Anthropometric profile of the coloured population of the Cape Peninsula

K. STEYN, J. FOURIE, J. E. ROSSOUW, M. L. LANGENHOVEN, G. JOUBERT, D. O. CHALTON

Summary

Study of a sample of 976 randomly selected coloured persons 15 - 64 years of age living in the Cape Peninsula included measurement of height, weight and mid-arm circumference and calculation of the body mass index (BMI). The mean height of the men was 167,6 cm and that of the women 156 cm. Mean weight, BMI and mid-arm circumference for men were 65,9 kg, 23,4 and 27,5 cm respectively and those for women 65,8 kg, 27,1 and 28,9 cm respectively. The prevalence of underweight for men (BMI $<$ 20) was 23,6% and for women (BMI $<$ 19) 9,8%; 17,7% of men were overweight (BMI $\geq$ 25) and 3,7% obese (BMI $\geq$ 30), while 35,2% of women were overweight (BMI $\geq$ 24) and 18,8% obese. Overweight and obesity were more common among the older coloured women than among a group of South African white women of the same age.

Obese women in the age group 35 - 44 years were 4,8 times more likely to be hypertensive than women of normal weight in the same age group (odds ratio; 95% confidence interval 2,2 - 4). Older women did not show this association. There were too few obese men to analyse in this manner. Many of the obese participants did not see themselves as obese. Only 19,7% of men and 45,2% of women had attempted to lose weight during the year preceding the study, in many cases using methods known to be ineffective.

The coloureds of the Cape Peninsula were found to be a population with shorter stature than South African white and American populations. Some young participants of both sexes and some older men were underweight, while among older women there was a high prevalence of overweight and obesity. The findings may suggest previous undernutrition in both sexes, with a marked tendency to current overnutrition in adult females.

S Afr Med J 1990; **78**: 68-72.

The coloured population of the Cape Peninsula has been shown to be at high risk of developing coronary heart disease (CHD)[1-4] because of high serum total cholesterol levels, hypertension and cigarette smoking. The extent to which this population is exposed to the minor risk factors for CHD is not known.

Centre for Epidemiological Research in Southern Africa, South African Medical Research Council, Parowvallei, CP
K. STEYN, M.B. CH.B., M.D.
J. FOURIE, B.A. (NURS.)
National Heart, Blood and Lung Institute, Bethesda, Maryland, USA
J. E. ROSSOUW, F.C.P. (S.A.), M.D.
Research Institute for Nutritional Diseases and Institute for Biostatistics of the South African Medical Research Council, Parowvallei, CP
M. L. LANGENHOVEN, M.SC. (DIET.)
G. JOUBERT, B.A., B.SC. HONS
D. O. CHALTON, M.SC.

Accepted 5 Dec 1988.
Reprint requests to: Dr K. Steyn, CERSA, PO Box 70, Tygerberg, 7505 RSA.

Evidence that obesity is an independent risk factor for CHD has been found in some[5-7] but not all[7-9] studies that looked for this association. CHD is certainly not the only disease associated with obesity.[10,11]

Little is known about the anthropometric patterns of the coloured people of the Cape Peninsula. Some earlier studies[12-14] showed that young coloureds were shorter and lighter than whites of the same age. O'Keefe *et al.*[15] found that coloureds admitted to Groote Schuur Hospital showed signs of undernutrition more commonly than white patients admitted to the same hospital, and were of lower weight. Other studies[16,17] indicated a relationship between perinatal mortality, small-for-dates babies and maternal height and weight in the coloured population of the Cape Peninsula. In an effort to remedy this lack of knowledge an anthropometric assessment of this population group was included as part of the CRISIC study, which ascertained the CHD risk profile of the coloured population of the Cape Peninsula.

The aim of the study was to determine the stature and features of body mass of the coloured population, to look for aspects of hypertension associated with obesity, and to ascertain what attempts had been made to reduce weight. In addition the anthropometric features of the coloured population were compared with those of other populations.

