

# 5 Obesity

## Introduction

Obesity is a major risk factor for type II diabetes mellitus, coronary heart disease, stroke and certain types of cancer e.g. colorectal cancer. Abdominal

fatness (truncal obesity) is a particular area of concern as it is associated with elevated risks to health in comparison to a more peripheral fat distribution.

## Definition

The WHO international classification of weight status and abdominal fatness was used (*WHO (B), 1998*).

Weight status was classified using the Body Mass Index (BMI).  $BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$ . Table 5.1

**Table 5.1: Classification of weight status**

Classification	Body Mass Index (BMI) (kg/m <sup>2</sup> )
Underweight	< 18.5
Normal weight	18.5 - 24.9
Overweight	≥ 25
Pre-obese	25 - 29.9
Obese	≥ 30

Abdominal fatness was identified using the waist-hip ratio (WHR).  $WHR = \text{waist circumference} / \text{hip}$

circumference. Table 5.2

**Table 5.2: Classification of abdominal fatness, by gender**

Gender	Abdominal fatness
Males	WHR > 1.0
Females	WHR > 0.85

## Method Used

The subjects were given clear instructions to wear thin, light clothing. An electronic weighing scale (SECA Model 220) was used to measure weight. The subjects had their weight taken without their shoes on. Height was taken using a stadiometer, which had been mounted on a stable backing board. Each subject was positioned against the board without any footwear and facing straight such that the Frankfurt plane<sup>1</sup> was horizontal. Readings were taken with the examiner's eyes level with the headpiece. Two readings were taken for each subject

and the average was calculated. Body Mass Index (BMI) was then calculated from the weight and height measurements.

Waist and hip measurements were taken with a tailor's measuring tape over the subject's thin clothing. Two readings each of waist and hip circumferences were taken for each subject and the average calculated. Waist-hip ratio (WHR) was then calculated from the measurements.

## Weight Status

The survey found that among Singapore residents aged 18 to 69 years, 9.2% were underweight (BMI less than 18.5), while 58.3% had normal weight (BMI 18.5–24.9) and 32.5% were overweight

(BMI 25.0 or more). There were 6.9% of Singapore residents who were obese (BMI 30.0 or more).  
Table 5.3

**Table 5.3: Weight status (%) of Singapore residents aged 18-69 years, by gender, 2004**

Weight Status	Males	Females	Total
Underweight	6.2	12.2	9.2
Normal weight	58.8	57.9	58.3
Overweight			
Pre-obese	28.6	22.6	25.6
Obese	6.4	7.3	6.9

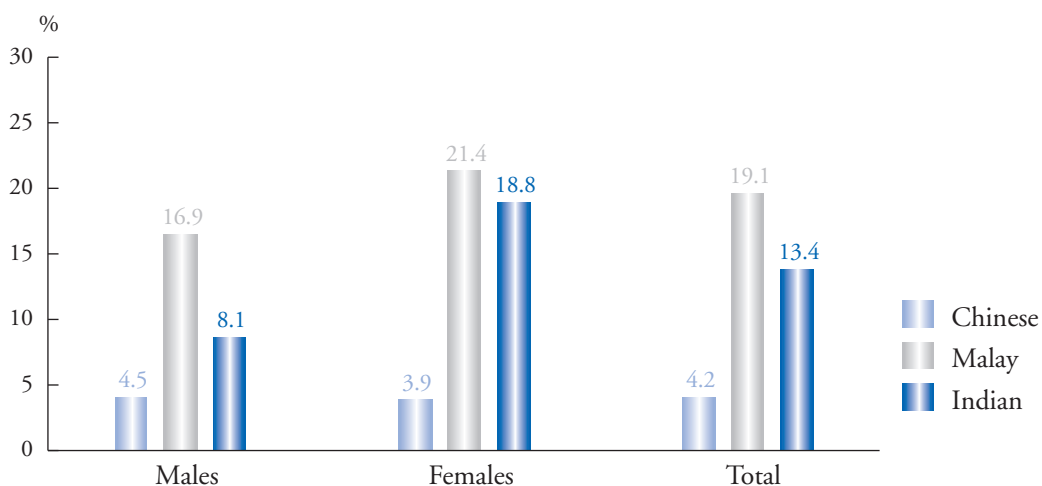
<sup>1</sup> Frankfurt plane is the plane formed when a line is drawn from the external auditory meatus to the orbital bone just below the eye.

