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Alarmingly high prevalence of obesity in Curaçao: data from an interview survey stratified for socioeconomic status

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OBJECTIVE: The aim of the article is to report the prevalence of obesity, abdominal fatness and waist circumference in different socioeconomic classes in Curaçao.
DESIGN: In 1993/1994 a health interview survey (the Curaçao Health Study) was carried out among a random sample ($n = 2248$, response rate = 85%) of the adult non-institutionalized population of Curaçao.
METHODS: We analyzed the association between obesity (BMI $\geq$ 30), abdominal fatness (waist hip ratio (WHR) $\geq$ 0.95 for men, WHR $\geq$ 0.80 for women) waist circumference (WC $\geq$ 100 cm for men, WC $\geq$ 91 cm for women) and socioeconomic status (SES) by age adjusted logistic regressions, for men and women separately.
RESULTS: The prevalence of obesity was about 27%: 36% of the women and 19% of the men were obese. An at risk WHR was reported among 62.2% of the women and among 20.4% of the men. A WC above the cut-off point was reported for 44.3% women and 25.3% men. Compared to women of higher SES, the lower SES women have a two to three times higher risk of a BMI, WHR or WC exceeding the cut-off points. Among men, no statistically significant difference between an increased BMI, WHR or WC and SES factors was found. The overlap between the three measures is large, about 56% of the women scored similarly on all three measurements. Among men the overlap is even greater (73%).
CONCLUSIONS: The prevalence of obesity in Curaçao is alarming. Low SES women are at the greatest risk of an increased BMI, WHR or WC. The obesity figures can be placed between industrialized societies and less modernized cultures. Action and additional research on the prevention of obesity in Curaçao are deemed necessary. The cut-off points in our study for WC in the non-white population are preliminary and need to be elucidated further.

Keywords: obesity; BMI; WHR; waist circumference; socioeconomic status

Introduction

A high prevalence of hypertension (between 20–30%) and diabetes mellitus (10%) has recently been reported in Curaçao, one of the five islands in the Dutch Caribbean.[1] In order to prepare a solid intervention program for these partially preventable diseases in Curaçao, information was needed to see if certain groups in the population could be defined as high risk groups due to obesity or abdominal fatness. Little is known about the prevalence of obesity in Caribbean countries. Most publications about obesity come from European and (Northern) American countries. A future health and preventive policy for Curaçao needs to be objective, specific data and cannot be based on American or European studies alone. To obtain data on obesity and other vital health care information, a thoroughly designed health interview survey, the Curaçao Health Study, was carried out. Body mass index (BMI), waist hip ratio (WHR) and waist circumference (WC) were used as indicators for obesity and abdominal fatness.

It is evident from numerous studies[2,3] that obesity constitutes a significant increased risk especially in the case of heart disease. Increased body weight is associated with elevated blood pressure, whereas weight loss in hypertensive individuals, is generally accompanied by a reduction in blood pressure.[4] Obesity is also a well-established risk factor for non-insulin dependent diabetes mellitus.[5] In most affluent societies there is an inverse relationship between educational level and prevalence of obesity among women, however mixed patterns are found among men.[6] The prevalence of obesity among men increases with age up to about 55 y, then levels off before decreasing until 65 y and then levels off.[7]

The WHR is recognized as a measure of abdominal fatness, which is a risk factor of cardiovascular disease, stroke, diabetes mellitus type 11 (Ref. 8) and infertility in women.[9,10] It has been suggested that a WHR exceeding certain cut-off points (0.95 for men

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and 0.80 for women) implies an increased cardiovascular health risk.[11] The abdominal fatness appears to increase with age among both genders.[12] In a study among European men a higher educational level was associated with lower WHR.[13]

As a simple measurement to indicate the need for weight management WC was recently proposed.[14] Large WC reflects both high body fatness (BMI) and abdominal fatness (WHR) and implies an increased cardiovascular health risk.[14,15] To our knowledge, cut-off marks for the WC have only been used in predominantly white populations.[11,16] Since this study population consists mainly of blacks and coloured people of mixed race, we could not justify using these cut-off marks. Consequently, we have to construct cut-off points applicable to our study population. The purpose of this paper is to describe the prevalence of obesity, abdominal fatness and waist circumference above cut-off points stratified for socioeconomic status in Curaçao.