Subjects and methods

Subjects for the study were an age- and sex-stratified sample of 976 coloured participants, aged 15 - 64 years, randomly selected by a multistage probability sampling technique. Survey techniques and interpretation of data other than anthropometric data have been described previously.[1-4]

Anthropometric measurements, standardised until correlation coefficients greater than 0,9 were achieved for both inter- and intra-observer variations, were taken by 12 field-workers. Measurements were taken with each subject in light clothing and without shoes. Height was recorded to the nearest 0,5 cm using a metal measuring tape against a wall and a flat headboard at right angles to the wall to ensure correct readings. The head was positioned in such a manner that the angle of the eye and the opening of the external auditory meatus were on a horizontal line. Weight was determined on good-quality bathroom scales standardised against a reference beam balance weekly to determine the zero setting. Thereafter the field-worker's own weight, measured daily, was used as a reference before weighing each participant. Body mass index (BMI) was calculated as weight (kg)/height^2 (m).[18] Cut-off points for obesity at BMI $\geq$ 30 for all subjects, for overweight at BMI $\geq$ 25 for men and $\geq$ 24 for women and for underweight at BMI $\leq$ 20 for men and $\leq$ 19 for women were used, as suggested by Bray.[18]

Mid-upper arm circumference was measured with a good flexible tape, positioned midway between the acromion process of the humerus and the olecranon process of the ulna, with the subject's arm hanging freely and relaxed. Measurements were taken to the nearest 0,5 cm.

Questionnaires completed by trained field-workers were used to identify CHD risk factors and related matters, such as

the health actions taken by the participants and features of socio-economic standing. A short medical history was taken. Blood pressure was measured according to the technique recommended by the American Heart Foundation.

Results

Table I shows the means (± SD) of height, weight, BMI and arm circumference for men and women, grouped according to age deciles. While the men's height was found to be fairly constant across the age groups, women's height was tallest in the youngest age group and shortest in the oldest group. This 4,8 cm difference reached statistical significance, but when the heights of all the women who participated in the study were plotted against their age, a secular trend of increasing height for the younger women could not be illustrated. The women were approximately 11 cm shorter than the men and those aged 45 years and older tended to have a higher BMI and greater arm circumference than the rest of the study population.

At each age decile the women's BMI was higher than that for men of the same age. The prevalence of underweight, normal weight, overweight and obesity, categorised by the BMI,[18] is presented in Table II. Overall 17,8% of the men studied were underweight, while not less than 39,4% of those aged 15 - 24 years fell into this category. Most of the men were of normal weight, while 23,8% were overweight and 6,1% obese. The latter two groups were mostly above 34 years of age. The picture for women was very different, only 6,4% being underweight. In the youngest age group (15 - 24 years) 18,4% were underweight. Few women, mostly younger ones, were of normal weight. Obesity and overweight were very common among older women, approximately 80% of women aged over 44 years falling into these categories. Even in the youngest age group, 15 - 24 years, 31,1% were overweight or obese. There was a far greater age-related increase in overweight and obesity among women than among men, and among women the increase occurred at an earlier age.

In an attempt to compare the hypertension-related history of obese persons with that of persons of normal weight, the

TABLE I. ANTHROPOMETRIC DATA FOR THE COLOURED POPULATION (MEAN ± SD)

Age group (yrs)	No.	Height (cm)	Weight (kg)	BMI	Mid-upper arm circumference (cm)
Men					
15 - 24	94	167,7 ± 8,8	59,0 ± 10,7	20,9 ± 3,0	25,6 ± 2,6
25 - 34	96	167,8 ± 6,6	64,9 ± 9,6	23,0 ± 3,0	27,6 ± 2,5
35 - 44	103	169,2 ± 6,7	68,7 ± 11,8	24,0 ± 3,8	28,4 ± 2,9
45 - 54	95	167,7 ± 6,8	68,7 ± 11,1	24,4 ± 3,7	28,0 ± 2,9
55 - 64	90	165,5 ± 6,6	67,9 ± 14,0	24,8 ± 4,8	27,7 ± 3,4
15 - 64	478	167,6 ± 7,2	65,9 ± 12,0	23,4 ± 3,9	27,5 ± 3,0
Women					
15 - 24	103	157,7 ± 8,0	55,6 ± 10,2	22,6 ± 4,4	25,3 ± 3,4
25 - 34	94	156,6 ± 7,1	63,1 ± 14,4	25,7 ± 5,3	27,8 ± 4,2
35 - 44	112	156,5 ± 5,9	65,7 ± 14,2	26,8 ± 5,4	29,1 ± 4,2
45 - 54	94	156,4 ± 6,2	73,8 ± 18,7	30,2 ± 7,8	31,2 ± 5,0
55 - 64	95	152,9 ± 5,8	71,8 ± 18,1	30,7 ± 7,3	31,3 ± 5,3
15 - 64	498	156,0 ± 68,8	65,8 ± 16,6	27,1 ± 6,8	28,9 ± 5,0

