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Section: International comparison of health determinants

Body mass index, waist hip ratio, and waist circumference: which measure to classify obesity?

Summary

Objectives: To determine the proportion of a representative population sample of adults in South Australia who have a body mass index (a measure of overall obesity) classified as normal or underweight, but who also have a waist circumference or waist hip ratio (measures of central obesity) that indicates obesity.

Methods: A representative population sample of adults aged 18 years and over living in the north west region of Adelaide (n = 2523) were recruited to the study. Clinical measures of height, weight, waist and hip circumference were obtained and used to determine body mass index, waist hip ratio and waist circumference.

Results: Among women with a normal body mass index, 19.0 % had a high waist circumference (≥ 80 cm) and 8.5 % had a high waist hip ratio (> 0.85). Among males with a normal body mass index, 3.4 % had a high waist circumference (≥ 95 cm) and 0.1 % had a high waist hip ratio (>1.0).

Conclusions: Body mass index, waist hip ratio and waist circumference all have a role in the identification of those who are obese or overweight.

Keywords: **Body mass index – Height – Weight – Anthropometry – Abdominal obesity – Central obesity.**

The prevalence of obesity is increasing in many developed and developing countries (Doll et al. 2002; Ho et al. 2001; Lev-Ran 2001). Obesity has been linked with the incidence of chronic conditions such as diabetes, cancer, cardiovascular disease, hypertension, hyperglycemia, and hypercholesterolemia (Doll et al. 2002; Defay et al. 2001; Despres et al. 2001; Ho et al. 2001; Lev-Ran 2001; McCarthy et al. 2001; IARC 2001; Hu et al. 2000). Laboratory measures of obesity, such as body potassium, body density and total body water are expensive in terms of time and equipment costs and are impractical for use in large-scale population studies (Reilly et al. 2000; Bandini & Dietz 1987). As a result, anthropometric measures and associated indices have been used in an attempt to identify those with a high level of obesity and who may be at risk of developing chronic health conditions.

Body mass index (BMI), based on self-reported or clinically assessed height and weight, is an accepted, inexpensive measure to determine overweight or obesity used in population studies due to the general ease and accuracy of the measurement required in order to calculate the index (Malina & Katzmarzyk 1999). BMI is determined by dividing weight (in kilograms) by height (in metres^2) and is regarded as a measure of the total body fat (Doll et al. 2002; Lev-Ran 2001), that is, a measure of overall obesity. A high BMI has been identified as a risk factor for development of conditions such as diabetes and cardiovascular disease (Hu et al. 2000; WHO 1998; Australian Centre for Diabetes Strategies 2000).

An android or centralised pattern of fat distribution, where excess body fat is distributed in the abdominal region rather than on the hips and thighs, has also been demonstrated to be an important consideration in chronic disease incidence (Despres et al. 2001; Ho et al. 2001, Lev-Ran 2001; Australian Centre for Diabetes Strategies 2000; WHO 1998; Lean et al. 1995). Waist circumference (WC) and hip circumference (HC) are the two basic anthropometric measurements taken and WC is divided by HC in order to create the waist hip ratio (WHR). Both WC and WHR provide an indication of abdominal obesity (Doll et al. 2002; Ho et al. 2001; Assayama et al. 2000; Lev-Ran 2001; Lean et al. 1995).

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In order to determine whether populations are at risk of chronic disease, cutoff values have been determined for BMI, WC and WHR. These values provide an indication of the proportion of the population "at risk" of chronic diseases, although even those that gain weight within the range considered "normal" may be at greater risk of diseases such as cancer (IARC 2001). The cut-off values for BMI are 25 kg/m^2, which indicates an overweight adult, and 30 kg/m^2, which identifies an obese adult (Cole et al. 2000; WHO 1998).