Methods

Subjects

The population of Curaçao is a melting pot of different nationalities and cultures; african, hispanic, jewish, portuguese and dutch origins are frequently seen. Six age-categories were constructed; 18–25 y (16.2%), 26–35 y (21.8%), 36–45 y (20.2%), 46–55 y (16.2%), 56–65 y (13.7%) and ≥ 66 y (11.9%). The Curaçao Health Study, an interview survey, was conducted in 1993/1994 with internationally validated instruments and some instruments developed or adapted to the local culture.[17] A random sample of 3000 individuals aged ≥ 18 y was drawn from the Registry office (approximately 3% of the adult population of Curaçao). Of this sample, 364 individuals did not meet the inclusion criteria (deceased, moved, non-existent addresses). The response rate of the participants was 85.3%, the 2248 persons aged ≥ 18 y comprise 57.3% women and 42.7% men. Roughly 79% of the population is black, 13% is coloured, 7% is white and 1% belongs to another race. The mean age of the study population is 40.2 y. Excluded from anthropometric measurements were: pregnant women, physically disabled or bedridden persons and five very heavy people, whose weight exceeded the scope of the scales used.

Anthropometry

The interviewers were trained to measure weight and height in accordance with the World Health Organisation (WHO) standards.[18] The participants were asked beforehand to wear light clothing and to remove jewellery, headdressings (curlers, beads and hairclips), shoes and socks. The scales were calibrated before use by the Government Calibration Office, allowing for a margin of error of 0.5%. To determine the proportion of the study population with obesity, the BMI is calculated (BMI = kg/m^2). BMI was classified according to standards of the WHO.[7] Obesity was defined as a BMI eqivalent to or above 30 km/m^2, a criterion that has been accepted as an indicator of being obese. The WHO cut-off point is primarily based on the association between BMI and mortality (the cut-off point of 30 is based on the point of flexion of the curve).[7] WC was measured with flexible tape to the nearest 0.5 cm at the minimum circumference between the lowest rib and the iliac crest at the end of a gentle expiration with the subject standing. Since there were no validated cut-off points for the WC in non-white populations available, we had to determine our own cut-off points. Cut-off points for the WC were identified through the plotting of the sensitivity and specificity of the WC with the BMI as the Golden Standard. The mark where the sum of the sensitivity and specificity was the highest, was chosen as the most adequate cut-off point. In Figure 1 and Figure 2 the sensitivity and specificity curves for men and women are presented.

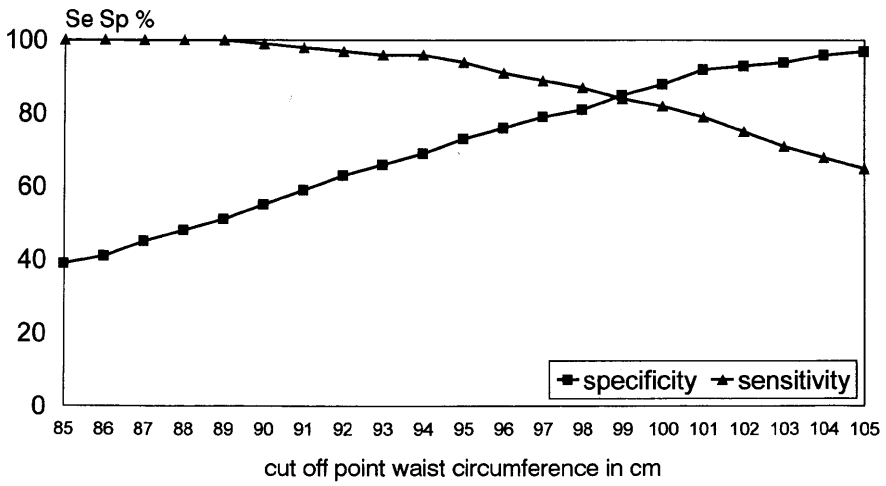

Figure 1 Sensitivity and specificity of waist circumference (WC) (cm) of 964 Curaçao men.