TABLE II. BMI CATEGORIES[18] IN THE COLOURED POPULATION (%)

Age groups (yrs)	Underweight (BMI < 20)	Normal weight (BMI 20 - 24,9)	Overweight (BMI 25 - 30)	Obese (BMI > 30)
Men				
15 - 24	39,4	53,2	5,3	2,1
25 - 34	13,5	65,7	19,8	1,0
35 - 44	12,6	52,4	29,2	5,8
45 54	9,5	48,4	35,8	6,3
55 - 64	14,4	43,4	26,6	15,6
15 - 64, crude rate	17,8	52,3	23,8	6,1
15 - 64, Peninsula coloureds*	23,6	55,0	17,7	3,7
Women				
15 - 24	18,4	50,5	24,3	6,8
25 - 34	8,5	33,0	41,5	17,0
35 - 44	2,7	30,3	46,5	20,5
45 - 54	0	17,0	40,4	42,6
55 - 64	2,1	17,9	34,7	45,3
15 - 64, crude rate	6,4	29,9	37,8	25,9
15 - 64, Peninsula coloureds*	9,8	36,2	35,2	18,8

* Age-standardised against the 5% subsample of the coloured population of the Cape Peninsula.

group of women with a BMI over 30 was compared with the women with a BMI between 19 and 23,9. Their hypertension-related histories are compared in Table III. This comparison could only be done for females in the age group over 34 years, since the younger groups contained too few obese participants to justify statistical analysis. Of interest is the finding that in the age groups 35 - 54 years hypertension was reported more frequently by obese women than by women of normal weight. Among younger obese women, aged 35 - 44 years, the odds ratio for being hypertensive was 9,4 (95% confidence interval (CI) 2,2 - 40), while among older women this difference was not observed. This difference remained in the younger group of women even after correcting for blood pressure readings when using a blood pressure cuff of inappropriate size in the obese women[19] (odds ratio 4,8; CI 1,3 - 18,5). The use of antihypertensive medication was also reported more often by women aged 35 - 44 years. No differences were found between these two groups of women for reported CHD, diabetes, constipation and stroke. When asked if they perceived themselves to be overweight, 35% of obese women said that they did not.

Table IV shows the percentages of men and women who had attempted to lose weight during the preceding year. The methods were diet, exercise, and using appetite suppressants, slimming preparations and/or slimming apparatus. More women than men had tried to lose weight. In the group of overweight and obese participants, 47% of women and 58,2% of men had not tried to lose weight during the year. Most subjects who had tried to lose weight had dieted (75,5% of men and 76,9% of women). Only 42,6% of men and 24,9% of women had exercised. Appetite suppressants were used by 9,6% of men and 18,7% of women. Women used other ineffective methods, such as slimming preparations and slimming apparatus (e.g. slimming pants) more frequently than men.

Discussion

Traditionally the coloured population of the Cape Peninsula is thought of as an undernourished, underweight group. This study has revealed a more complex situation. Figs 1 and 2 compare the heights of coloured men and women participating in this study with those of the USA population,[20] South African whites living in the south-western Cape (J. E. Rossouw, P. L. Jooste — unpublished data), urban blacks living in Durban, and Asians living in Durban (Professor F. G. H.

