

## Original Article

# Prevalence of obesity, overweight and underweight in a Hong Kong community: the United Christian Nethersole Community Health Service (UCNCHS) primary health care program 1996-1997

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The aim of this cross-sectional observation study was to assess thoroughly the body mass index (BMI) profile in Hong Kong Chinese and report all categories of BMI cutoff points as suggested by the World Health Organization (WHO). A cohort of 17242 subjects (4822 men and 12420 women) aged 15 or above from the community of Hong Kong presenting themselves voluntarily from April 1996 to August 1997 for primary health assessment at the Three Health Centers of the United Christian Nethersole Community Health Service (UCNCHS). The mean age ( $\pm$  SD) was  $51.0 \pm 16.2$  years (range 15-96 years, median 49.6 years). The mean BMI of the 17242 subjects was  $23.5 \pm 3.3$  kg/m<sup>2</sup> in men and  $23.0 \pm 3.7$  kg/m<sup>2</sup> in women. The BMI peaked at age 30 to 50 years in men and 50 to 70 years in women. The age-standardized prevalence of BMI  $\geq 30$  kg/m<sup>2</sup> or  $\geq 25$  kg/m<sup>2</sup> in Hong Kong Chinese was 3.0% in men and 3.2% in women, and 29.1% in men and 21.3% in women, respectively. For underweight, 35.9% and 27.8% of women and 27.5% and 10.3% of men aged 15-20 and 20-30 years, respectively, had BMI  $< 18.5$  kg/m<sup>2</sup>. In conclusion, a significant proportion of Hong Kong Chinese had a BMI  $\geq 25$  kg/m<sup>2</sup>. Among Hong Kong Chinese aged  $< 30$  years, the prevalence of underweight was also high.

**Key Words:** body mass index, obesity, overweight, underweight, Hong Kong Chinese

## Introduction

Obesity is now an epidemic with increasing prevalence in most parts of the world.<sup>1</sup> In 1993, World Health Organization (WHO), based on Caucasians' data, defined body mass index (BMI) cutoff level of  $\geq 25$  kg/m<sup>2</sup> for overweight and  $\geq 30$  kg/m<sup>2</sup> for obesity.<sup>2</sup> Using this definition to compare Caucasians and Asians, the latter group is often considered as non-obese populations. In recent years, there was increasing evidence that the association between BMI and body fat percentage (BF%) differ across ethnic groups.<sup>3-6</sup> In many Asian populations, a specific BMI reflects a higher BF% than in European populations.<sup>3, 6-8</sup> In accord to this, WHO Western Pacific Region (WPR), International Association for the Study of Obesity (IASO) and International Obesity Task Force (IOTF) in the year 2000 had jointly proposed a revised guideline in the definition of obesity.<sup>9</sup> In this proposal, BMI cutoff levels for overweight and obesity in Asians were redefined as  $\geq 23$  kg/m<sup>2</sup> and  $\geq 25$  kg/m<sup>2</sup> respectively.<sup>9</sup> This new definition induced further debates on the needs for developing different BMI cutoff levels for different ethnic groups. On the other hand, more 'new' proposals on obesity definition have been raised in various countries based on their own data. In particular, the Working Group on Obesity in Mainland China in the year 2002 had redefined BMI cutoff levels for overweight and obesity as  $\geq 24$  kg/m<sup>2</sup> and  $\geq 28$  kg/m<sup>2</sup> respectively for Chinese.<sup>10</sup>

In January 2004, a WHO expert consultation addressed this debate and suggested the current BMI cut-off levels should be retained as international classification i.e  $\geq 25$  kg/m<sup>2</sup> as overweight and  $\geq 30$  kg/m<sup>2</sup> as obesity.<sup>11</sup> But the cut-off points of 23, 27.5, 32.5 and 37.5 kg/m<sup>2</sup> are to be added as points for public health action. For many Asian populations, these additional trigger points for public health action were identified as  $\geq 23$  kg/m<sup>2</sup>, representing increased risk, and  $\geq 27.5$  kg/m<sup>2</sup> as representing high risk.<sup>11</sup> This consultation has also suggested that wherever possible, countries should use all categories for reporting purposes, with a view to facilitating international comparisons.<sup>11</sup>

Information on the prevalence of obesity and overweight in Hong Kong is limited. We examined BMI profiles of 17242 Hong Kong Chinese adults recruited from the community. Preliminary result of part of the database has been reported before.<sup>12</sup> In this report, we aimed to study thoroughly the BMI profile in Hong Kong Chinese and report all categories of BMI cutoff points as suggested by WHO.

