Factors Associated with Overweight/Obesity in Economically Active South African Populations

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Objective: To investigate factors associated with self-reported weight status of economically active adults from the 4 major ethnic groups in South Africa.

Design: Cross-sectional survey.

Setting: South Africa.

Participants: A random sample (*N*=2100) was selected from a database of economically active adults from the 4 major ethnic groups in South Africa (Black, White, Asian, and mixed ancestry). Of the 2100 selected, 554 subjects returned mailed questionnaires.

Main Outcome Measures: Weight status (BMI), dieting history, meal patterns, intake of high fat food items and alcohol, level of physical activity, smoking habits, family history of obesity, and socioeconomic characteristics.

Results: Identified risk factors for overweight/obesity included: Black ethnicity, education level ≤Grade 7, inactivity, and at least one overweight parent. Protective factors included: describing one's own weight as under- or normal weight, hardly ever or never binging, not having tried to lose weight during the past year, and describing one's own health as excellent. Factors that were not related to overweight/obesity in this group included: employment status, income, smoking, meal patterns, intake of high fat food items and alcohol, and ''sick'' days taken off from work during the prior 6 months. (*Ethn Dis*. 2003;13:109–116)

Key Words: Overweight, Obesity, Self-Reported Weight Status, BMI, Lifestyle Behaviors, Adults, Ethnic Groups, South Africa, Intervention, Weight Management

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Introduction

Exposure to lifestyle factors such as unhealthy diet, smoking, lack of exercise, and, possibly, stress, contribute to the development of chronic diseases of lifestyle, including coronary heart disease, strokes, type 2 diabetes mellitus, and tobacco- and nutrition-related cancers.[1] Obesity, due, in part, to the aforementioned lifestyle factors, also contributes directly or indirectly to the development of these chronic disease conditions.[2]

In 1995, 48% of reported mortality in South Africa was due to chronic diseases.[3] This is not surprising, given the fact that the burden of chronic disease risk factors is high, as illustrated by the following statistics: Hypertension prevalence rates are 13.9% for Blacks, 13.6% for those of mixed ancestry, 9.6% for Asians, and 14.8% for Whites. Hypercholesterolemia prevalence rates range from 0–12.5% for Blacks (higher among urban Blacks), 17% for those of mixed ancestry, and 25%–26% for Whites. Thirty-four percent of all South Africans smoke, with figures being higher for males than females in all ethnic groups, and highest for the mixed ancestry group.[4–8] An increasing number of South Africans, urban and rural, find themselves in a phase of nutritional transition which involves changes related to economic, social, demographic (specifically urbanization), and health factors, with the net result being an increased prevalence of obesity and noncommunicable diseases of lifestyle.[9,10]

The high prevalence rates of overweight and obesity among South African populations could also be an important contributing factor to the high prevalence rates of chronic diseases. The most recent Demographic and Health Survey indicated that among women (aged 15–65 years), the prevalence rates of obesity (BMI≥30) were 31.8% in Blacks, 26.3% in those of mixed ancestry, 21.1% in Asians, and 22.7% in Whites.[11] The rates were lower in men, ranging from 6.0% in Blacks to 18.2% in Whites.[5] The prevalence of overweight/obesity (BMI≥25) was also high in children from disadvantaged backgrounds, ranging from 4%–20% in 1–9 year olds.[12]

Prevention of chronic diseases is of prime importance for all South African ethnic groups, which requires addressing unfavorable lifestyle factors and the high prevalence of obesity in each population group. Provisions for the prevention, early detection, and cost-effective management of chronic diseases are generally inadequate in South Africa,[13] particularly when compared with the recommended WHO guidelines.[14] The multicultural backgrounds of patients requiring health care further compound the problems of inadequate diagnosis and poor management of chronic diseases and their risk factors. Therefore, the use of intervention models and materials developed in Western societies, or for use with one particular ethnic group, may not be appropriate for those with different lifestyles, habits, and practices, which indicates a need to develop and test culturally sensitive intervention programs for specific target groups and situations in South Africa.

In order to address these issues, the aims of this study were: 1) to investigate self-reported weight status and associated factors in economically active South Africans from the 4 major ethnic groups; 2) to identify specific factors associated with the development of over-

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weight/obesity in these populations; and 3) to formulate conclusions regarding factors to be considered in the design of culturally sensitive interventions.

RESEARCH METHODS

Study Population

The sample was randomly drawn from the South African National Database, the largest consumer database in South Africa, and comprised more than 7 million economically active adults (consumers between the ages of 18 and 65). The sampling frame included names and addresses of 52% White, 30% mixed ancestry, 11% Asian, and 6% Black South Africans. A random sample of 2100 was drawn to be proportionally representative of all ethnic groups in the database, and to include at least one small town and one city from each of the 9 provinces in the final sample.