Several cut-offs have been proposed for WC and WHR, indicators of abdominal fat accumulation, based on their association with relative risk of disease (Molarius & Seidell 1998). Studies conducted by Han et al. (1995) and Lean et al. (1995) suggested that men with a WC of 94 cm or greater and women with a WC of 80 cm or greater should not gain further weight. A WC of 102 cm or greater for men and 88 cm or greater for women, was the level suggested for weight reduction to occur (Han et al. 1995; Lean et al. 1995). These cut-off values were also used by Booth et al. (2000). Adoption of these recommended "action levels" was suggested by the Australian Centre for Diabetes Strategies (2000) with an adjustment for men to a WC of 95 cm or greater as the endpoint for not gaining more weight, and the reduction of weight limits being 100 cm or greater for men and 90 cm or greater for women. This paper defines a high WHR as 1.0 for males and 0.85 for females (Australian Centre for Diabetes Strategies 2000). These cut-offs, however, vary according to the population groups being described and care is required when examining associations for populations other than Caucasians (Lev-Ran 2001; Australian Centre for Diabetes Strategies 2000; Booth et al. 2000; Molarius et al. 1999; Molarius & Seidell 1998; Han et al. 1995; Lean et al. 1995).

The risk of chronic disease has been shown to vary according to the measure of obesity used. Strong positive associations have been demonstrated between BMI, hypertension, cardiovascular disease and diabetes (Despres et al. 2001; Lev-Ran 2001; Hu et al. 2000; WHO 1998). Defay et al. (2001) found that in older males the prevalence of diabetes was associated with total body fat whereas in older females abdominal fat as measured by WHR was associated with diabetes. Ho et al. (2001) also demonstrated an effect of gender on the association of BMI, WC and WHR and metabolic syndrome, with BMI and WC useful in assessing cardiovascular risk factors in males and WC and WHR the most useful for women. Other studies have also indicated an association of WC with metabolic functions and coronary heart disease and increased mortality (Defay et al. 2001; Despres et al. 2001; McCarthy et al. 2001; Visscher et al. 2001; Lean et al. 1995). There is also evidence to suggest that BMI may not be sufficiently sensitive as a risk factor, as discrepancies can occur in defining obese populations, depending on the measurement of central or overall obesity used (Lev-Ran 2001; Roubenoff et al. 1995). Booth et al. (2000) examined the relationship between BMI and WC for males and females and found that the prevalence of overweight based on self-reported BMI and WC combined was significantly greater than the prevalence based on self-reported BMI alone.

This paper examines measurements of BMI, WC and WHR taken on a population sample to determine the level of overall and central obesity using different methods of classifying obesity. The WC and WHR of those subjects with a normal or underweight BMI were determined in order to assess whether these subjects would be classified as obese using different criteria. Demographic characteristics of those classified with a normal or underweight BMI but high central obesity are also examined.

Methods

Sample selection

The sample described in this paper was obtained from the North West Adelaide Health Study, a collaboration between the North Western Adelaide Health Service (The Queen Elizabeth Hospital and Lyell McEwin Health Service campuses), the South Australian Department of Human Services, The University of Adelaide, and the University of South Australia. This study is one of the first of its kind in Australia to provide a comprehensive health assessment of specified chronic health conditions in the adult population of a particular community (Centre for Population Studies in Epidemiology 2002a; 2002b). The north west region of Adelaide was considered a priority study area because it is identified as having overall greater relative social disadvantage compared with many other areas of South Australia and previous evidence from population surveys (Wilson et al. 1992) and studies indicate higher levels of chronic disease and risk factors in the region (Pilotto et al. 1999).

All households in the north western area of Adelaide with a telephone connected and a number listed in the Electronic White Pages (EWP) were eligible for selection in the study. A household was randomly selected from the EWP and an introductory letter and an information brochure were sent to the householder. Within each household, the person aged 18 years or over who was last to have a birthday was selected and interviewed using Computer-Assisted Telephone Interview (CATI) technology and invited to attend a clinic assessment. Up to 10 call-backs were made to each selected household to obtain an interview. There was no replacement

for refusal or non-response. During the recruitment process, appointments were made to call back pregnant women after their expected delivery date.

Data collection

During the telephone recruitment interview, information was collected on contact details, demographic information, self-reported health conditions, mental health, smoking status and where respondents refused to take part in the study, the reasons behind the refusal. Demographic questions included age, sex, area of residence, highest education level obtained, gross household income, country of birth, marital status, and work status. If participants agreed to attend for a clinic assessment, an appointment was made at either The Queen Elizabeth Hospital or the Lyell McEwin Health Service, two teaching hospitals located in the western and northern suburbs of Adelaide, South Australia. Participants were sent an information folder that contained information about the location of the clinic, confirmation of their appointment and a further questionnaire that they completed and returned when they attended their appointment. This questionnaire also examined issues such as quality of life, mental health, health service use, risk factor prevalence and health conditions in more detail.