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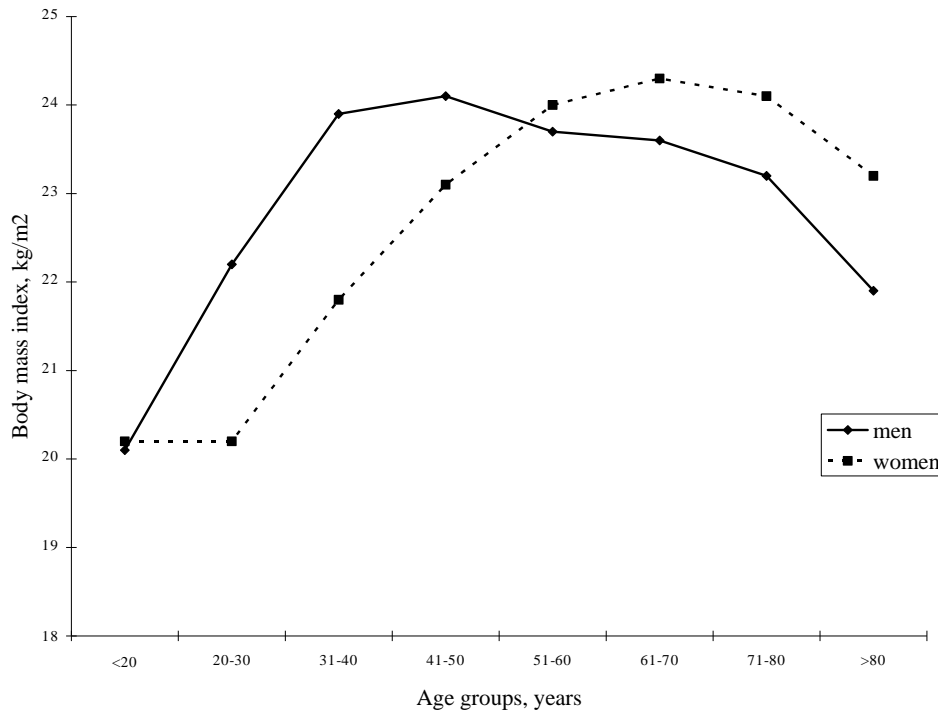


Figure 1. Mean body mass index of the 17242 subjects according to their age and gender

Tables 1. Clinical characteristics and body mass index profiles of the 17242 subjects