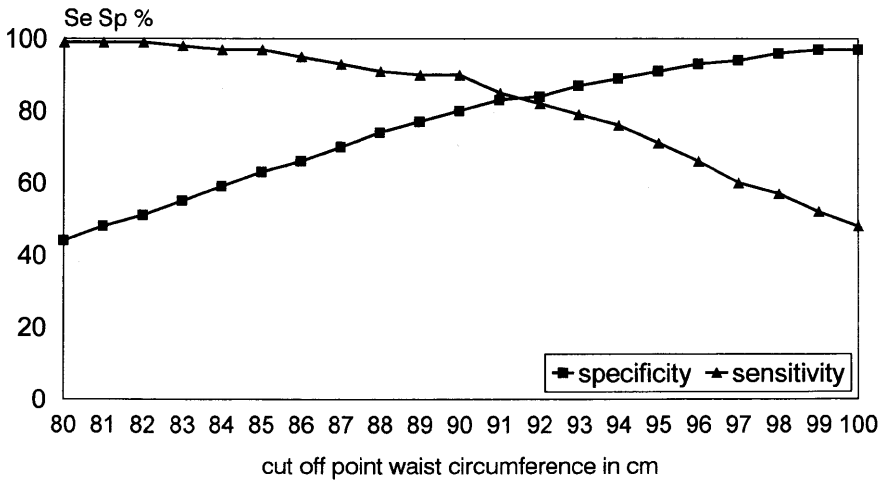

Figure 2 Sensitivity and specificity of waist circumference (WC) (cm) of 1284 Curaçao women.

The cut-off points in this study were determined at 100 cm for men and 91 cm for women. Hip circumference was measured to the nearest 0.5 cm at the widest point of the hip area. In this study, following Han *et al*,[11] we choose 0.95 for men and 0.80 for women, as relevant cut-off points for WHR. A WHR above these cut-off points indicates a high amount of abdominal fat.

Socioeconomic status (SES)

Net household income, occupational prestige and level of education were chosen as indicators for socioeconomic status. The respondents indicated their net household income category out of eleven possibilities, which were then reduced to three categories of equal size, defined as (relatively) low, middle and high income. Respondents indicated their current or past occupation and, if applicable, that of their (deceased spouses). The highest of the two was used for the calculation of occupational prestige. The occupations were classified according to the International Standard Classification of Occupations (ISCO-88). The ISCO-88 was than coded into Treiman's International Prestige Scale.[19] This scale was then divided into three categories varying from relatively low to high occupational prestige, each containing approximately equal percentages of respondents. The level of education was assessed through a sequence of questions designed to determine the highest level of education successfully completed by the respondent. The highest level of education completed was coded according to the International Standard Classifications of Education (ISCED), developed by UNESCO in Paris (1976), which was reduced to three categories.

Statistical methods

Firstly global descriptive statistics are presented. Mean values of anthropometric parameters (BMI, WHR and WC) and standard deviations are given. Means are compared by analysis of variance and percentages by chi-square tests. The age-standardized ninetieth percentile for BMI is calculated. The proportion of subjects with BMI ≥ 30 for men and women, WHR ≥ 0.95 for men and WHR ≥ 0.80 for women, and WC ≥ 100 cm for men and WC ≥ 91 cm for women, are reported stratified for gender, age group and SES group. The association between BMI and SES, WHR and SES, and WC and SES was studied by using logistic regression models. Furthermore, 95% confidence intervals (95% CI) were calculated.[20] Odds ratios (OR) that do not include 1.0 in the 95% CI indicate an OR significantly different from 1 ($P \leq 0.05$). OR's adjusted for age are presented. The data on BMI, WHR and WC were linked together by means of crosstabulation. The correlations between BMI and WHR, BMI and WC, and between WHR and WC are also presented. All analyses were performed separately for each gender. SPSS software was used for all statistical analyses.[21]

Results

Global figures

The prevalence of obesity is 27.4%; 36.2% among women and 18.7% among men. The age-standardized ninetieth percentile for BMI is 37.0 kg/m^2 in women and 31.9 kg/m^2 in men. The prevalences of WHR above cut-off values are 62.2% for women and 20.4% for men. The gender difference is also apparent when we look at WC: 44.3% of the women and 25.3% of the men have a WC above the cut-off points.

Mean BMI, WHR and WC

The mean BMI, WHR and WC among different subgroups are presented in Table 1 and Table 2. Women have a mean BMI of 28.3 and for men a mean BMI of 26.0 was measured. For women, an inverse relationship was found between all SES indicators and mean BMI. Among men the mean BMI