Measurements taken within the clinic setting included blood pressure and spirometry. A fasting blood sample was taken to determine cholesterol and glucose levels and skin tests were performed to test sensitivity to a variety of irritants. The four measurements taken to determine the level of obesity were height, weight, waist circumference and hip circumference. These measurements were taken by assistants who had undergone rigorous training prior to the commencement of the clinic sessions.

Height was measured to the nearest 0.5 cm using a stadiometer, and weight to the nearest 0.1 kg in light clothing and without shoes using standard digital scales. BMI was calculated as weight (kg)/height $(m)^2$. Overweight was defined as BMI > 25 kg/m^2 and obesity as BMI > 30 kg/m^2 (National Heart Foundation 1989).

WC was measured to the nearest 0.1 cm using an inelastic tape maintained in a horizontal plane, with the subject standing comfortably with weight distributed evenly on both feet. The measurement was taken at the level of the narrowest part of the waist. The mean of three measurements was calculated. Hip circumference was also measured using an inelastic tape, at the level of the maximum posterior extension of the buttocks. Three measurements were taken and the average of the three was calculated. A high WHR was defined as > 1.0 for males and > 0.85 for females (Australian Centre for Diabetes Strategies 2000). A WC of ≥ 95 cm for males or ≥ 80 cm for females was defined as the level at which no further weight should be gained. A WC of ≥ 100 cm for males and ≥ 90 cm for females was defined as the level at which weight reduction should be recommended (Han et al. 1995; Lean et al. 1995).

Statistical analyses

The data were weighted to the Australian Bureau of Statistics 1999 Estimated Residential Population (Australian Bureau of Statistics 2000) by region, age group, sex, and probability of selection in the household, to ensure that the sample was representative of the North West region of Adelaide. The data were analysed using SPSS version 10.0 (Statistical Package for the Social Sciences 1999) and Epi Info 6.0 (Dean et al. 1994). Chi-square tests were performed to compare the prevalence of overweight and obesity for each measure between males and females. The proportion of males and females with normal or underweight BMI who also had a high WHR or WC was determined. Univariate analyses were conducted to determine odds ratios for demographic variables associated with a normal or underweight BMI but a high WHR or WC among females. Males were not included in these analyses because only a small number were classified with a normal or underweight BMI but a high WHR or WC. Supplementary tables in the Appendix report the percentiles P10, P25, P50, P75, P90, as well as the mean and standard deviation (SD) for the continuous variables of BMI, WHR, and WC for males and females by age group.

Results

Of the total eligible sample (n = 4951), 74% (n = 3650) took part in the initial telephone interview and 51% (n = 2523) attended the clinic. The response rate for attendance at the clinic among those who were interviewed was 69%.

The distributions of BMI, WHR, and WC for males and females by age group are shown in the Appendix. The overall prevalence of overweight, as measured by BMI, was 35.2% (95% CI: 33.3–37.1) and the prevalence of obesity was 28.5% (95% CI: 26.8–30.4). Overall, 16.7% (95% CI: 15.3–18.3) were classified as having a high WHR. According to the WC measure, 57.4% (95% CI: 55.4–59.3) were at the level where they should be advised to gain no further weight and 36.7% (95% CI: 34.8–38.6) were at the level where they should be advised to lose weight. Table 1 shows the prevalence of overweight as measured by BMI, WHR and WC, by sex. Males were statistically significantly more likely than females to be overweight or obese according to their BMI. Females, however, were statistically significantly more likely to

Table 1 Prevalence of overweight and obesity according to BMI, WHR, and WC

	Males		Females		Overall	
	n	%	n	%	n	%
BMI (> 25, overweight/obese)						
no	377	30.5 ∨	538	41.8 ∧	915	36.3
yes	859	69.5 ∧	749	58.2 ∨	1608	63.7
WHR (obese) (> 1.0 men, > 0.85 women)						
no	1145	92.7 ∧	956	74.2 ∨	2101	83.3
yes	90	7.3 ∨	332	25.8 ∧	422	16.7
WC (lose weight) (≥ 100 cm men, ≥ 90 cm women)						
no	788	63.8	808	62.8	1597	63.3
yes	447	36.2	479	37.2	926	36.7
WC (not gain weight) (≥ 95 cm men, ≥ 80 cm women)						
no	567	45.9 ∧	508	39.5 ∨	1075	42.6
yes	668	54.1 ∨	779	60.5 ∧	1448	57.4

∧ ∨ Statistically significantly higher or lower than comparison gender group.

have a high WHR or a WC where they should be advised to gain no further weight.