## Prevalence of Obesity

Prevalence of obesity was higher among females (7.3%) than among males (6.4%). Obesity was most prevalent in Malays (19.1%), followed by

Indians (13.4%) and Chinese (4.2%). The highest prevalence of obesity was noted in the 60-69 age group. Graph 5.1; Table 5.4

**Graph 5.1: Crude prevalence (%) of obesity among Singapore residents aged 18-69 years, by gender and ethnic group, 2004**



**Table 5.4: Age-specific prevalence (%) of obesity, by gender, 2004**

Age (years)	Males	Females	Total
18-29	9.6	4.0	6.8
30-39	5.0	8.5	6.8
40-49	6.5	7.4	6.9
50-59	4.7	8.4	6.5
60-69	5.1	10.0	7.6
<b>18-69</b>	<b>6.4</b>	<b>7.3</b>	<b>6.9</b>

## Trends in Obesity

The prevalence of obesity among Singapore residents aged 18 to 69 years rose from 6.0% in 1998 to 6.9% in 2004. No significant change was

detected in the age-standardised prevalence by gender and ethnic group between 1998 and 2004. Table 5.5

**Table 5.5: Prevalence (%) of obesity, by gender and ethnic group, 1992, 1998 and 2004**

Gender / Ethnic group	Crude prevalence			Age-standardised prevalence (95% Confidence Interval)			Difference in age-standardised prevalence	
	1992	1998	2004	1992	1998	2004	['98-'92]	['04-'98]
<b>Total</b>	5.1	6.0	6.9	5.3 (4.6, 6.0)	6.2 (5.5, 6.8)	6.8 (6.1, 7.6)	0.9	0.6
<i>Gender</i>								
Males	4.1	5.3	6.4	4.0 (3.1, 4.9)	5.4 (4.4, 6.3)	6.4 (5.3, 7.5)	1.4*	1.0
Females	6.1	6.7	7.3	6.6 (5.6, 7.7)	6.9 (6.0, 7.8)	7.3 (6.3, 8.3)	0.3	0.4
<i>Ethnic group</i>								
Chinese	3.5	3.8	4.2	3.6 (2.9, 4.4)	3.9 (3.2, 4.5)	4.3 (3.5, 5.1)	0.3	0.4
Malay	11.1	16.2	19.1	12.5 (10.1, 15.0)	16.6 (14.2, 19.1)	19.2 (16.5, 21.9)	4.1*	2.6
Indian	11.2	12.2	13.4	11.2 (8.7, 13.8)	13.0 (10.5, 15.6)	13.5 (10.8, 16.2)	1.8	0.5

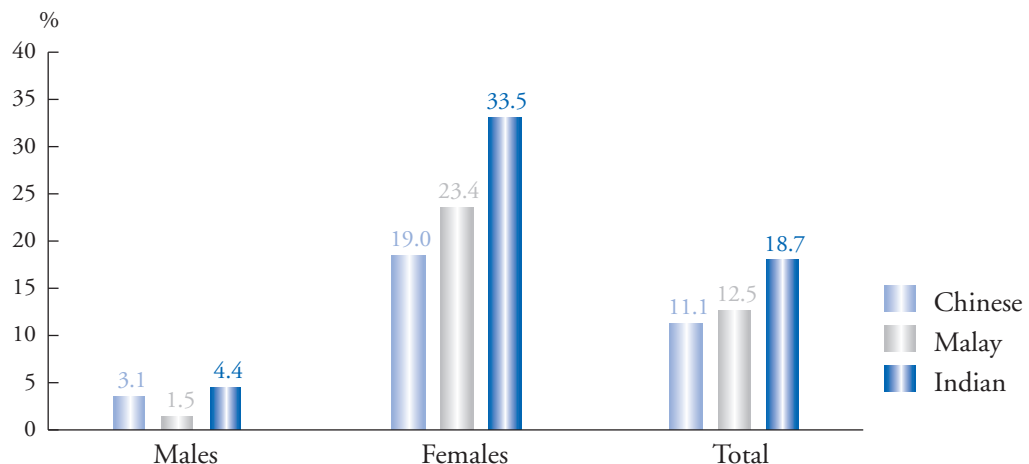
\* 0.01 < p < 0.05

## Prevalence of Abdominal Fatness

The prevalence of abdominal fatness was more predominant in females (20.7%) than in males (3.0%). Indians (18.7%) had the highest prevalence of abdominal fatness, compared with Malays

(12.5%) and Chinese (11.1%). Overall, abdominal fatness rates increased consistently with age. Graph 5.2; Table 5.6

**Graph 5.2: Crude prevalence (%) of abdominal fatness among Singapore residents aged 18-69 years, by gender and ethnic group, 2004**