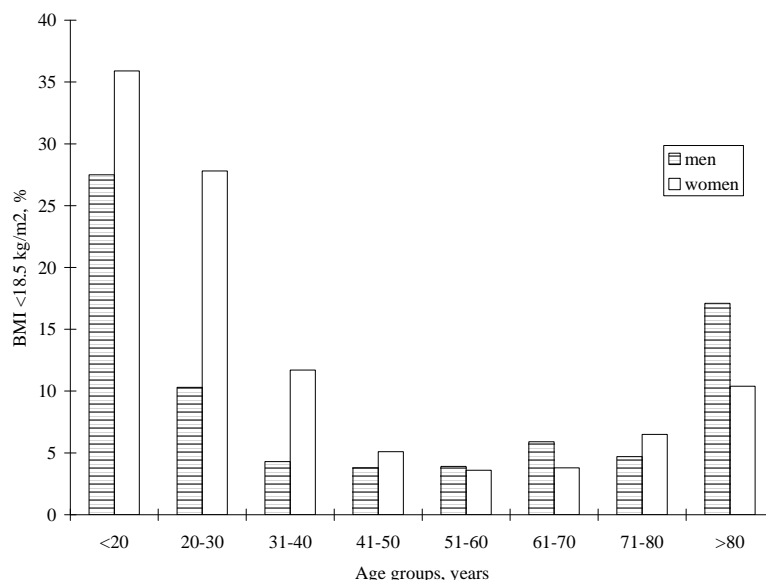
	Total (N = 17242)	Men (N = 4822)	Women (N = 12420)	P values			
Age, years	51.0 ± 16.2	51.7 ± 16.2	50.8 ± 16.2	0.001			
BMI, kg/m <sup>2</sup>	23.2 ± 3.6	23.5 ± 3.3	23.0 ± 3.7	<0.001			
Systolic BP, mmHg	122 ± 24	124 ± 22	121 ± 25	<0.001			
Diastolic BP, mmHg	76 ± 11	78 ± 11	75 ± 11	<0.001			
Smoker, n (%)	2611 (15.1)	1851 (38.4)	760 (6.1)	<0.001			
Drinker, n (%)	2508 (14.6)	1674 (34.7)	834 (6.7)	<0.001			
<b>BMI profiles:</b>	<i>N (%)</i>	<i>Cumulative %</i>	<i>N (%)</i>	<i>Cumulative %</i>	<i>N (%)</i>	<i>Cumulative %</i>	<i>P values</i>
<17.0 kg/m <sup>2</sup>	360 (2.1)	2.1	80 (1.7)	1.7	280 (2.3)	2.3	0.014
≥17.0-18.4 kg/m <sup>2</sup>	984 (5.7)	7.8	185 (3.8)	5.5	799 (6.4)	8.7	<0.001
≥18.5-22.9 kg/m <sup>2</sup>	7391 (42.9)	50.7	1870 (38.8)	44.3	5521 (44.5)	53.1	<0.001
≥23.0-24.9 kg/m <sup>2</sup>	3477 (20.2)	70.8	1133 (23.5)	67.8	2344 (18.9)	72.0	<0.001
≥25.0-27.4 kg/m <sup>2</sup>	2957 (17.1)	88.0	1004 (20.8)	88.6	1953 (15.7)	87.7	<0.001
≥27.5-29.9 kg/m <sup>2</sup>	1404 (8.1)	96.1	409 (8.5)	97.1	995 (8.0)	95.7	0.310
≥30.0-32.4 kg/m <sup>2</sup>	432 (2.5)	98.6	94 (1.9)	99.0	338 (2.7)	98.5	0.004
≥32.5-34.9 kg/m <sup>2</sup>	173 (1.0)	99.6	33 (0.7)	99.7	140 (1.1)	99.6	0.009
≥35.0-37.4 kg/m <sup>2</sup>	48 (0.3)	99.9	10 (0.2)	99.9	38 (0.3)	99.9	0.270
≥37.5-39.9 kg/m <sup>2</sup>	8 (0.0)	100.0	1 (0.0)	99.9	7 (0.1)	100.0	0.330
≥40.0 kg/m <sup>2</sup>	8 (0.0)	100.0	3 (0.1)	100.0	5 (0.0)	100.0	0.548

### Subjects and Methods

From April 1996 to August 1997, 17242 subjects aged 15 or above from the community of Hong Kong present themselves voluntarily at the United Christian Nethersole Community Health Service (UCHCNS) Centers for health assessment. UCNCHS is a self-funded, non-profit making organization with the objective of health promotion through primary health care and education. Subjects came from different districts all over Hong Kong. All Hong Kong citizens are entitled to join the health-screening program for a modest fee (average HK\$700).

Smokers and drinkers were defined as those having current smoking or drinking respectively. Demographic data including height and weight (measured to the nearest

0.1kg) were documented following a standard protocol with the subject in light clothing without shoes. BMI was calculated as weight (in kg) divided by the square of height (in meter). After sitting for at least 5 minutes, blood pressure (BP) was measured in the right arm with a standard mercury sphygmomanometer. The Korotkoff sound V was taken as the diastolic BP. Prevalence of categories at various BMI cutoff points as suggested by the WHO expert consultation in 2004 was reported.<sup>11</sup> Prevalence of overweight and obesity as defined by Working Group on Obesity in Mainland China in 2002 and the joint proposal of redefining obesity in Asians by WHO WPR, IASO and IOFT was also reported.<sup>9,10</sup>



**Figure 2.** Prevalence of underweight (body mass index <18.5 kg/m<sup>2</sup>) of the 17242 subjects according to their age and gender.