The proportion of participants with normal or underweight BMI, by age and sex, who had a high WHR or WC are shown in Table 2. Overall, 5.0% of people with normal or underweight BMI had a high WHR. Only 0.1% of males with normal or underweight BMI had a high WHR. Among females with normal or underweight BMI, however, 8.5% overall had a high WHR, and 26.3% aged 60 years or over had a high WHR.

Among participants who were normal or underweight according to their BMI, 1.1% (0.6% of males, 1.5% of females) had a WC at the level where they should be advised to lose weight. In terms of a WC at the level where they should be advised to gain no further weight, 12.6% of participants (3.4% of males, 19.0% of females) with normal or underweight BMI had a WC at this level. Among females aged 60 years and over with normal or underweight BMI, 43.1% had a WC at this level.

Of those participants with a high WHR, 10.9% (n = 47) were classified as normal or underweight according to their BMI (9.9% were normal and 0.9% were underweight). Of participants with a WC at the level where they should be advised to gain no further weight, 7.8% (n = 114) were classified as normal or underweight according to their BMI (7.6% were normal and 0.2% were underweight). Of participants with a WC at the level where they should be advised to lose weight, 0.9% (n = 9) were classified as normal according to their BMI.

Table 2 Proportion (%) of participants with normal or underweight BMI, by sex and age group, who have high WHR and/or WC

BMI ≤ 25 kg/m²		WHR		WC			
Males	**n**	**≤1.0**	**>1.0**	**<100 cm**	**≥100 cm[a]**	**<95 cm**	**≥95 cm[b]**
Age group (years)							
18–39	247	100.0	–	100.0	–	99.3	0.7
40–59	75	99.6	0.4	99.6	0.4	93.1	6.9
60+	55	100.0	–	96.3	3.7	89.2	10.8
All ages	377	99.9	0.1	99.4	0.6	96.6	3.4
Females	**n**	**≥0.85**	**>0.85**	**<90 cm**	**≥90 cm[a]**	**<80 cm**	**≥80 cm[b]**
Age group (years)							
18–39	324	96.1	3.9	99.0	1.0	89.2	10.8
40–59	136	91.0	9.0	99.1	0.9	75.3	24.7
60+	78	73.7	26.3	95.5	4.5	56.9	43.1
All ages	538	91.5	8.5	98.5	1.5	81.0	19.0
Overall	915	95.0	5.0	98.9	1.1	87.4	12.6

[a] Action level at which weight should be reduced.
[b] Action level at which no further weight should be gained.

Among males with a high WHR, 0.3% had normal or underweight BMI. In the case of WC, 1.9% of males with a high WC (≥ 95 cm) had a normal or underweight BMI. Among females, with a high WHR, 13.7% had a normal or underweight BMI. Table 3 describes the demographic characteristics associated with normal or underweight BMI among females with a high WHR. That is, the characteristics of females who would be missed, or not classified as being overweight or obese, if only the BMI and not the WHR measure was used. Among females with a high WHR, those with a normal or underweight BMI were significantly more likely than those with overweight or obese BMI to have a bachelor degree or higher level of education, have been born in Asia or an "other" country and be widowed, and less likely to be aged 40 to 59 years and live in the northern suburbs of Adelaide.

Among females with a high WC (≥ 80 cm), 13.0% had a normal or underweight BMI. Table 4 shows the demographic characteristics associated with normal or underweight BMI among females who had a high WC (≥ 80 cm). Among females with a high WC, those with a normal or underweight BMI were significantly more likely than those with an overweight or obese BMI to have a bachelor degree or higher level of education and be widowed, and less likely to be born in the northern suburbs of Adelaide.

Discussion

Obesity continues to be a major health risk factor in today's society and can be considered a disease in its own right (WHO 1998). Difficulties remain, however, as to how best to measure it on a large scale or population basis. Measurements such as BMI, WC and WHR have all been used in an attempt to define obesity and overweight.

Cut-off points are used for anthropometric measures to describe associations between obesity and relative risk of disease (Molarius & Seidell 1998). Despite the growing body of evidence supporting specific cut-off points, their selection is largely arbitrary (Molarius & Seidell 1998). Cut-off points continue to be used because of their importance in setting public health recommendations and comparing populations (Molarius & Seidell 1998). It must be recognised, however, that BMI, WHR, and WC are continuous variables and the risk of disease increases, often linearly, with increasing obesity.