TABLE III. COMPARISON OF FEATURES OF HYPERTENSION AMONG OBESE (BMI >30) AND NORMAL-WEIGHT (BMI 19 - 23,9) WOMEN AGED 35 - 64 YEARS (%)

Feature	Age groups (yrs)	Normal (67)	Obese (106)	Odds ratio	95% CI
Self-reported HT	**35 - 44**	**14,7**	**56,5**	**7,5**	**2,1 - 26,5**
	45 - 54	**18,8**	**52,5**	**4,8**	**1,2 - 19,4**
	55 - 64	**58,8**	**58,1**	**0,97**	**0,3 - 3,0**
Measured HT	**35 - 44**	**8,8**	**47,8**	**9,4**	**2,2 - 40,0**
(> 160/95 mmHg)	**45 - 54**	**37,5**	**62,5**	**2,8**	**0,5 - 9,2**
	55 - 64	**58,8**	**81,4**	**3,1**	**0,9 - 10,5**
HT corrected for	**35 - 44**	**11,8**	**39,1**	**4,8**	**1,3 - 18,5**
cuff-size[19]	**45 - 54**	**37,5**	**52,5**	**1,8**	**0,6 - 6,0**
	55 - 64	**58,8**	**67,4**	**1,5**	**0,5 - 4,6**
On antihypertensive	**35 - 44**	**2,9**	**21,7**	**9,2**	**1,0 - 84,6**
drugs	**45 - 54**	**6,3**	**27,5**	**5,7**	**0,7 - 48,4**
	55 - 64	**47,1**	**53,5**	**1,3**	**0,4 - 4,0**

HT = hypertension.

TABLE IV. ATTEMPTS AT WEIGHT LOSS

Age groups (yrs)	Attempted No.	Attempted %	Methods used* Diet	Exercise	Appetite suppressants	Slimming preparations	Slimming apparatus
Men							
15 - 24	**94**	**8**	**8,5**	**50,0**	**87,5**	**12,5**	**12,5**
25 - 34	**96**	**20**	**20,8**	**80,0**	**60,0**	**0**	**0**
35 - 44	**103**	**20**	**19,4**	**75,0**	**55,0**	**0**	**0**
45 - 54	**95**	**22**	**23,2**	**68,2**	**36,4**	**22,7**	**4,5**
55 - 64	**90**	**24**	**26,7**	**87,5**	**8,3**	**12,5**	**8,3**
15 - 64	**478**	**94**	**19,7**	**75,5**	**42,6**	**9,6**	**4,3**
Women							
15 - 24	**103**	**36**	**35,0**	**69,4**	**36,1**	**27,8**	**8,3**
25 - 34	**94**	**38**	**40,4**	**60,5**	**44,7**	**23,7**	**21,1**
35 - 44	**112**	**58**	**51,8**	**81,0**	**24,1**	**25,9**	**13,8**
45 - 54	**94**	**48**	**51,1**	**87,5**	**14,6**	**12,5**	**12,5**
55 - 64	**95**	**45**	**47,4**	**80,0**	**11,1**	**4,4**	**13,3**
15 - 64	**498**	**225**	**45,2**	**76,9**	**24,9**	**18,7**	**13,8**

* Expressed as a percentage of those who attempted to lose weight.