Table 1 Mean BMI, WHR, WC and s.d. among Curaçao men according to age and SES factors

	n	*BMI Mean (s.d.)*	*WHR Mean (s.d.)*	*WC (cm) Mean (s.d.)*
Total	964	26.0(4.9)	0.89(0.07)	91.6(13.5)
Age group				
18–25 y	176	24.5(4.6)	0.83(0.05)	83.6(11.6)
26–35 y	200	26.1(5.1)	0.87(0.06)	89.3(12.8)
36–45 y	178	26.0(4.5)	0.89(0.06)	92.6(13.1)
46–55 y	165	27.1(4.4)	0.92(0.06)	96.5(11.6)
56–65 y	136	27.1(5.5)	0.94(0.07)	97.1(14.9)
≥ 66 y	109	25.4(4.7)	0.93(0.06)	93.3(12.2)
Income				
Low	161	25.5(5.1)	0.89(0.08)	88.7(14.4)
Middle	318	26.2(4.9)	0.89(0.07)	92.4(14.3)
High	341	26.6(4.6)	0.90(0.07)	93.9(12.4)
Education				
Low	194	25.5(5.0)	0.91(0.08)	91.7(14.8)
Middle	378	25.8(4.8)	0.88(0.07)	90.0(12.9)
High	391	26.5(4.8)	0.89(0.07)	93.3(13.3)
Occupational prestige				
Low	258	25.7(5.2)	0.89(0.07)	89.6(13.5)
Middle	336	26.1(5.0)	0.89(0.07)	91.0(13.0)
High	313	26.6(4.4)	0.91(0.07)	95.7(13.3)

BMI = body mass index; WHR = waist, hip ratio; WC = waist circumference; SES = socioeconomic status.

Table 2 Mean BMI, WHR, WC and s.d. among Curaçao women according to age and SES factors

	n	*BMI Mean (s.d.)*	*WHR Mean (s.d.)*	*WC (cm) Mean (s.d.)*
Total	1284	28.3(6.4)	0.89(0.07)	89.3(14.2)
Age group				
18–25 y	188	24.5(4.6)	0.77(0.06)	79.8(12.1)
26–35 y	289	26.1(5.1)	0.80(0.06)	86.1(13.5)
36–45 y	277	26.0(4.5)	0.82(0.07)	90.8(13.2)
46–55 y	200	27.1(4.4)	0.84(0.08)	93.9(15.2)
56–65 y	172	27.1(5.5)	0.86(0.07)	92.8(12.1)
≥ 66 y	158	25.4(4.7)	0.87(0.08)	93.6(13.7)
Income				
Low	381	25.5(5.1)	0.84(0.07)	92.1(13.8)
Middle	357	26.2(4.9)	0.82(0.08)	89.3(14.0)
High	339	26.6(4.6)	0.81(0.07)	85.9(12.5)
Education				
Low	384	25.5(5.0)	0.86(0.08)	94.0(13.7)
Middle	537	25.8(4.8)	0.82(0.07)	89.6(14.0)
High	361	26.5(4.8)	0.80(0.07)	83.9(13.1)
Occupational prestige				
Low	426	25.7(5.2)	0.84(0.08)	91.3(14.6)
Middle	406	26.1(5.0)	0.83(0.08)	90.7(13.7)
High	351	26.6(4.4)	0.81(0.08)	86.8(13.5)

BMI = body mass index; WHR = waist, hip ratio; WC = waist circumference; SES = socioeconomic status.

increased in concurrence with all SES indicators, but statistically significant findings were not found. A mean WHR of 0.83 and 0.89 was found for women and men, respectively. The mean WC for women was 89.3 cm and for men 91.6 cm. Among women a statistically significant inverse relationship was found between all SES indicators and mean WHR and WC.

Logistic regression

Table 3 and Table 4 show for both sexes the main results of the multiple logistic regression analysis of BMI, WHR and WC above cut-off points, and the prevalence of these measures among subgroups. Compared to the reference group (18–25 y) the BMI OR for both genders in every age group is greater than 1. The highest OR is found in women aged 45–55 y – women in this age group have a more than four times higher risk for obesity compared to the youngest age group. For women, a statistically significant relationship between BMI and age was found, but for men the findings were not statistically significant. The association between SES factors and obesity (BMI ≥ 30) differs by gender. The logistic regression revealed statistically significant findings for women with respect to all SES factors (income, education and occupational prestige): women of lower SES are approximately two times (OR between 1.8 and 2.4 for all SES variables) more at risk for being obese

Table 3 Logistic regression analysis of BMI ≥ 30, WHR ≥ 0.95 and WC ≥ 100 cm according to age and SES factors among men

