



Risk Factors

# Obesity - Body Mass Index

Stage 3

Epidemiological Series Report # 2011 - 18

December 2011



## Introduction

The following overview presents information about of obesity among the participants of the North West Adelaide Health Study, and the demographics, chronic conditions and risk factors associated with high Body Mass Index (BMI). Stage 1 of the study was conducted between 2000 and 2003, with Stage 2 conducted from 2004 to 2006, and Stage 3 conducted from 2008 to 2010.

## Measurement and definition of BMI

Obesity is generally measured using BMI. BMI was calculated using height and weight measurements taken in the study clinic using calibrated instruments and standard methods. The formula for calculating BMI is:

$$\text{weight (kg)} / \text{height (m)}^2$$

## Proportion of BMI categories – Stage 1, Stage 2 & Stage 3

The proportion of participants at different categories of BMI for Stages 1, 2 and 3 is shown in Table 1. Overall, **27.0%** (95% CI 25.4-28.6) in Stage 1 and **29.4%** (95% CI 27.3-31.5) in Stage 2 and **33.4%** (95% CI 30.9-36.1) in Stage 3 of study participants were obese.

**Table 1: Proportion of BMI categories**

	Stage 1		Stage 2		Stage 3	
	n	%	n	%	n	%
Underweight ( $\leq 18.5$ )	49	1.2	43	1.3	22	8.8
Normal (18.5-24.9)	1440	35.5	1021	31.9	663	26.7
Overweight (25-29.9)	1471	36.3	1196	37.4	970	39.0
Obese ( $\geq 30$ )	1094	27.0	939	29.4	831	33.4
Total	4054	100.0	3198	100.0	2486	100.0

\* Note: The weighting of data can result in rounding discrepancies or totals not adding.

## Explanation of statistical terms used in this report

**Incident rate** is a measure of risk of developing a condition or risk factor within a specified period of time, often one year but in this report per 1000 person years. This allows for different amounts of observation times among participants between the baseline and Stage 3 results (ranging from 2000-2003 to 2008-2010). The incident rates were calculated without adjusting for age in this report. *For example, in a population of 1000 people, if 28 people develop a disease over two years, this would be expressed as 14 incident cases over 1000 person years (28 cases per 1000 divided by 2 years).*

**Hazard ratio (HR)** is the ratio of the hazard rates corresponding to a chronic condition or risk factor developing in the different groups over time – in this case, the time since the baseline examination (between 2000 and 2003). This allows for different amounts of observation times among participants between the baseline and Stage 3 results (ranging from 2000-2003 to 2008-2010). *For example, looking at cardiovascular disease, a hazard ratio of 2 for overweight or obese people implies that twice as many people with this risk factor have developed cardiovascular disease in this time compared to the reference group (those who are underweight or who have a healthy weight with a hazard ratio of 1).*

**Adjusting for age** is a technique used to better allow populations to be compared when the age profiles of the populations are quite different.

Tables 2 and 3 present the incidence rate per 1000 person years among those participants who were not obese at baseline Stage 1 (321 incident cases).

## Demographic profile of those who were obese

The risk of developing obesity among study participants who were not obese at baseline was statistically significantly lower among those who were aged 60 years and over (Table 2).