### Statistical analysis

Statistical analyses were performed using the SPSS (version 10.0) software on an IBM compatible computer. All results were expressed as mean  $\pm$  SD or  $N$  (%) where appropriate. Student's *t*-test and Chi-square test were used for between group comparisons. A  $P < 0.05$  (2-tailed) was considered to be significant. Age-standardized prevalence rates of overweight and obesity were calculated using direct standardization with the overall Hong Kong population distribution by age and sex according to the 1997 Hong Kong Census.<sup>13</sup> This study was conducted in accordance with the internationally agreed ethical principles for the conduct of medical research.

### Results

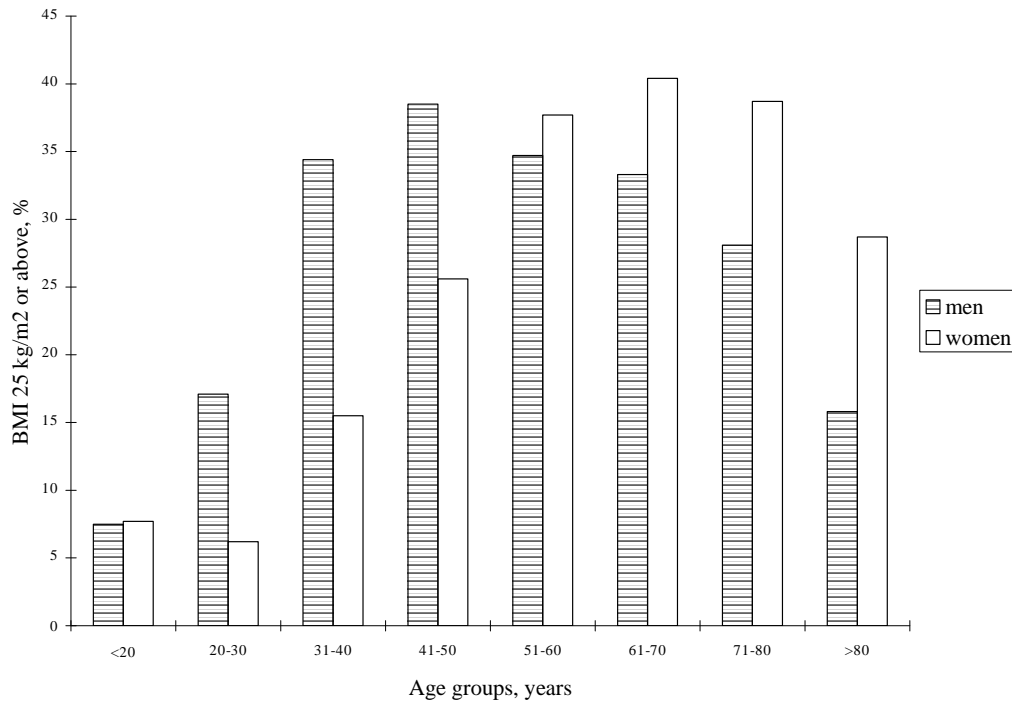
Of the 17242 subjects, there were 4822 (28.0%) men and 12420 (72.0%) women. The mean age ( $\pm$  SD) was 51.0  $\pm$  16.2 years (range 15-96 years, median 49.6 years) (men: range 15-96 years, median 50.2 years; women: range 15-90 years, median 49.4 years). There were 38.4% men and 6.1% women who smoke. Table 1 summarizes their clinical characteristics and BMI profiles. Concerning socioeconomic status, 41.4% of our subjects were housewives or had retired. Among the rest, 14.3% were professional or managerial, 49.4% were non-manual skilled workers, 34.7% were manual skilled workers and 1.6% were non-