**Table 5.6: Age-specific prevalence (%) of abdominal fatness, by gender, 2004**

Age (years)	Males	Females	Total
18-29	0.5	4.4	2.5
30-39	0.4	9.5	5.0
40-49	1.6	18.8	10.1
50-59	6.1	40.3	23.1
60-69	14.0	59.4	37.5
<b>18-69</b>	<b>3.0</b>	<b>20.7</b>	<b>11.9</b>

## Trends in Abdominal Fatness

The prevalence of abdominal fatness among Singapore residents aged 18 to 69 years rose from 8.1% in 1998 to 11.9% in 2004. There was a significant increase

in the age-standardised prevalence of abdominal fatness in both genders, and among the Chinese and Indians between 1998 and 2004. Table 5.7

**Table 5.7: Prevalence (%) of abdominal fatness, by gender and ethnic group, 1992, 1998 and 2004**

Gender / Ethnic group	Crude prevalence			Age-standardised prevalence (95% Confidence Interval)			Difference in age-standardised prevalence	
	1992	1998	2004	1992	1998	2004	['98-'92]	['04-'98]
<b>Total</b>	2.6	8.1	11.9	3.0 (2.5, 3.6)	8.4 (7.6, 9.2)	11.0 (10.1, 12.0)	5.4**	2.6**
<i>Gender</i>								
Males	0.6	1.8	3.0	0.6 (0.3, 1.0)	1.9 (1.3, 2.4)	2.7 (1.9, 3.5)	1.3**	0.8*
Females	4.6	14.4	20.7	5.4 (4.4, 6.4)	14.9 (13.5, 16.3)	19.3 (17.6, 21.0)	9.5**	4.4**
<i>Ethnic group</i>								
Chinese	2.1	7.4	11.1	2.3 (1.7, 2.9)	7.5 (6.6, 8.4)	10.0 (8.9, 11.1)	5.2**	2.5**
Malay	3.8	9.5	12.5	5.8 (4.0, 7.6)	10.5 (8.6, 12.5)	12.7 (10.6, 14.7)	4.7**	2.2
Indian	5.6	12.9	18.7	5.9 (4.1, 7.8)	14.1 (11.6, 16.7)	19.4 (16.5, 22.3)	8.2**	5.3**

\* 0.01 < p < 0.05

\*\* p < 0.001

## New Risk Categories for Obesity

In 2002, WHO convened an expert consultation to review the interpretation of recommended body mass index cut-off points for determining overweight and obesity in Asian populations. The recommendations were accepted and published in 2004<sup>2</sup>. The expert consultation recommended that the WHO BMI cut-off points should be retained for international classifications of overweight and

obesity. The expert consultation also recognised that risks for cardiovascular disease and diabetes mellitus exist at lower body mass index points for Asian populations and recommended additional ranges of body mass index for determining public health and clinical action. The ranges are given below (Table 5.8).

**Table 5.8: Body mass index ranges for public health action for Asian populations**

Classification	Body Mass Index (BMI) (kg/m <sup>2</sup> )
Low to moderate risk	18.5 - 27.5
Moderate to high risk	23.0 - 32.5
High to very high risk	27.5 - 37.5

Based on the ranges above, the following risk categories were drawn up (Table 5.9).

**Table 5.9: Body mass index risk categories**

Classification	Body Mass Index (BMI) (kg/m <sup>2</sup> )
Low risk	18.5 - 22.9
Moderate risk	23.0 - 27.4
High risk	≥ 27.5

<sup>2</sup> WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004. 363 : 157 – 163.

## BMI Risk Category Status

The survey found that among Singapore residents aged 18 to 69 years, 38.1% had acceptable risk (BMI 18.5 – 22.9), 36.7% had moderate risk (BMI

23.0 – 27.4) and 16.0% had high risk (BMI 27.5 or more). Table 5.10.

**Table 5.10: BMI risk category status (%) of Singapore residents aged 18-69 years, by gender, 2004**

Risk Category	Males	Females	Total
Low risk	35.3	40.7	38.1
Moderate risk	42.5	31.0	36.7
High risk	16.0	16.1	16.0

## Prevalence of BMI Risk Categories by Gender and Ethnic Group

### *Moderate Risk*

A higher proportion of males were in the moderate risk category compared to females (42.5% vs 31.0%). Indians had the highest proportion of

persons in this risk category compared to Chinese and Malays. Table 5.11.

