.28	0.38	0.22
	Southern	0.72	0.27	0.71	0.21	1.32	0.38	0.57	0.32
	Illawarra	1.19	0.41	0.69	0.21	1.07	0.31	0.30	0.17
	South West Sydney	0.69	0.25	0.61	0.19	1.09	0.32	0.51	0.29
	New England	1.19	0.43	0.50	0.16	1.06	0.32	0.45	0.26
	Greater Murray	1.54	0.54	0.63	0.19	1.15	0.34	**0.24**	0.15
	Hunter	1.13	0.39	0.64	0.19	1.18	0.34	**0.29**	0.16
	Mid Western	1.20	0.42	0.69	0.20	1.48	0.44	0.43	0.25
	Macquarie	1.11	0.41	0.65	0.21	1.30	0.38	0.67	0.40
	Far West	0.75	0.27	**0.50**	0.18	0.82	0.25	0.65	0.37
Log likelihood			-4012.95		-4012.95		-3354.82		-3354.82
Observations			7661		7661		5347		5347

A full set of model results is presented in Appendix A2

Predicted probabilities were calculated for selected subsets of the male and females sample. Results show marked trends in females' misperception as their BMI increases. The group of females who are underweight are most likely to over perceive their weight (70%) and the least likely to match their weight. As BMI increases, the probability of matching increases. Normal and overweight females have an equal probability of matching their perception to their BMI (74%). Whilst normal females are more likely to over perceive (21%), overweight females are more likely to under perceive (21%) Obese females are the most accurate group with a 91% probability of matching.

Results indicate that as females get older their likelihood of matching increases and peaks at 35-54yrs (78%). Subsequently it declines to 71% in the older age groups. The trend shows a gradual decline in the likelihood of over perception as this group gets older. (17%-13%) and a gradual increase in the likelihood of under perception. (10%-16%). At risk alcohol consumption appears to be associated with an increased chance of over perceiving (16% compared with 13%) in females.

Table 3: Predicted Probabilities: Females

Characteristic	Women (n=7661)					
	Match		Underperceive		Overperceive	
	Mean	SD	Mean	SD	Mean	SD
Age (years)						
16-24yrs	0.73	0.15	0.1	0.1	0.17	0.17
*25-34yrs	0.76	0.14	0.08	0.08	0.16	0.18
35-44yrs	0.78	0.12	0.08	0.08	0.14	0.16
45-54yrs	0.78	0.12	0.1	0.09	0.12	0.15
55-64yrs	0.76	0.11	0.12	0.11	0.12	0.15
65-74yrs	0.71	0.13	0.16	0.14	0.13	0.16
Disadvantage						
1 least disadvantaged	0.77	0.13	0.07	0.08	0.16	0.16
2..	0.77	0.12	0.09	0.09	0.14	0.15
*3..	0.77	0.12	0.10	0.10	0.13	0.15
4..	0.74	0.13	0.11	0.11	0.15	0.16
5 Most disadvantaged	0.75	0.14	0.11	0.11	0.14	0.17
BMI						
< 18.5 BMI	0.29	0.08	0.00	0.00	0.71	0.08
*18.5 ≤ BMI ≤ 25	0.74	0.05	0.04	0.02	0.22	0.06
25 ≤ BMI ≤ 30	0.75	0.09	0.25	0.09	0.00	0.00
BMI ≥ 30	0.91	0.03	0.08	0.04	NA	NA
Self rated health						
*Excellent	0.74	0.13	0.11	0.11	0.15	0.16
Very good	0.77	0.12	0.09	0.09	0.14	0.15
Good	0.77	0.13	0.09	0.09	0.14	0.15

	Fair	0.72	0.14	0.14	0.13	0.14	0.17
	Poor	0.73	0.15	0.12	0.11	0.15	0.17
	Very poor	0.84	0.12	0.07	0.07	0.09	0.18
Alcohol							
	At risk alcohol consumption	0.74	0.14	0.10	0.10	0.16	0.17
	*Not at risk alcohol consumption	0.77	0.12	0.10	0.10	0.13	0.15

Notes: Baseline categories '*'

Results indicate that for men, under perceiving is associated with age, being overweight, self rated health and smoking.