The results described in this paper suggest that different "fatness" criteria are measured when determining obesity using BMI, WHR or WC measurements. According to BMI measurements, 63.7% of participants were defined as overweight or obese. In contrast, 57.4% of participants would be advised to not gain further weight and 36.7% to lose weight if their WC measurement was used as the indicator of obesity. When considering WHR, 16.7% of participants had a high WHR. In

Table 3 Univariate odds ratios for demographic variables associated with normal or underweight BMI among females with a high WHR

Variable	n	%	OR	(95% CI OR)	p value
Age group (years)					
18 to 39	13/61	20.6	1.00		
40 to 59	12/129	9.5	0.41	(0.17–0.95)	0.04
60+	21/141	14.6	0.66	(0.30–1.43)	0.3
Area of residence					
western suburbs	23/118	19.7	1.00		
northern suburbs	22/213	10.4	0.47	(0.25–0.89)	0.02
Highest education level obtained					
secondary	22/199	11.0	1.00		
trade/Apprenticeship/Cert/Diploma	14/100	14.1	1.32	(0.65–2.71)	0.4
bachelor degree or higher	6/17	38.9	5.14	(1.74–15.17)	0.003
Gross household income					
up to $20000	23/129	17.5	1.00		
$20001–40000	7/76	9.1	0.47	(0.19–1.17)	0.1
$40001–60000	4/50	7.6	0.39	(0.12–1.21)	0.1
more than $60000	9/42	20.0	1.18	(0.49–2.85)	0.7
Country of birth					
Australia	27/202	13.2	1.00		
UK or Ireland	11/80	13.2	0.99	(0.46–2.14)	0.9
Europe, USSR, Baltic States	3/33	9.5	0.69	(0.20–2.37)	0.6
Asia, Other	5/11	45.8	5.54	(1.59–19.35)	0.007
Marital status					
married or living with partner	25/212	12.0	1.00		
separated/Divorced	2/33	5.0	0.39	(0.08–1.94)	0.2
widowed	14/51	27.0	2.71	(1.29–5.69)	0.008
never married	5/32	14.0	1.19	(0.41–3.49)	0.7
Work status					
employed	15/103	14.1	1.00		
unemployed/Home duties/ retired/Student	29/221	13.0	0.91	(0.46–1.79)	0.8

Table 4 Univariate odds ratios for demographic variables associated with normal or underweight BMI among females with a high WC (≥ 80 cm)

Variable	n	%	OR	(95 % CI OR)	p value
Age group (years)					
18 to 39	33/223	15.0	1.00		
40 to 59	34/284	11.8	0.76	(0.45–1.27)	0.3
60+	34/271	12.5	0.81	(0.48–1.35)	0.4
Area of residence					
western suburbs	53/297	17.9	1.00		
northern suburbs	48/480	9.9	0.50	(0.33–0.77)	**0.001**
Highest education level obtained					
secondary	47/435	10.8	1.00		
trade/Apprenticeship/Cert/Diploma	35/251	14.0	1.34	(0.84–2.14)	0.2
bachelor degree or higher	15/59	25.7	2.85	(1.48–5.49)	**0.002**
Gross household income					
up to $20 000	40/268	15.0	1.00		
$20 001–40 000	17/180	9.5	0.59	(0.32–1.08)	0.09
$40 001–60 000	16/145	11.3	0.72	(0.39–1.33)	0.3
more than $60 000	23/126	18.4	1.28	(0.73–2.24)	0.4
Country of birth					
Australia	73/514	14.1	1.00		
UK or Ireland	18/156	11.3	0.78	(0.45–1.35)	0.4
Europe, USSR, Baltic States	5/75	7.3	0.48	(0.19–1.18)	0.1
Asia, Other	4/21	20.8	1.60	(0.53–4.77)	0.4
Marital status					
married or living with partner	63/521	12.1	1.00		
separated/Divorced	10/70	14.3	1.21	(0.59–2.49)	0.6
widowed	19/92	20.7	1.89	(1.07–3.34)	**0.03**
never married	8/82	9.5	0.76	(0.35–1.67)	0.5
Work status					
employed	46/305	15.0	1.00		
unemployed/Home duties/ retired/Student	51/458	11.2	0.71	(0.46–1.09)	0.1

addition, 1.8 % of participants had a BMI of 25 kg/m^2 or less but their WHR was over the cutoff point of 1.0.