skilled workers. The mean BMI levels of the 17242 subjects according to their age and gender are shown in Figure 1. The BMI peaks at age 30 to 50 years in men and 50 to 70 years in women. Based on the 1997 Hong Kong Census statistics of the overall Hong Kong population data, the age-standardized prevalence rates of underweight (BMI <18.5%), overweight and obesity as defined by various BMI cutoff were summarized in Table 2. Using the international definition of obesity by WHO<sup>2</sup>, the age-standardized prevalence of BMI  $\geq 30$  kg/m<sup>2</sup> in Hong Kong Chinese is only 3.0% in men and 3.2% in women. Using the revised definition by WHO WPR, IASO and IOTF<sup>9</sup>, the age-standardized prevalence of BMI  $\geq 25$  kg/m<sup>2</sup> in Hong Kong Chinese is 29.1% in men and 21.3% in women. Using the definition by Working Group on Obesity in Mainland China<sup>10</sup>, the age-standardized prevalence of BMI  $\geq 28$  kg/m<sup>2</sup> in Hong Kong Chinese is 8.5% in men and 9.2% in women. Figures 2 shows the prevalence of underweight in the 17242 subjects according to their age and gender. In particular, 35.9% and 27.8% of women and 27.5% and 10.3% of men aged 15-20 and 20-30 years, respectively, were underweight (BMI <18.5 kg/m<sup>2</sup>). Figures 3 and 4 show the crude prevalence of overweight and obesity as defined by various BMI cutoff levels in different age groups.

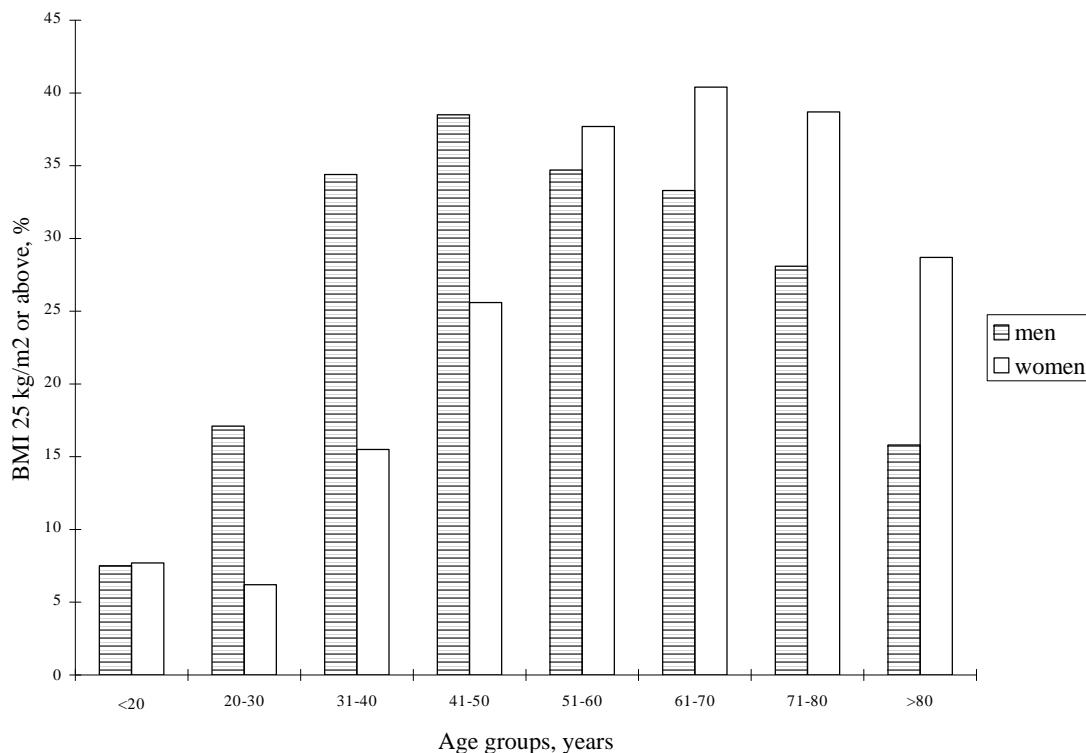
**Table 2.** Age-standardized prevalence of underweight, overweight and obesity as defined by various BMI cutoffs in the 17242 subjects

*Categories	Crude prevalence, %			#Age-standardized prevalence, %		
	Total	Men	Women	Total	Men	Women
BMI <18.5 kg/m <sup>2</sup>	7.8	5.5	8.7	11.9	7.5	13.6
BMI $\geq 23$ kg/m <sup>2</sup>	49.4	55.8	46.9	40.9	50.4	37.2
BMI $\geq 25$ kg/m <sup>2</sup>	29.2	32.2	28.0	23.4	29.1	21.3
BMI $\geq 28$ kg/m <sup>2</sup>	9.8	8.8	10.1	7.9	8.5	9.2
BMI $\geq 30$ kg/m <sup>2</sup>	3.9	2.9	4.3	3.2	3.0	3.2