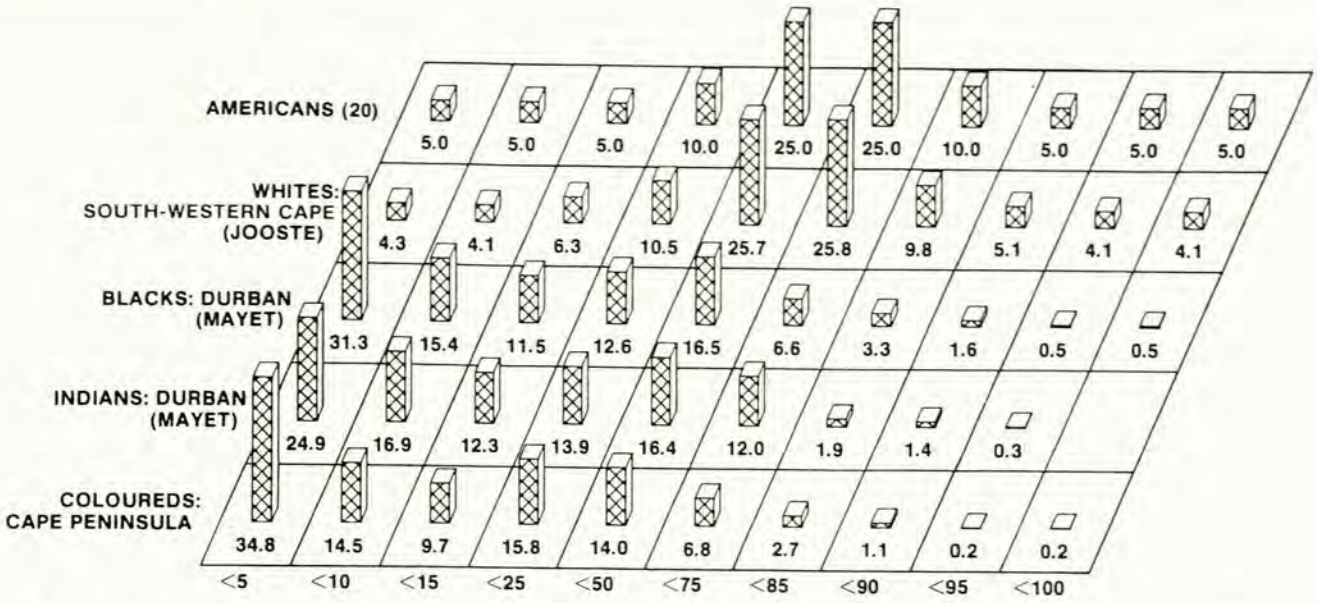

Fig. 1. Comparison of the distribution (%) of the heights of men of four South African populations with that of men in the USA.

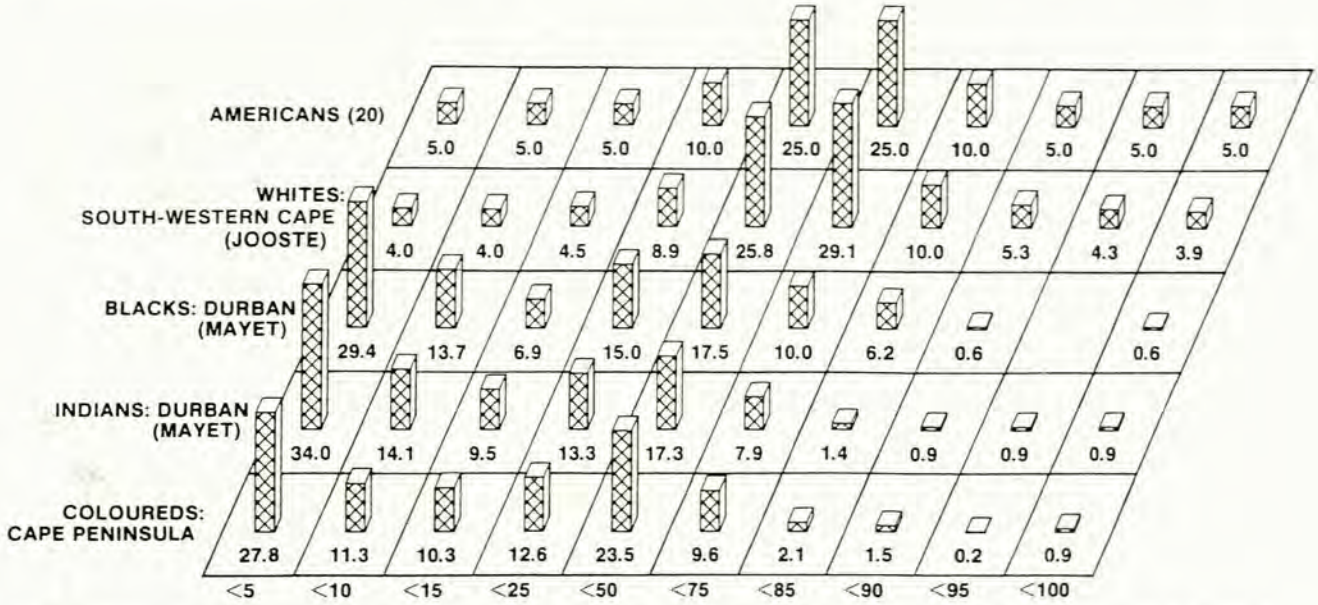

Fig. 2. Comparison of the distribution (%) of the heights of women of four South African populations with that of women in the USA.