**Table 5.11: Prevalence (%) of Singapore residents aged 18-69 years in the moderate BMI risk category, by gender and ethnic group, 2004**

Ethnic Group	Males	Females	Total
Chinese	42.8	30.3	36.5
Malay	35.7	29.6	32.6
Indian	49.2	39.2	44.2
<b>Total</b>	<b>42.5</b>	<b>31.0</b>	<b>36.7</b>

*High Risk*

The proportion of males and females who were in the high risk category was similar (16.0% in males vs 16.1% in females). Malays had the highest

proportion of persons in this risk category compared to Chinese and Indians. Table 5.12.

**Table 5.12: Prevalence (%) of Singapore residents aged 18-69 years in the high BMI risk category, by gender and ethnic group, 2004**

Ethnic Group	Males	Females	Total
Chinese	13.4	11.0	12.2
Malay	30.8	36.4	33.6
Indian	18.6	34.2	26.3
<b>Total</b>	<b>16.0</b>	<b>16.1</b>	<b>16.0</b>

# 6 Cigarette Smoking

## Introduction

Cigarette smoking is a major risk factor for hypertension, heart disease, stroke, cancer and respiratory problems and has been identified as

the single most avoidable cause of death. WHO estimates that globally tobacco kills one person every 10 seconds in the 1990s (*WHO (A), 1998*).

## Definition

The WHO classification criteria for smoking status was used in the National Health Survey 2004 (*WHO (A), 1998*). Table 6.1

**Table 6.1: Classification of smoking status**

Classification	Frequency of cigarette smoking
Daily smoker	Smokes cigarettes at least once a day (including people who smoke every day but have to stop temporarily because of religious fasting or medical reasons)
Occasional smoker	Smokes cigarettes but not every day
Ex-smoker	Formerly a daily smoker, but currently does not smoke at all
Non-smoker	Never smoked before or smoked too little in the past to be regarded as an ex-smoker

## Method Used

An interviewer-administered questionnaire was used. The questionnaire was based on WHO's

recommended core questions for assessing smoking status (*WHO (A), 1998*).



## Smoking Status

The survey showed that among Singapore residents aged 18 to 69 years, 12.6% smoked daily, 1.9% were occasional smokers, 5.9% were ex-smokers and 79.6% were non-smokers. Table 6.2

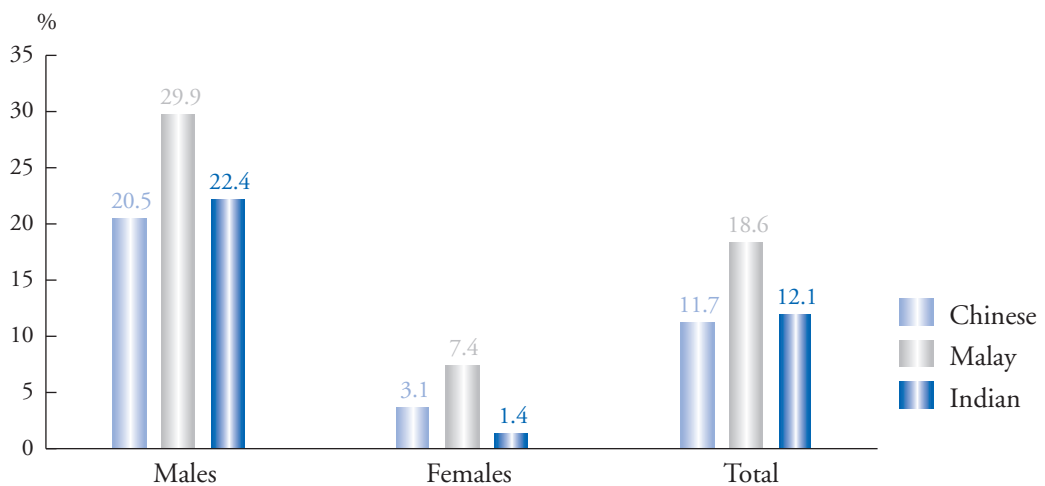
**Table 6.2: Smoking status (%) of Singapore residents aged 18-69 years, by gender, 2004**

Smoking Status	Males	Females	Total
Daily smoker	21.8	3.5	12.6
Occasional smoker	3.1	0.6	1.9
Ex-smoker	10.6	1.3	5.9
Non-smoker	64.5	94.6	79.6

## Prevalence of Daily Smoking

The crude prevalence of daily smoking among Singapore residents aged 18 to 69 years was 21.8% in males and 3.5% in females. Smoking rate was highest in Malays (18.6%) followed by Indians (12.1%) and Chinese (11.7%). Graph 6.1