#Direct age standardization based on the 1997 Hong Kong Census statistics of the overall Hong Kong population data. \*Categories: BMI <18.5 kg/m<sup>2</sup>: underweight according to World Health Organization (WHO) international definition, BMI  $\geq 23$  kg/m<sup>2</sup>: overweight according to WHO Western Pacific Region (WPR), International Association for the Study of Obesity (IASO) and International Obesity Task Force (IOTF) in the year 2000 BMI  $\geq 25$  kg/m<sup>2</sup>: obesity according to WHO WPR, IASO and IOTF in the year 2000, overweight according to WHO international definition BMI  $\geq 28$  kg/m<sup>2</sup>: obesity according to the Working Group on Obesity in Mainland China in the year 2002 BMI  $\geq 30$  kg/m<sup>2</sup>: obesity according to WHO international definition.



**Figure 3.** Prevalence of people with body mass index  $\geq 25.0$  kg/m<sup>2</sup> of the 17242 subjects according to their age and gender



**Figure 4.** Prevalence of people with body mass index  $\geq 30.0$  kg/m<sup>2</sup> of the 17242 subjects according to their age and gender

### Discussion

Data of the present report has to be interpreted with caution since our subjects attend the examination voluntarily and may be more aware of their health and consequently 'healthier' than the general population. The small proportion of subjects with low socio-economic status (only 1.6% were non-skilled workers) may also imply a 'healthier' sample in our study.<sup>14</sup> However, the percentage of smoking in this study is similar to that

reported in general population. The potential 'healthier' sample may be one reason accounting for the low prevalence of obesity in this study (age-standardized prevalence ~3% at BMI cutoff point of 30 kg/m<sup>2</sup>). However, if we use the modified definition of obesity by WHO WPR, IASO and IOTF at BMI cutoff point of 25 kg/m<sup>2</sup>, the age-standardized prevalence of obesity was 29.1% in men and 21.3% in women. These figures are actually similar to or

even higher than those reported in other Asian countries such as Japan.<sup>15,16</sup> Nevertheless, there was increasing evidence of the emerging high prevalence of type 2 diabetes and other obesity-related morbidity in Asia where the average BMI is below the international cutoff point for overweight of 25 kg/m<sup>2</sup>.<sup>17,18</sup> This favors the need for having different BMI cutoff levels among different ethnic groups. The obesity prevalence (age standardized) of 21-29% in Hong Kong Chinese is similar to that in U.S. and may probably represent a genuine picture that obesity is reaching epidemic in both East and West of the world. In addition, the crude prevalence of BMI  $\geq$ 25 kg/m<sup>2</sup> in this study was slightly higher than that reported from a working population survey in 1990 (29.2% vs. 27.7%) suggesting the problem of obesity may be deteriorating in Hong Kong.<sup>19</sup>

Many Asian countries studied their own populations and confirmed that Asians generally have a higher BF% than Caucasians of the same BMI.<sup>3,4,6-8</sup> It is now generally accepted that the WHO international classification with BMI cutoff points of  $\geq$ 25 kg/m<sup>2</sup> as overweight (or pre-obese) and  $\geq$ 30 kg/m<sup>2</sup> as obesity are too high for Asians.<sup>20,21</sup> On the other hand, there is no good data indicating one clear BMI cutoff point for all Asians for obesity. The recent WHO expert consultation suggest the category of BMI 18.5-23.0 kg/m<sup>2</sup> is associated with acceptable health risk while 23.0-27.5 kg/m<sup>2</sup> is associated with increased health risk and  $\geq$ 27.5 kg/m<sup>2</sup> a higher risk.<sup>11</sup> The additional trigger point for public health action at 27.5 kg/m<sup>2</sup> is similar to the revised definition of obesity as BMI  $\geq$ 28.0 kg/m<sup>2</sup> by the Working Group on Obesity in Mainland China.<sup>11</sup>