Mayet — unpublished data). The percentile distribution of the USA population was taken as reference and the South African populations compared with that distribution. For both men and women the height of South African whites was found to be very similar to that of the American population. It can be seen, however, that the coloureds, urban blacks and Asians were much shorter than the first two groups. Short stature could indicate poor nutrition during childhood, but many other factors could explain these differences. No association between height and present socio-economic standing was found in this population. Although no secular trend of increasing height with younger age could be shown, the youngest group of women was significantly taller than the oldest group, suggesting that the improved nutritional status of the younger group could have influenced their height favourably. While the men tended to be underweight rather than overweight, the reverse was true for women, indicating that current undernutrition was unlikely in the latter.

Most of the women were found to be overweight and obese, while only a few were underweight. Over 24 years of age the mean BMI fell above the cut-off point for overweight for women and over 45 years it fell above the cut-off point for obesity (Table I). The coloured women had a mean BMI of 27,1; this is higher than that for US white women aged 18 - 64 years (BMI 24,6) and very close to that for US black women (BMI 27,4). Compared with South African white women in the CORIS study (BMI 25,8), the coloured women were more obese. The tendency for women to develop obesity in urbanising populations also seems to apply to black urbanising South African populations.[21] The coloured men were not as obese as the women; in fact underweight was a problem among these men. A comparison with the recently presented

data[20] of the NHANES II American survey indicates that the coloured men of Cape Town had a lower BMI (BMI 23,4) than both American black and American white men (18 - 64 years), and their BMI was much lower than that of South African white men aged 15 - 64 years in the CORIS study[22] (mean BMI 26). Of coloured men aged 16 - 25 years 39,4% had a BMI below 20, while only 18,4% of women of the same age had a BMI below 19, reflecting underweight (Table II). These underweight persons may be more prone to disease, and the women may tend to have small babies and increased perinatal mortality, so it is important to keep in mind that a sector of this population is still in need of nutritional education to improve their health.

Mid-upper arm circumference also reflected obesity among coloured women in Cape Town. When the mean for the coloured population was compared with that for the American population,[23] 41% of coloured men and 8,4% of the women fell below the 5th percentile for American men and women respectively, while only 0,4% of coloured men and 6,1% of coloured women fell above the 95th percentile.

Analysis of the short medical histories taken showed that women reported suffering from hypertension more often than was actually the case, even when an inappropriate blood pressure cuff was corrected for (Table III). Of the obese women under 45 years more were hypertensive than those obese women of 45 years and older. It is of importance that this difference between obese women and those of normal weight was only significant in the younger age group, although in all groups the obese reported the condition more often than those of normal weight. This would suggest that obesity as a precursor of hypertension exerts its effect more strongly in younger women, and that this effect diminishes as women get older, when factors other than obesity become more important precursors of hypertension. These older obese but normotensive women may represent a group of 'healthy obese' subjects with a genetically determined 'short-fat' habitus that expresses itself as obesity as these women age.

A considerable number of subjects had attempted to lose weight during the preceding year (Table IV). Although dieting was used most commonly, many other methods that are known to be ineffective were also used. Exercise was insufficiently utilised (by only 42,6% of men and a meagre 24,9% of women). Women in particular used ineffective methods including appetite suppressants, slimming preparations such as the various powdered formulas, and slimming apparatus such as slimming pants and massage utensils.

Should an intervention programme for the treatment of obesity in the coloured population be planned, it will be important to consider the fact that many of even the obese women did not see themselves as obese. It may be that overweight is still considered a sign of good health and prosperity, particularly in a population that may have suffered from undernutrition during childhood. The coloured population of the Cape Peninsula has therefore been identified as a population with short stature and overweight in older women. However, undernutrition leading to underweight is still present and will have to be taken into consideration and corrected, particularly among young females and men of all ages.