Further support for the fact that BMI and WC or WHR measure different premises is provided by the fact that while some subjects were classified with a low or normal BMI, the WC measurement was within the action zone areas (either no more weight should be gained, or weight should be lost). This supports the view that there may be not be recognition of those at risk of chronic disease if BMI alone is used (Lev-Ran 2001; Roubenoff et al. 1995).

Participants with a low or normal BMI but a high WHR or WC were significantly more likely to be female. Investigation of the demographic characteristics of females with a high WHR or WC showed those with a normal or underweight BMI were more likely to have a bachelor degree or higher level education, be widowed and living in the western suburbs. Females have different body shapes to males and consequently a different distribution of fat (Perissinotto et al. 2002; Ho et al. 2001; Lev-Ran 2001). Although age itself was not a significant predictor of normal or underweight BMI among women with a high WC, being widowed is an indicator of older age, and provides an indication that BMI and WHR or WC may change in older females as a result of ageing and redistribution of fat (Perissinotto et al. 2002; Lev-Ran 2001). WC and WHR may therefore be more sensitive measures of obesity among older women. The significant association of Asian or "other" nationalities in the case of WHR may indicate the variation in body fat distribution among different ethnic groups (Lev-Ran 2001; Molarius & Seidell 1998; Deurenberg et al. 1999).

The results of this study indicate that while BMI is widely used to describe overweight and obesity, it may not be sensitive enough to detect all those who are overweight or obese and ultimately those who may be at risk of chronic diseases. WC measures central adiposity and this measurement also classifies those who should not gain further weight or who should lose weight. Females in particular appear more likely to be misclassified if BMI alone is used as a measure of obesity. At this stage the use of both measurements is warranted as different types of obesity are being assessed. Both central adiposity and total body fat appear to have a role in the identification of those who are obese.

The North West Adelaide Health Study has been designed as a prospective cohort study. Future analyses of this sample will therefore have the potential to determine the ability of each indicator of obesity to predict morbidity and mortality. The fact remains, however, that regardless of which measure is used to define obesity, the same policy development and health promotion initiatives are critical to reduce this public health epidemic.

Zusammenfassung

Body-Mass-Index, Taille-Hüft-Quotient und Taillenumfang: welcher ist das richtige Mass für die Bestimmung von Übergewicht?

Zielsetzungen: Die Bestimmung des Anteils an Erwachsenen in einer repräsentativen Bevölkerungsstichprobe in Südaustralien, die einen als normal oder untergewichtig geltenden Body-Mass-Index aufweisen (BMI, ein Mass zur Bestimmung von generellem Übergewicht), aber gleichzeitig einen für Adipositas typischen Taillenumfang oder Taille-Hüft-Quotient (ein Mass der zentralen Adipositas) aufweisen.

Methoden: Eine repräsentative Bevölkerungsstichprobe von Erwachsenen ab 18 Jahren, die im Nordwesten von Adelaide (n = 2 523) lebt, wurde rekrutiert. Zur Bestimmung von BMI, Taille-Hüft-Quotient und Taillenumfang wurden Körpergrösse und -gewicht, Taillen- und Hüftumfang erfasst.

Ergebnisse: Unter den Frauen mit normalem BMI hatten 19 % einen grossen Taillenumfang (≥ 80 cm) und 8,5 % hatten einen hohen Taille-Hüft-Quotient (> 0,85). Unter den Männern mit normalem BMI hatten 3,4 % einen grossen Taillenumfang (≥ 95 cm) und 0,1 % einen hohen Taille-Hüft-Quotient (> 1,0).

Schlussfolgerung: Alle Messgrössen, BMI, Taille-Hüft-Quotient und Taillenumfang müssen bei der Identifikation von übergewichtigen und adipösen Personen berücksichtigt werden.

Résumé

Indice de masse pondérale, rapport taille/hanche et circonférence de la taille: quelle est la bonne mesure de l'obésité?

Objectifs: Déterminer la proportion d'un échantillon représentatif de la population adulte du sud de l'Australie ayant un indice de masse corporelle (IMC, une mesure de l'obésité générale) classé comme normal ou pas, mais qui ont aussi une circonférence de la taille ou un rapport taille/hanche (qui sont des mesures d'obésité centrale) compatibles avec une obésité.