Results show marked differences in misperception as BMI increases. Similarly to females, the group of men who are underweight have the highest probability of over perceiving their weight (51%) and the least likely to match their weight. Males who are in the normal or obese BMI category have the highest probability of matching their BMI (76% and 83% respectively). It is the group of overweight males that show a marked level of misperception. This group has a 54% chance of matching their BMI and a 46% chance of under perceiving their BMI. Smoking appears to be associated with an increased chance of under perceiving (31% compared to 25%) in males

Table 4: Predicted Probabilities: Males

Characteristic		Men (n=5347)					
		Match		Underperceive		Overperceive	
		Mean	SD	Mean	SD	Mean	SD
Age (years)							
	* 16-24yrs	0.61	0.17	0.33	0.21	0.06	0.1
	25-34yrs	0.66	0.17	0.3	0.2	0.04	0.08
	35-44yrs	0.71	0.15	0.25	0.17	0.04	0.08
	45-54yrs	0.72	0.14	0.24	0.16	0.04	0.08
	55-64yrs	0.71	0.14	0.24	0.17	0.05	0.09
	65-74yrs	0.68	0.15	0.25	0.18	0.07	0.1
BMI	< 18.5 BMI	0.49	0.15	0	0	0.51	0.15
	*18.5 ≤ BMI ≤ 25	0.76	0.07	0.13	0.07	0.11	0.05
	25 ≤ BMI ≤ 30	0.54	0.11	0.46	0.11	NA	NA
	BMI ≥ 30	0.83	0.07	0.17	0.07	NA	NA
Self rated health	* Excellent	0.66	0.17	0.30	0.19	0.04	0.06
	Very good	0.67	0.15	0.27	0.18	0.06	0.09
	Good	0.70	0.15	0.25	0.17	0.05	0.08
	Fair	0.71	0.15	0.24	0.17	0.05	0.08
	Poor	0.63	0.18	0.30	0.20	0.07	0.15
	Very poor	0.78	0.15	0.20	0.16	0.02	0.06

Smoking	Occasional /daily smoking	0.64	0.17	0.31	0.20	0.05	0.09
	* Not occasional/daily smoking	0.70	0.15	0.25	0.18	0.05	0.08

4. Discussion and limitations

As the prevalence of overweight and obesity increases, it is important that we increase our understanding of how individuals perceive their body mass and their own health risks associated with overweight and obesity.

Gender differences in the perception of body mass have been well documented [8, 9,10]. Our analysis supports earlier findings that there are significant differences between how men and women perceive their body mass. Results show that females are more likely than men to report they are overweight and in particular females with 'underweight' BMI are most likely to do so. This trend is most evident in the younger age groups, up to 35yrs of age. In contrast there is a pattern of underestimation of weight amongst men, particularly those men whose BMI falls within BMI categories..

The probability of underestimation of weight in males is greater in the younger age group (16-24 years). This group makes up a significantly lower proportion of the overweight group relative to older age groups. However, on average the predicted probability of under estimating body mass in this age group is 33%. This may support the conclusion of Johnson et al (2008) [4] who attributed a pattern of under estimation to the stigma associated with being overweight, discouraging younger people in particular from identifying themselves as overweight or obese.

Clearly these results have different implications. There is evidence from previous research that women tend to be preoccupied with their physical appearance and in western societies powerful messages exist that to be fat is a sign of poor self control [11]. Although we found no significant geographical differences in perception of BMI our research supports the idea that body weight is very important to young females and young males and influences their feelings of well being and self esteem and that peer group and external messages may have an impact on how they feel about themselves. This suggests that local culture and norms may be effective in moderating attitudes to weight.