It cannot be over-emphasized that the association between increasing BMI and health risk is a continuum. Nevertheless, BMI cutoff levels are essential for public health education, epidemiological analysis, facilitation of clinical judgment and decision making on the management of obesity. Whether BMI of 25.0, 27.5 or 28.0 kg/m<sup>2</sup> should be regarded as the cutoff point for obesity in Hong Kong remains unsettled and requires further long-term outcome studies. For the time being, in Hong Kong, it may be advisable to have BMI of 23.0 kg/m<sup>2</sup> as the cutoff point for overweight or pre-obese state. Subjects with BMI  $\geq$ 23 kg/m<sup>2</sup> should be alerted of increased health risk. The category of BMI 25.0-27.5 kg/m<sup>2</sup> represents 'early' obesity in Hong Kong Chinese such that this group of subjects is already suffering from a chronic disease since obesity is associated with a definite long-term morbidity and higher risk of mortality. The category of BMI  $\geq$ 30.0 kg/m<sup>2</sup> represents severe obesity in Hong Kong Chinese such that early assessment by physicians on their cardiovascular risk status, lifestyle pattern and relevant hormonal profile is warranted.

Despite the overall awareness of the problem of obesity in Hong Kong is much improved nowadays, there are people misinterpreting the information such that some of them, especially some young ladies, are eager to have weight reduction or so-called 'slimming' despite their BMI are normal or even low. It is alarming to find that more than one-quarter of Hong Kong women aged 20-30 years are actually underweight i.e. BMI <18.5 kg/m<sup>2</sup>. Only ~15% of this group of subjects were overweight

with BMI  $\geq$ 23 kg/m<sup>2</sup>. Both the government and medical professionals are responsible to disseminate to the community the correct message of healthy body weight. On the one hand, we try our best to combat the problem of obesity. On the other hand, we encourage normal and healthy body build but not underweight.

In conclusion, WHO encourage the reporting of all categories of BMI cutoff points at 17.0, 18.5, 23.0, 25.0, 27.5, 30.0, 32.5, 35.0, 37.5, and 40.0 kg/m<sup>2</sup> for the facilitation of international comparisons. The age-standardized prevalence of obesity in Hong Kong as defined by BMI  $\geq$ 25 kg/m<sup>2</sup> was 29% in men and 21% in women. The prevalence of underweight (BMI <18.5 kg/m<sup>2</sup>) was also high in young Hong Kong Chinese adults. The correct concept of normal BMI is essential for a healthy community. The understanding of underweight being BMI <18.5 kg/m<sup>2</sup> and overweight being BMI  $\geq$ 23.0 kg/m<sup>2</sup> should be properly propagated to Hong Kong Chinese.

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## Original Article

# Prevalence of obesity, overweight and underweight in a Hong Kong community: the United Christian Nethersole Community Health Service (UCNCHS) primary health care program 1996-1997

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## 香港某一社区肥胖、超重及体重过轻的流行率：基督教联合那打素社区健康服务初级保健计划1996-1997

本具有代表性的观察性研究的目的一是全面评估香港华人的体重指数情况，二是如世界卫生组织建议的那样，确定各种健康状况下体重指数的截止点。在1996年4月至1997年8月期间，共有17242（4822男性和12420女性）名15岁以上来自于香港基督教联合那打素社区的三个健康中心的人自愿参加了这项初级健康评估。他们的平均年龄为51.0 ± 16.2岁（年龄范围为15-96岁，平均为49.6岁）。男性的平均体重指数为23.5 ± 3.3 kg/m<sup>2</sup>，女性为23.0 ± 3.7 kg/m<sup>2</sup>。男性的体重指数在30-50岁达到峰值，女性则在50-70岁达到峰值。香港华人体重指数 ≥ 30 kg/m<sup>2</sup>的年龄标准化流行率为男性3.0%，女性3.2%；体重指数25 kg/m<sup>2</sup>的年龄标准化流行率为男性29.1%，女性21.3%。对于体重过轻，分别有35.9%和27.8%年龄为15-20岁和20-30岁的女性，27.5%和10.3%年龄为15-20岁和20-30岁的男性的体重指数 < 18.5 kg/m<sup>2</sup>。总之，香港华人中体重指数 ≥ 25 kg/m<sup>2</sup>的占显著比例。年龄小于30岁的香港华人中，存在体重过轻的高流行率。

**关键词：** 体重指数、肥胖、超重、体重过轻、香港华人。