	% BMI ≥ 30	*OR(95%CI)*	*% WHR ≥ 0.95*	*OR(95%CI)*	*% WC ≥ 100*	*OR(95%CI)*
Age group						
18–25 y[a]	14.9	1.0	2.3	1.0	10.9	1.0
26–35 y	18.9	1.3(0.8–2.3)	11.7	5.6(1.9–16.6)	19.3	2.0(1.1–3.6)
36–45 y	18.3	1.3(0.7–2.3)	14.1	7.0(2.4–20.6)	24.3	2.6(1.5–4.7)
46–55 y	22.1	1.6(0.9–2.8)	29.9	18.2(6.4–51.8)	35.4	4.5(2.5–8.0)
56–65 y	23.3	1.7(0.9–3.1)	41.8	30.7(10.7–87.6)	39.6	5.4(3.0–9.7)
≥ 66 y	13.9	0.9(0.5–1.9)	35.9	24.0(8.2–69.8)	28.2	3.2(1.7–6.1)
Income*						
Low	16.5	0.8(0.8–1.3)	24.1	0.9(0.5–1.5)	22.8	0.8(0.5–1.3)
Middle	19.9	0.9(0.7–1.6)	17.8	0.6(0.4–1.0)	27.7	1.0(0.7–1.5)
High[a]	21.4	1.0	23.9	1.0	27.7	1.0
Education*						
Low	15.8	0.7(0.9–1.1)	32.8	1.1(0.7–1.7)	28.0	0.9(0.6–1.3)
Middle	17.2	0.8(0.9–1.8)	13.4	0.7(0.9–1.0)	23.0	1.0(0.7–1.4)
High[a]	21.5	1.0	1.0	1.0	26.2	1.0
Occupational prestige*						
Low	16.0	0.8(0.8–1.3)	20.3	0.9(0.6–0.3)	22.7	0.7(0.5–1.1)
Middle	21.6	1.1(0.7–1.6)	17.9	0.8(0.5–1.1)	24.2	0.6(0.6–1.2)
High[a]	20.3	1.0	26.4	1.0	32.2	1.0

BMI = body mass index; WHR = waist, hip ratio; WC = waist circumference; SES = socioeconomic status; OR = Odds ratio; CI = 95% confidence interval.
*Odds ratio adjusted for age; [a]Reference group.

Table 4 Logistic regression analysis of BMI ≥ 30, WHR ≥ 0.80 and WC ≥ 91 cm according to age and SES factors among women

	% BMI ≥ 30	*OR(95%CI)*	*% WHR ≥ 0.80*	*OR(95%CI)*	*% WC ≥ 91*	*OR(95%CI)*
Age group						
18–25 y[a]	17.9	1.0	28.3	1.0	15.0	1.0
26–35 y	27.5	1.7(1.1–2.8)	50.5	2.6(1.8–3.9)	31.8	2.6(1.6–4.3)
36–45 y	44.9	3.7(2.4–9.2)	62.7	4.2(2.8–6.3)	49.3	5.5(3.4–8.8)
46–55 y	47.2	4.1(2.6–6.6)	74.5	7.6(4.8–12.0)	58.0	7.8(4.5–12.9)
56–65 y	39.1	2.9(1.8–4.8)	78.8	9.0(5.5–14.6)	55.9	7.2(4.3–11.9)
≥ 66 y	40.0	3.1(1.9–5.1)	88.2	16.7(9.4–29.3)	61.8	9.2(5.4–13.1)
Income*						
Low	43.4	2.4(1.8–3.4)	73.4	2.2(1.5–3.0)	55.8	2.6(1.8–3.6)
Middle	36.8	2.0(1.4–2.8)	60.1	1.5(1.1–2.1)	45.0	2.0(1.4–2.8)
High[a]	25.8	1.0	52.0	1.0	32.6	1.0
Education*						
Low	44.7	2.0(1.3–2.9)	83.2	3.0(2.0–4.5)	62.7	3.0(2.1–4.4)
Middle	37.2	1.8(1.3–2.5)	58.3	1.7(1.3–2.3)	43.2	2.3(1.7–3.1)
High[a]	25.9	1.0	45.6	1.0	26.6	1.0
Occupational prestige*						
Low	42.2	2.2(1.8–4.2)	70.0	2.1(1.5–2.9)	52.6	2.5(1.8–3.4)
Middle	41.0	2.2(1.6–3.0)	61.6	1.4(1.0–1.9)	48.3	2.2(1.6–3.0)
High[a]	27.5	1.0	56.2	1.0	33.6	1.0

BMI = body mass index; WHR = waist, hip ratio; WC = waist circumference; SES = socioeconomic status; OR = Odds ratio; CI = 95% confidence interval.
*Odds ratio adjusted for age; [a]Reference group.

than are women of higher SES. There were no statistical differences found for men and the SES regarding obesity. Figure 3 and Figure 4 clearly illustrate the different relationships between obesity (BMI) and SES (education) in men and women.