On the other hand overweight individuals who believe they are of normal BMI levels may not recognise the risk this poses to their health and, if this means they are less likely to attempt to lose weight or consult a health professional about their weight-related risk, they may be at greater risk of developing obesity related conditions such as diabetes. This indicates that despite health education and promotion messages aimed at raising awareness of the need to maintain a healthy weight, a significant proportion of overweight people are likely to view healthy weight messages as not being relevant to them.

There was evidence of spatial differences in perception of body mass across NSW, however no clear patterns emerged. Evidence from Wardle et al (2000) suggested that a 'peer effect' may be evident when high levels of overweight and obesity exist in a

peer group or community. Whilst rural areas generally had higher levels of overweight and obesity, there was no significant association with under perceiving or over perceiving in these areas.

4.1. Limitations

The major limitation of this research is the use of self reported height and weight. According to the literature [12,13] there is evidence that self reporting may result in women under estimating their weight and men overestimating their height. It is therefore likely that both BMI and the prevalence of overweight are both underestimated in this sample. A potential implication of this is that the proportion of people who under perceive their weight may be underestimated and the proportion who over perceive it may be over estimated.

The calculation of body mass index (BMI) is the most common measure used to determine levels of overweight and obesity at a population level. It is well recognised that this measure has limitations [14]. Although generally related to body fat, it does not measure fat itself. BMI does not take into account skeletal size, amount of body water or muscle mass and it is not gender specific. Nevertheless, on a population level BMI is considered to be the most appropriate measure. It is easily calculated on the basis of standard measures that generally show little inter-observer variation and is inexpensive to measure and calculate.

A further limitation of this analysis is in the measurement of the levels of the two attributes used in the analysis 1) perceived weight and 2) BMI. Perceived weight has three levels, underweight, acceptable weight and overweight. BMI has 4 levels: underweight, normal, overweight and obese. As a result the group categorised as overweight or obese according to their BMI will be 'matched' with the perceived weight category "overweight". Hence, obese respondents who perceive themselves as 'overweight' will be considered 'matched' rather than being an under perceivers.

Whilst it is unlikely that these limitations will affect the conclusions we have reached, the potential that they are an underestimation of the extent of under perception of weight needs to be taken into consideration.

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6. Appendix

Appendix A1 Males and Females Mean %'s by mismatch

Characteristic	Females (n=7661, 58.9%)			Males (n=5347, 41.1%)		
	Match Mean	Under perceive Mean	Over perceive Mean	Match Mean	Under perceive Mean	Over perceive Mean
Age (years)						
	45.64	48.94	43.35	41.74	39.65	42.15
Income						
< $10,000	0.05	0.07	0.05	0.04	0.04	0.07
$10,000-$20,000	0.13	0.16	0.13	0.13	0.12	0.13
$20,000-$40,000	0.16	0.15	0.14	0.16	0.17	0.15
$40,000-$60,000	0.14	0.15	0.16	0.15	0.14	0.12
$60,000-$80,000	0.11	0.05	0.09	0.13	0.12	0.11
>$80,000	0.19	0.15	0.18	0.23	0.22	0.23
Marital Status						
Married	0.58	0.53	0.56	0.61	0.58	0.50
Widowed	0.08	0.12	0.07	0.03	0.02	0.04
Separated	0.03	0.03	0.03	0.02	0.02	0.02
Divorced	0.08	0.08	0.06	0.06	0.05	0.04
Never married	0.23	0.24	0.28	0.28	0.32	0.40
Education						
Tertiary qualified	0.24	0.18	0.26	0.25	0.19	0.30
Non tertiary qualified	0.75	0.81	0.73	0.75	0.80	0.69
Disadvantage						
1 least disadvantaged	0.16	0.12	0.18	0.14	0.12	0.17
2..	0.18	0.15	0.17	0.20	0.17	0.22
3..	0.21	0.21	0.19	0.21	0.20	0.22
4..	0.26	0.31	0.26	0.27	0.26	0.19