Méthodes: Un échantillon représentatif de la population adulte âgé de 18 ans et plus vivant dans la région Nord-Ouest d'Adélaide (n = 2523) a été recruté dans cette étude. Les mesures cliniques de la taille, du poids, la circonférence de la taille et des hanches ont été utilisées pour déterminer IMC et le rapport taille/hanche.

Résultats: Parmi les femmes ayant un IMC normal, 19 % avaient une circonférence de la taille élevée (≥ 80 cm) et 8,5 % avaient un rapport taille/hanche élevé (> 0.85). Parmi les hommes ayant un IMC normal, 3,4 % avaient une circonférence de la taille élevée (≥ 95 cm) et 0,1 % avaient un rapport taille/hanche élevé (> 1).

Conclusions: L'indice de masse corporelle, le rapport taille/hanche et la circonférence de la taille jouent tous un rôle dans l'identification des personnes obèses ou ayant du surpoids.

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Appendix

Table A1 Body mass index (BMI), waist hip ratio (WHR) and waist circumference (WC) among males, North West Adelaide, South Australia, 2000 (n = 1236)

Age group (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
BMI (kg/m²)							
18–19	55	19.3	20.0	22.3	25.2	27.1	23.0 (3.1)
20–24	165	20.3	21.4	24.5	27.6	33.4	25.2 (4.9)
25–29	130	20.7	23.5	26.1	31.2	35.5	27.9 (6.4)
30–34	120	21.4	23.6	26.9	30.5	35.1	27.9 (5.5)
35–39	106	23.4	24.7	26.8	30.6	33.9	27.6 (4.3)
40–44	131	23.5	25.9	28.2	31.2	36.6	29.0 (5.0)
45–49	97	23.4	25.3	28.0	29.8	33.1	27.9 (3.5)
50–54	98	24.7	26.1	28.4	31.2	35.8	29.0 (4.4)
55–59	67	23.9	25.7	29.2	33.2	38.4	30.0 (5.8)
60–64	71	24.0	26.2	28.5	30.9	34.0	28.9 (4.3)
65–69	61	24.2	26.2	28.7	30.9	35.5	29.2 (4.9)
70–74	57	24.1	26.2	28.1	29.7	32.7	28.0 (4.1)
75+	78	21.3	23.4	26.3	28.5	30.3	26.0 (3.7)

Table A1 (continued)

Age group (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
WHR							
18–19	55	0.80	0.81	0.84	0.89	0.89	0.84 (0.04)
20–24	165	0.77	0.80	0.86	0.90	0.92	0.86 (0.06)
25–29	130	0.81	0.84	0.88	0.92	0.99	0.89 (0.07)
30–34	120	0.84	0.87	0.90	0.95	0.98	0.91 (0.05)
35–39	106	0.86	0.88	0.92	0.94	0.97	0.92 (0.05)
40–44	131	0.89	0.91	0.94	0.98	1.00	0.94 (0.05)
45–49	97	0.87	0.89	0.93	0.96	0.99	0.93 (0.05)
50–54	98	0.87	0.91	0.95	0.98	1.03	0.95 (0.06)
55–59	67	0.89	0.92	0.95	0.99	1.03	0.96 (0.05)
60–64	71	0.90	0.92	0.95	0.99	1.02	0.95 (0.05)
65–69	61	0.89	0.92	0.95	0.99	1.02	0.95 (0.05)
70–74	57	0.89	0.92	0.95	0.99	1.02	0.95 (0.05)
75+	78	0.86	0.91	0.94	0.96	1.00	0.93 (0.05)
WC							
18–19	55	76.0	78.0	82.2	87.0	89.0	82.5 (6.2)
20–24	165	71.5	77.7	87.0	97.0	106.5	87.6 (13.6)
25–29	130	76.2	83.4	91.0	104.5	113.0	94.0 (17.0)
30–34	120	79.6	84.0	93.0	102.0	112.0	94.5 (12.6)
35–39	106	83.5	88.0	94.0	102.0	110.0	94.9 (10.2)
40–44	131	87.2	93.0	98.0	106.1	119.0	100.3 (12.3)
45–49	97	85.0	90.0	97.6	103.0	112.1	97.3 (9.7)
50–54	98	85.7	93.0	99.7	107.3	115.8	101.0 (12.0)
55–59	67	87.9	94.9	101.4	112.6	124.6	104.7 (15.2)
60–64	71	89.6	94.5	99.3	106.5	113.9	101.5 (10.9)
65–69	61	87.0	95.1	101.0	108.0	116.9	102.5 (14.0)
70–74	57	87.0	94.0	100.7	108.4	116.1	101.0 (10.4)
75+	78	85.4	89.7	96.9	103.9	108.5	96.7 (10.0)