In general, the older age groups are more at risk of increased WHR than the younger age groups. Among women there have been statistically significant findings for all SES groups. Women in the low education group have a three times higher risk of increased WHR, compared to women of the high education group, (CI:2.0–4.5). Among men, increased WHR appeared more often in the higher SES groups, although these findings are not statistically significant.

Compared to the youngest age group, all other age groups are more at risk of a WC above the cut-off points. The highest OR is found among women in the oldest age group, these women have a more than nine times higher risk for a WC above 91 cm compared to the youngest women (CI:5.4–13.1). Again the results with regards to SES factors differ by gender. Women of lower SES are at increased risk of a WC above cut-off values (OR varies between 2.5 and 3.0 for all SES indicators) compared to women of higher SES. Among men no statistically significant differences between increased WC and SES factors were found.

Differences and overlapping between obesity indicators

WC correlated significantly ($P < 0.01$) with BMI (men $r = 0.841$, women $r = 0.835$) and with WHR (men $r = 0.741$, women $r = 0.664$). the correlations between BMI and WHR were also statistically significant but weaker (men $r = 0.475$, women $r = 0.322$). The differences and overlap between BMI, WHR and WC are presented in Table 5. About 56% of the women scored similarly on all three measurements, among men the overlap is even greater (73%).

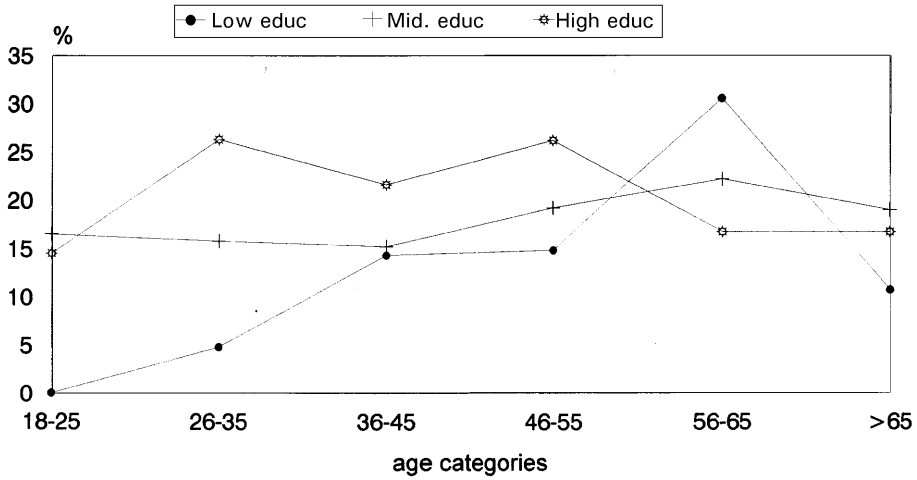

Figure 3 Prevalence of obesity (body mass index (BMI) ≥ 30) with regard to education and age in 964 Curaçao men. The association between waist hip ratio (WHR) and waist circumference (WC), education and age revealed similar results.