**Table 2: Hazard ratios for demographic variables associated with obesity**

Variable	n	New Cases (N) <sup>†</sup>	Incidence rate (1000 person yrs) <sup>†</sup>	HR (95%CI)**	p value**
<b>Sex</b>					
Male	1219	163	20.6	1	
Female	1192	158	19.9	0.95 (0.71-1.25)	0.696
<b>Age group</b>					
Up to 49 years	1443	225	23.6	1	
50 to 59 years	339	40	17.1	0.78 (0.56-1.08)	0.138
60 years and over	629	55	13.9	0.61 (0.44-0.83)	<b>0.002</b>
<b>Highest education level obtained*</b>					
Secondary	1007	141	21.5	1	
Trade/apprenticeship/cert/diploma	1001	140	21.2	0.93 (0.69-1.26)	0.648
Bachelor degree or higher	301	35	17.2	0.66 (0.41-1.09)	0.103
<b>Gross annual household income*</b>					
Up to \$20,000	516	58	17.7	1	
\$20,001- 40,000	591	90	22.4	1.07 (0.69-1.67)	0.749
\$40,001- 60,000	529	83	23.7	1.09 (0.67-1.76)	0.735
More than \$60,000	652	75	17.3	0.75 (0.45-1.26)	0.280
<b>Family structure*</b>					
Family & children, two biological/ adoptive parents	808	115	21.6	1	
Adult living with partner, no children	601	73	17.5	0.83 (0.57-1.23)	0.356
Adult living alone	315	37	18.0	0.87 (0.55-1.38)	0.552
Adults – related/unrelated, living together	227	30	21.8	1.02 (0.62-1.68)	0.927
Step/sole/shared parenting & other	215	42	30.1	1.37 (0.83-2.27)	0.224
<b>Marital status*</b>					
Married or living with partner	1550	207	19.9	1	
Separated/divorced	185	23	18.6	0.95 (0.65-1.38)	0.787
Widowed	160	15	15.8	1.03 (0.63-1.69)	0.892
Never married	503	75	23.5	0.88 (0.55-1.40)	0.588
<b>Work status*</b>					
Full time employed	952	156	24.5	1	
Part time/casual employed	416	57	20.4	0.81 (0.55-1.21)	0.307
Unemployed	83	12	24.1	1.08 (0.44-2.66)	0.861
Home duties/retired	750	78	16.3	0.87 (0.61-1.26)	0.473
Student/other	178	16	13.7	0.53 (0.26-1.08)	0.080

\* Don't know/ refused/ not stated category not reported

\*\* All variables adjusted for age (except for age group) to calculate hazard ratio

† Not adjusted for age

## Chronic condition and risk factor profile of those who were obese

The risk of developing obesity among study participants who were not obese at baseline was statistically significantly higher among those who were current smokers, or those who had a high waist hip ratio or high blood pressure, than those without these risk factors (Table 3).

**Table 3: Hazard ratios for chronic conditions and risk factors associated with obesity**

Variable	n	New Cases (N) <sup>†</sup>	Incidence rate (1000 person yrs) <sup>†</sup>	HR (95%CI)**	p value**
<b>Cardiovascular disease</b>					
No	2262	301	20.1	1	
Yes	147	19	21.8	1.52 (0.91-2.53)	0.107
<b>Diabetes</b>					
No	2301	308	20.3	1	
Yes	110	13	19.0	1.21 (0.71-2.06)	0.473
<b>Arthritis</b>					
No	1786	241	20.3	1	
Yes	457	62	20.6	1.23 (0.89-1.71)	0.214
<b>Current mental health condition</b>					
No	2109	263	19.0	1	
Yes	286	53	27.7	1.42 (1.00-2.02)	0.052
<b>Smoking*</b>					
Non-smoker	1131	122	16.4	1	
Ex-smoker	704	90	19.8	1.27 (0.94-1.71)	0.118
Current smoker	568	108	28.5	1.50 (1.06-2.13)	<b>0.023</b>
<b>Alcohol risk</b>					
Non-drinker/ No risk	1269	153	16.7	1	
Low risk	973	140	21.3	1.03 (0.77-1.36)	0.861
Intermediate to very high risk	158	28	26.7	1.21 (0.66-2.21)	0.532
<b>Physical activity</b>					
Sedentary	590	86	21.9	1	
Undertakes some exercise	1620	212	19.9	0.94 (0.69-1.28)	0.695
<b>High waist/hip ratio (&gt;1.0 men, &gt;0.85 women)<sup>^</sup></b>					
No	2157	278	19.4	1	
Yes	254	43	27.6	1.64 (1.18-2.27)	<b>0.003</b>
<b>High total cholesterol (≥5.5mmol/L)<sup>^</sup></b>					
No	1537	208	20.9	1	
Yes	846	110	19.3	0.95 (0.73-1.25)	0.734
<b>High blood pressure (≥140/90mmHg)<sup>^</sup></b>					
No	1796	234	19.7	1	
Yes	616	87	21.6	1.39 (1.02-1.91)	<b>0.038</b>

\* Don't know/ refused/ not stated category not reported

\*\* All variables adjusted for age (except for age group) to calculate hazard ratio

† Not adjusted for age

<sup>^</sup> Biomedical measurement

This document is one of a series of reports concerning Stage 3 of the North West Adelaide Health Study. Please see the website for other reports in the series - [www.health.adelaide.edu.au/pros/data/nwahs/](http://www.health.adelaide.edu.au/pros/data/nwahs/).

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