Table A2 Body mass index (BMI), waist hip ratio (WHR) and waist circumference (WC) among females, North West Adelaide, South Australia, 2000 (n = 1 287)

Age group (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
BMI (kg/m²)							
18–19	90	20.5	21.7	23.6	26.4	40.0	25.8 (6.5)
20–24	118	18.8	20.8	22.2	29.5	30.9	23.9 (4.8)
25–29	116	19.7	21.6	24.8	32.2	36.3	26.8 (6.3)
30–34	126	19.7	21.4	23.9	29.9	35.7	25.9 (6.1)
35–39	100	21.3	22.7	26.5	31.2	36.3	27.6 (5.8)
40–44	134	20.7	22.8	26.4	31.5	37.8	28.2 (7.1)
45–49	93	21.8	24.1	28.1	33.8	37.5	29.2 (6.7)
50–54	106	22.6	24.8	27.9	32.7	37.0	29.2 (6.0)
55–59	80	21.9	24.5	28.1	31.9	36.1	28.6 (5.6)
60–64	66	23.3	25.5	28.3	31.2	37.1	28.9 (4.8)
65–69	70	22.1	24.5	28.2	32.5	36.3	28.7 (5.7)
70–74	63	22.2	25.2	28.5	31.4	36.9	28.9 (5.5)
75+	122	22.2	25.0	28.2	31.1	34.1	28.1 (4.5)
WHR							
18–19	90	0.71	0.74	0.77	0.79	0.87	0.78 (0.05)
20–24	118	0.69	0.72	0.76	0.79	0.83	0.76 (0.05)
25–29	116	0.71	0.73	0.77	0.81	0.88	0.78 (0.07)
30–34	126	0.73	0.74	0.78	0.82	0.86	0.79 (0.05)
35–39	102	0.74	0.76	0.79	0.83	0.88	0.80 (0.06)
40–44	134	0.73	0.75	0.80	0.86	0.89	0.81 (0.07)
45–49	93	0.74	0.77	0.81	0.86	0.90	0.82 (0.06)
50–54	106	0.75	0.78	0.82	0.86	0.90	0.82 (0.06)
55–59	80	0.74	0.77	0.82	0.88	0.93	0.83 (0.07)
60–64	66	0.75	0.78	0.82	0.89	0.93	0.83 (0.07)
65–69	70	0.75	0.78	0.83	0.88	0.92	0.83 (0.07)
70–74	63	0.77	0.81	0.85	0.88	0.94	0.85 (0.06)
75+	122	0.77	0.81	0.85	0.88	0.92	0.85 (0.06)

Table A2 (continued)

Age group (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
WC							
18–19	90	65.0	71.0	73.0	78.2	103.0	77.4 (12.5)
20–24	118	65.0	67.0	72.5	80.2	93.7	75.5 (10.8)
25–29	116	66.0	70.0	79.0	89.3	100.8	82.0 (14.3)
30–34	126	68.0	71.0	78.0	88.0	102.0	81.0 (13.5)
35–39	102	69.7	73.0	83.8	94.0	104.3	85.0 (14.0)
40–44	134	68.2	74.7	82.7	98.5	108.5	86.7 (15.7)
45–49	93	70.7	77.0	87.9	97.4	106.9	88.9 (14.9)
50–54	106	73.0	78.2	86.9	99.0	110.0	89.5 (14.0)
55–59	80	71.5	78.0	89.7	99.5	106.0	89.7 (14.1)
60–64	66	75.9	80.7	87.7	98.8	111.6	90.2 (12.7)
65–69	70	73.8	81.7	89.5	100.2	109.5	90.7 (13.2)
70–74	63	77.0	83.0	91.0	100.3	110.3	92.3 (12.3)
75+	122	77.0	84.0	93.0	99.5	107.7	91.7 (11.4)