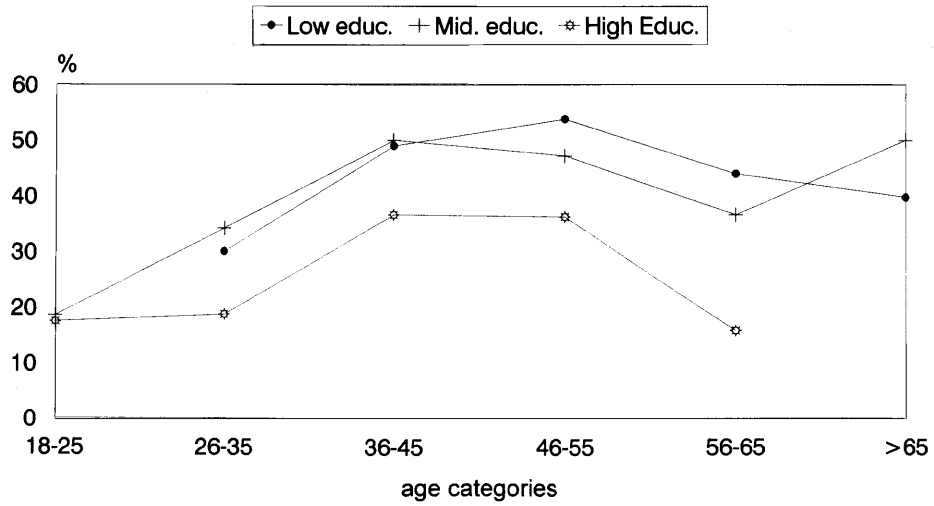

Figure 4 Prevalence of obesity (body mass index (BMI) $\geq$ 30) with regard to education and age in 1284 Curaçao women. The association between waist hip ratio (WHR) and waist circumference (WC), education and age revealed similar results. The number of obese women in the youngest age group and women with a high education in the oldest age group is very small and were therefore removed.

Table 5 Differences and overlap between obesity indicators among Curaçao men and women

Obesity indicators	*Men*		*Women*	
A = BMI^+ WHR^+ WC^+	72		333	
B = BMI^- WHR^- WC^-	619		367	
Total percentage overlap		73%		56.1%
C = BMI^- WHR^+ WC^+	58		151	
D = BMI^+ WHR^- WC^+	71		60	
E = BMI^+ WHR^- WC^-	31		36	
F = BMI^- WHR^+ WC^-	57		270	
G = BMI^- WHR^- WC^+	32		8	
H = BMI^+ WHR^+ WC^-	1		23	
Total*	941	100%	1248	100%

*Sample size may vary slightly due to missing observations.
BMI = body mass index; WHR = waist, hip ratio; WC = waist circumference.

Discussion

Before discussing the results in detail, the validity of our study deserves some attention. The response and participation rate in this study is very satisfactory; the most frequent reasons for non-response were refusal, not keeping an appointment and being too busy. Measures of stature, weight and waist hip girdle were carefully performed. It is not very likely that misclassifications of BMI, WHR and WC have occurred. Inter and intra observer variability is estimated to be very low, since all interviewers were thoroughly trained. Furthermore, the measurement of BMI, WHR and WC by trained observers improves the validity of the study compared to self reported material.[22]

Comparisons

In comparison with the Netherlands,[23] Spain[24] and Brazil,[25] the prevalence of obesity in Curaçao is strikingly high Figure 5. Especially notable, is the much higher prevalence of obesity among women in Curaçao. Our findings on the inverse relationship between obesity and SES in women are in line with the studies in Spain and the Netherlands. Among men, the association between SES and obesity is diverse; men in the Netherlands and Spain show an inverse relationship whereas men in Brazil show a positive relationship between obesity and SES factors, and Curaçao men tend to lean towards the pattern found in Brazil. Curaçao seems to be in an intermediate phase, the men show patterns found in developing countries, while the association between obesity and SES in women is comparable to more modern societies.[6] But in making these comparisons we have to bear in mind that SES is not always measured in the same way. Comparisons in this study are made with the Netherlands because of the strong political and historical ties between Curaçao and the Netherlands. Comparison with Brazil and Spain are made because of the use of almost similar age groups and similar (WHO) cut-off points for obesity in available publications. Comparisons with other countries in the Caribbean region are difficult to make because comparable studies are scarce.

The Curaçao obesity figures for women are similar to those of the black female population of the USA.[26,27] In his study on obesity in Europe, Seidell[28] compared the ninetieth percentiles of BMI in European populations. Compared to Seidell's findings Curaçao women rank highest and Curaçao men are in third place. Abdominal fatness in Curaçao is comparable to that found in a study in a biracial population carried out in the United States.[12] Compared to a study which reports results from four different European countries, the mean WHR among Curaçao women is much higher (0.79 *vs* 0.83). The finding that the WHR increases with age is in line with other studies.[11,12] Mean WC among women is much higher than reported in other studies.[11,29]