REFERENCES

1. Steyn K, Jooste PL, Langenhoven ML *et al.* Coronary risk factors in the coloured population of the Cape Peninsula. *S Afr Med J* 1985; **67:** 619-625.
2. Steyn K, Jooste PL, Fourie JM, Parry CDH, Rossouw JE. Hypertension in the coloured population of the Cape Peninsula. *S Afr Med J* 1986; **69:** 165-169.
3. Steyn K, Jooste PL, Langenhoven ML *et al.* Smoking patterns in the coloured population of the Cape Peninsula (CRISIC study). *S Afr Med J* 1987; **71:** 145-148.
4. Steyn K, Benadé AJS, Langenhoven ML, Joubert G, Rossouw JE. Hypercholesterolaemia in the coloured population of the Cape Peninsula (CRISIC study) *S Afr Med J* 1987; **71:** 483-486.
5. Hubert HB, Feinleib M, McNamara P, Castelli WP. Obesity as an independent risk factor for cardiovascular disease: a 26-year follow-up of participants in the Framingham Heart Study. *Circulation* 1987; **67:** 968-977.
6. Lew EA, Garfinkel L. Variations in mortality by weight among 750 000 men and women. *J Chron Dis* 1979; **32:** 563-577.
7. Barrett-Connor EL. Obesity, atherosclerosis, and coronary artery disease. *Ann Intern Med* 1985; **103:** 1010-1019.
8. Keys A, Menotti A, Aravanis C *et al.* The seven countries study: 2,289 deaths in 15 years. *Prev Med* 1984; **32:** 141-154.
9. Keys A. Overweight, obesity, coronary heart disease and mortality. *Nutr Rev* 1980; **38:** 297-307.
10. Report of the Royal College of Physicians Working Party on Obesity. *J R Coll Physicians Lond* 1983; **17:** 5-61.
11. Burton BT, Foster WR. Health implications of obesity; an NIH consensus development conference. *J Am Diet Assoc* 1985; **85:** 1117-1121.
12. Walker ARP, Walker BF, Jones J, Walker C, Ncongwane J. Sugar intake and weight and height of pupils of 16 years in South African ethic groups. *Am J Clin Nutr* 1982; **36:** 643-649.
13. Woods DL, Heese H de V, Davey DA, Van Schalkwyk DJ. Stature and weight of coloured primigravidas in Cape Town. *S Afr Med J* 1978; **54:** 776-777.
14. Richardson BD, Wadvalla M. The bearing of height, weight and skinfold thickness on obesity in South African ethnic groups of school pupils of 17 years. *Trop Geogr Med* 1977; **29:** 82-90.
15. O'Keefe SJD, Dicker J, Delport I. Incidence of malnutrition in adult patients at Groote Schuur Hospital, 1984. *S Afr Med J* 1986; **70:** 16-20.
16. Knutzen VK, Davey DA. The relationship between maternal height and weight at booking and perinatal mortality. *S Afr Med J* 1977; **51:** 672-675.
17. Keet MP, Jaroszewicz AM, Van Schalkwyk DJ *et al.* Klein-vir-datum babas: etiologiese faktore by die Kaapse kleurlingbevolking. *S Afr Med J* 1981; **60:** 199-203.
18. Bray GA. Definition, measurement and classification of the syndromes of obesity. *Int J Obes* 1978; **2:** 99-112.
19. Maxwell MH, Wales AJ, Schroth PC, Karam M, Darnfeld LP. Error in blood pressure measurements due to incorrect cuff size in obese patients. *Lancet* 1982; **2:** 33-35.
20. National Center for Health Statistics, Najjar MF and Rowland M. *Anthropometric Reference Data and Prevalence of Overweight, United States, 1976-80* (Vital and Health Statistics, Series 11, No. 238. DHHS Pub. No. (PHS) 87-1688). Washington DC: Government Printing Office, 1987.
21. O'Keefe SJD, Thusi D, Epstein S. The fat and the thin — a survey of nutritional status and disease patterns among urbanised Black South Africans. *S Afr Med J* 1983; **63:** 679-683.
22. Jooste PL, Steenkamp HJ, Benadé AJS, Rossouw JE. The prevalence of overweight and obesity and its relation to coronary heart disease in the CORIS study. *S Afr Med J* 1988; **74:** 101-104.
23. Frisancho AR. New norms of upper limb fat and muscle areas for assessment of nutritional status. *Am J Clin Nutr* 1981; **34:** 2540-2545.