**Graph 6.1: Crude prevalence (%) of daily smoking among Singapore residents aged 18-69 years, by gender and ethnic group, 2004**



Smoking prevalence levels were consistently higher among males than females in all age groups. Daily smoking was most prevalent in males aged between 40 and 49 years (24.7%), while in females the highest rate was seen in younger females aged 18 to 29 years old (6.6%). Table 6.3

**Table 6.3: Age-specific prevalence (%) of daily smoking, by gender, 2004**

Age (years)	Males	Females	Total
18-29	18.2	6.6	12.3
30-39	22.7	3.7	13.0
40-49	24.7	2.2	13.5
50-59	23.1	1.8	12.5
60-69	17.6	2.0	9.6
<b>18-69</b>	<b>21.8</b>	<b>3.5</b>	<b>12.6</b>

## Onset of Daily Smoking

The mean age at which young smokers aged 18 to 24 years established their smoking habit was 17 years. Male daily smokers aged 18 to 24 years first tried smoking at the mean age of 14 years while female daily smokers in the same age group first

experimented with smoking at the mean age of 15 years.

The most common reason cited by young smokers for smoking was for relaxation or stress relief (42.8%).

## Smoking Intensity of Daily Smokers

The mean number of cigarettes consumed by a daily smoker was 13 cigarettes per day. Male smokers tended to smoke more heavily than female

smokers (14 cigarettes/day compared with 9 cigarettes/day).

## Trends in Daily Smoking

The prevalence of daily smoking declined from 15.2% in 1998 to 12.6% in 2004. Between the two years, there were significant declines in age-standardised prevalence of daily smoking in males

as well as the three major ethnic groups. The largest decline in age-standardised rates was found in the Malays; from 23.1% in 1998 to 18.1% in 2004. Table 6.4

**Table 6.4: Prevalence (%) of daily smoking, by gender and ethnic group, 1992, 1998 and 2004**

Gender / Ethnic group	Crude prevalence			Age-standardised prevalence (95% Confidence Interval)			Difference in age-standardised prevalence	
	1992	1998	2004	1992	1998	2004	['98-'92]	['04-'98]
Total	18.3	15.2	12.6	17.8 (16.5, 19.1)	15.0 (14.0, 16.0)	12.5 (11.4, 13.5)	-2.8***	-2.5***
<i>Gender</i>								
Males	33.2	27.1	21.8	32.7 (30.4, 35.0)	27.1 (25.2, 29.0)	21.5 (19.6, 23.4)	-5.6***	-5.6***
Females	3.1	3.2	3.5	3.1 (2.3, 4.0)	3.1 (2.4, 3.8)	3.5 (2.8, 4.3)	0.0	0.4
<i>Ethnic group</i>								
Chinese	16.5	13.8	11.7	16.5 (15.1, 17.9)	13.7 (12.5, 14.9)	11.7 (10.5, 12.9)	-2.8**	-2.0*
Malay	30.8	23.4	18.6	28.5 (25.4, 31.5)	23.1 (20.6, 25.7)	18.1 (15.5, 20.7)	-5.4**	-5.0**
Indian	15.3	16.4	12.1	14.7 (12.1, 17.4)	15.8 (13.2, 18.4)	11.8 (9.3, 14.2)	1.1	-4.0*

\* 0.01 <  $p$  < 0.05  
 \*\* 0.001 <  $p$  < 0.01  
 \*\*\*  $p$  < 0.001

## Trends in Daily Smoking

Changes in smoking rates between 1998 and 2004 for the various age groups by gender are shown in Graph 6.2.

### *Young adults aged 18-24 years*

The prevalence of smoking in young male adults declined significantly from 25.5% in 1998 to 13.4% in 2004 ( $p < 0.05$ ). Among young female adults, smoking prevalence remained about the same; 5.9% in 1998 and 5.8% in 2004.

### *Adults aged 25-44 years*

The smoking rate fell from 27.2% in 1998 to

24.3% in 2004 among male adults in this age group. In contrast, the smoking rate increased significantly from 2.6% to 4.2% ( $p < 0.05$ ) among the female adults.

### *Older adults aged 45-69 years*

Smoking prevalence declined in both genders. In males, the smoking rate fell significantly from 27.6% in 1998 to 21.7% in 2004 ( $p < 0.05$ ). In females, the rate decreased from 3.1% in 1998 to 1.9% in 2004 but the difference was not statistically significant.

**Graph 6.2: Age-specific prevalence (%) of daily smoking, by gender, 1998 and 2004**