5 Most disadvantaged	0.18	0.21	0.19	0.18	0.25	0.20
Language spoken at home						
Other	0.12	0.13	0.15	0.13	0.14	0.16
Born in Australia						
No	0.06	0.05	0.06	0.05	0.06	0.10
BMI						
< 18.5 BMI	0.02	N/A	**0.23**	0.01	N/A	**0.16**
18.5 ≤ BMI ≤ 25	0.53	0.22	**0.77**	0.48	0.23	**0.84**
25 ≤ BMI ≤ 30	0.25	0.63	0.00	0.32	0.68	0.00
BMI ≥ 30	0.20	0.14	N/A	0.19	0.10	N/A
Self rated health						
Excellent	0.22	0.22	0.23	0.22	0.25	0.16
Very good	0.31	0.25	0.29	0.31	0.31	0.37
Good	0.29	0.26	0.28	0.28	0.26	0.27
Fair	0.13	0.19	0.15	0.14	0.12	0.13
Poor	0.05	0.06	0.05	0.04	0.05	0.06
Very poor	0.02	0.01	0.01	0.01	0.01	0.01
Alcohol						
At risk alcohol consumption	0.29	0.29	0.33	0.40	0.41	0.37
Exercise						
Not regular exercise	0.59	0.62	0.57	0.51	0.52	0.48
Smoking						
Occasional/daily smoking	0.19	0.20	0.23	0.22	0.26	0.25

Appendix A2: MNL Model – significant factors for under perceivers.

Under perceive	Females (n=7661)		Males (n=5347)	
Variable	RRR	St.Err	RRR	St.Err
Age (years)	**0.94**	**0.02**	**0.92**	**0.02**
Income (base=$20,000-$40,000)				
< $10,000	1.07	0.24	0.80	0.16
$10,000-$20,000	1.01	0.19	0.94	0.14
$20,000-$40,000				
$40,000-$60,000	1.18	0.24	0.76	0.12
$60,000-$80,000	**0.56**	**0.15**	0.82	0.15
>$80,000	1.11	0.27	0.83	0.14
Marital Status (base = married)				
Married				
Widowed	1.14	0.32	0.90	0.22
Separated	1.29	0.41	1.21	0.29
Divorced	1.18	0.37	0.92	0.15
Never married	1.48	0.48	1.11	0.16
Education (base = tertiary qualified)				
Tertiary qualified				
Non tertiary qualified	1.08	0.20	1.25	0.17
Disadvantage (base = least disadvantaged)				
1 least disadvantaged				
2..	1.11	0.30	0.86	0.20
3..	1.21	0.33	0.97	0.24
4..	1.51	0.43	0.86	0.21
5 Most disadvantaged	1.68	0.47	1.30	0.33
Language spoken at home (base = English)				
Other	0.93	0.18	0.89	0.16
Born in Australia (base = yes)				
No	0.96	0.26	1.21	0.26
BMI (base = 18.5 ≤ BMI ≤ 25)				
< 18.5 BMI	0.00	0.00	0.00	0.00
18.5 ≤ BMI ≤ 25				
25 ≤ BMI ≤ 30	**6.47**	**1.00**	**6.34**	**0.75**
BMI ≥ 30	**1.82**	**0.38**	**1.44**	**0.23**
Self rated health (base = excellent)				
Excellent				
Very good	**0.70**	**0.12**	0.81	0.10
Good	**0.68**	**0.12**	**0.65**	**0.09**
Fair	1.07	0.20	**0.68**	**0.11**
Poor	0.98	0.27	1.08	0.28
Very poor	**0.44**	**0.17**	0.56	0.19
Alcohol (base = Not at risk alcohol consumption)				
At risk alcohol consumption	1.05	0.14	0.98	0.09
Exercise (base = regular exercise)				
Not regular exercise	1.03	0.13	1.08	0.10
Smoking (base = Occasional /daily smoking)				
Not occasional/daily smoking	1.13	0.18	**1.40**	**0.16**
Log likelihood		-4012.95		-3354.82
Observations		764		1421

Appendix A3: MNL Model – significant factors for over perceivers.