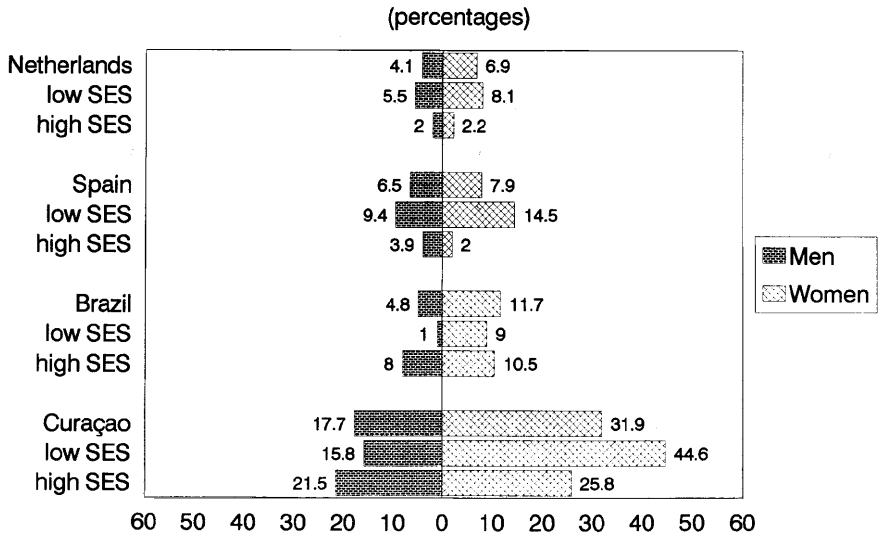

Figure 5 Prevalence of obesity (body mass index (BMI) ≥ 30) and socioeconomic status (SES) in the Netherlands, Spain, Brazil and Curaçao (%).

Obesity indicators

Our results suggest that the overlap between the anthropometric measurements is large. Therefore the question can be asked if one obesity indicator would have been sufficient to get an impression of the general obesity in Curaçao. It is clear that the measurement of the WC is the most simple, least sensitive for errors, index used in this study. If one, easy to measure, obesity indicator had to be chosen to describe the prevalence of obesity in a general population, we would prefer the WC above the BMI and WHR. Especially, where large scale health surveys and limited resources are involved, the WC appears to reveal sufficient relevant information about obesity, and the need for prevention and treatment of obesity in a general population. Although the overlap is large in our study, 44% of the women and 26% of the men would not have been identified correctly by the WC alone. Another remarkable finding is that among 21.6% of the women, a low WC in combination with a low BMI but an increased WHR (Table 5, F) was noticed. The stature and body composure of these women may explain this deviation.

The cut-off points used for BMI and WHR in this study are well-established,[7,11] however cut-off points will always be subject to discussion.[16,30,31] We have to be very careful with the cut-off points of the WC used in this study, as women on the island of Curaçao are very obese and might not be representative of other black women elsewhere. The cut-off points in our study resemble the cut-off points found by Han *et al.*[15] Our cut-off points refer to Action Level II (men 102 cm, women 88 cm) where immediate action on weight management is advised. The fat distribution, stature and body density for different ethnic groups such as blacks, whites or Asians may differ.[11,16,30] Therefore the validity of the cut-off points used in our study will have to be tested in further studies.

Differences in energy intake and physical activity among SES groups are the obvious explanations for Curaçao's variations in the prevalence of obesity. A study on lifestyle aspects in Curaçao, indeed showed a high consumption of take-out and fast food among high SES men and a higher consumption of extra sugar in soft drinks among low SES women.[32] The lifestyle study futhermore showed a lack of physical exercise in lower SES classes and among women, which may also contribute to obesity. Women in the higher socioeconomic strata may have more knowledge of the importance of body weight and the role of obesity, which could result in a lower prevalence of obesity in these classes. In cross-sectional studies from affluent countries, BMI usually increases with the number of pregnancies.[7] In general, women in the lower SES groups have more pregnancies than in the higher socioeconomic classes, which could be a contributing factor. The self image of low SES obese women may also play a role. Data not presented here reveal that only 50% of these women regard themselves as too fat in comparison with 90% of the high SES obese women (MEC Grol and JM Eimers, unpublished data). A possible explanation for this observation could be of a cultural nature, for example, social tolerance of obesity, and differences in perception and attitudes.

The high prevalence of obesity in Curaçao, especially among the low SES women, is alarming. The WHO recommends immediate attention, of both the individual concerned as well as the health practitioner, when a high prevalence of obesity is observed.[7] Obesity is difficult to treat,[26] therefore studies should be undertaken to explore which intervention adapted to the Caribbean culture, will be most successful to prevent people from becoming obese. Environmental and behavioural factors related to obesity and SES, such as social or cultural perception, acceptance of obesity and car use, hours of watching

television and visiting snack bars, should be explored. It is clear that the cut-off points and the value of the WC need to be elucidated in other non-white populations.

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