Over perceive	Females (n=7661)		Males (n=5347)	
Variable	RRR	St.Err	RRR	St.Err
Age (years)	**1.06**	**0.02**	1.04	0.03
Income (base=$20,000-$40,000)				
< $10,000	1.00	0.25	1.21	0.53
$10,000-$20,000	1.28	0.24	0.84	0.27
$20,000-$40,000				
$40,000-$60,000	1.25	0.24	1.02	0.35
$60,000-$80,000	0.89	0.20	1.11	0.44
>$80,000	0.96	0.19	1.19	0.42
Marital Status (base = married)				
Married				
Widowed	1.20	0.39	1.55	0.62
Separated	1.27	0.44	0.88	0.40
Divorced	0.96	0.33	1.07	0.35
Never married	1.03	0.35	1.27	0.35
Education (base = tertiary qualified)				
Tertiary qualified				
Non tertiary qualified	1.09	0.15	0.75	0.18
Disadvantage (base = least disadvantaged)				
1 least disadvantaged				
2..	1.00	0.21	1.61	0.73
3..	1.14	0.26	2.06	1.00
4..	**1.62**	**0.39**	1.41	0.69
5 Most disadvantaged	1.42	0.38	1.95	0.96
Language spoken at home (base = English)				
English				
Other	0.93	0.18	1.13	0.40
Born in Australia (base = yes)				
Yes				
No	1.04	0.27	**2.11**	0.76
BMI (base = 18.5 ≤ BMI ≤ 25)				
< 18.5 BMI	**9.40**	1.83	**9.57**	4.02
18.5 ≤ BMI ≤ 25				
25 ≤ BMI ≤ 30	0.00*	0.00	0.00*	0.00
BMI ≥ 30	0.00*	0.00	0.00*	0.00
Self rated health (base = excellent)				
Excellent				
Very good	1.08	0.16	**1.85**	**0.51**
Good	1.26	0.19	1.75	0.55
Fair	**1.45**	**0.27**	1.45	0.53
Poor	1.32	0.38	2.17	1.48
Very poor	0.62	0.30	0.32	0.29
Alcohol (base = Not at risk alcohol consumption)				
At risk alcohol consumption				
Not at risk alcohol consumption	**1.30**	**0.15**	1.18	0.21

Exercise (base = regular exercise)					
	Regular exercise				
	Not regular exercise	1.06	0.12	1.03	0.19
Smoking (base = Occasional /daily smoking)					
	Occasional /daily smoking				
	Not occasional/daily smoking	1.09	0.16	0.94	0.23
% overweight and obese by Area Health Service (base = Northern Sydney)					
	Northern Sydney				
	Central Sydney	0.73	0.19	0.44	0.24
	South East Sydney	0.71	0.18	0.44	0.22
	Northern Rivers	0.58	0.18	0.54	0.29
	Western Sydney	0.80	0.22	0.44	0.24
	Central Coast	0.62	0.18	0.56	0.30
	Mid North Coast	**0.48**	**0.15**	0.56	0.33
	Wentworth	**0.55**	**0.16**	0.38	0.22
	Southern	0.71	0.21	0.57	0.32
	Illawarra	0.69	0.21	0.30	0.17
	South West Sydney	0.61	0.19	0.51	0.29
	New England	0.50	0.16	0.45	0.26
	Greater Murray	0.63	0.19	**0.24**	**0.15**
	Hunter	0.64	0.19	**0.29**	**0.16**
	Mid Western	0.69	0.20	0.43	0.25
	Macquarie	0.65	0.21	0.67	0.40
	Far West	**0.50**	**0.18**	0.65	0.37
Log likelihood			-4012.95		-3354.82
Observations			971		265