Data Collection

A questionnaire eliciting lifestyle factors and self-reported weight status was mailed to the randomly selected adults. Each questionnaire was mailed with a prepaid return envelope. After the due date for the return of the questionnaires had passed, a reminder was mailed to the non-responders. A second reminder followed the first one. The researchers checked each returned questionnaire before data processing commenced.

Development of the Questionnaire

The questionnaire was devised by experts in nutrition in order to evaluate the weight status (outcome variable) and associated factors (exposure variables) in economically active South Africans. The dendrogram technique[15] was used to develop the questionnaire by means of a theoretical framework. This technique provides a focus during the review of related literature and also sets boundaries within which theory is studied. The theoretical basis is identified by repeatedly asking the subject the question, "Is determined by what"? In this manner, concepts and theory are identified and organized in a structured way. The exposure variables measured by the questionnaire included questions on sociodemographic characteristics, dieting history, meal patterns, frequency of intake of high fat foods and alcohol, level of physical activity, smoking habits, current health status, and family history of overweight/obesity.

Weight status was determined from self-reported weight and height measurements, which were then converted to the body mass index (BMI; weight [kg]/height^2 [m]).[16] Weight status of each participant's parents was requested in descriptive terms, ie, overweight/normal/thin.

Eating patterns were characterized by the following descriptive phrases: 3 meals/day with no snacking between meals; 3 meals/day with eating between meals; 1–2 meals/day with no snacking between meals; 1–2 meals/day with eating between meals; or no regular meals but small frequent snacking throughout the day. Dieting behavior was determined by questions on the subjects' perception of their own weight, frequency of dieting, and binging. Intake of high-fat foods was measured by consumption frequency of specified portions of high fat food items that are typically part of the diets of the various South African ethnic groups.[17] These items included the following: red meat (high fat cuts), poultry with skin, fried chicken and fish, organ meats, processed meats, meat pies/sausage rolls, fried potatoes/french fries, deep fat fried confections (vetkoek, doughnuts, koeksusters), whole milk, coffee creamers, cheese, chocolates, regular margarine (soft and hard), butter, lard, regular salad dressings, mayonnaise, and crisps.

The determination of physical activity levels was based on self-reported physical activity "when not at work," as well as on self-reported evaluation of total levels of physical activity as low, moderate, or high; descriptions of each level were included. Participants were asked to report on their past and present cigarette smoking habits, and health status was evaluated based on self-evaluation of health as excellent, good, fair, or poor, as well as the number of "sick" days taken off from work during the prior 6 months. General questions on age, education, and socioeconomic status were included.

Validity and Reliability of the Questionnaire

Content validity of the questionnaire was ensured by the following: 1) an in-depth review of the literature (with an emphasis on South African research)[18,19] to ensure a sound theoretical basis for the development of the questionnaire based on the "dendogram"[15] technique; and 2) evaluation of the questionnaire by a senior epidemiologist from the South African Medical Research Council, as well as by 3 experts in different fields of health sciences. Suggested changes were incorporated into the questionnaire.

The questionnaire was piloted using 20 Black and 16 White male and female adults.

Data Analyses

Statistical analyses were conducted using the SAS statistical software package.[20] Contingency tables were constructed to analyze differences between the ethnic groups regarding the socio-demographic characteristics, as well as the BMI categories (using the chi-square statistic). To determine the association between weight status (under/normal weight: BMI<25; overweight/obese: BMI≥25) and exposure variables (factors associated with weight status), the chi-square was computed to test for significance, which was then followed by logistic regression to compute the odds ratios (OR) and 95% Wald confidence intervals. The odds ratio is defined as the odds of disease (overweight) in exposed (exposure variable) subjects divided by the odds of disease (overweight) in unexposed subjects.[21] The procedure was repeated while adjusting for age and sex, which are known to be associated with BMI[22] and therefore could act as confounders. All 554 records were included in the analysis of the socioeconomic data and initial BMI data. However, the dietary data (frequency of intake of specific food items) was judged to be unreliable in 49 records, which were excluded during the logistic regression analyses.

Ethical Issues

Detailed information concerning the purpose of the research was included in an introductory letter that accompanied the questionnaire. Confidentiality and anonymity were guaranteed. Participation in the study was completely voluntary (no incentives were promised), and the completion and return of the questionnaire indicated informed consent.

RESULTS

A profile of the study population is presented in Table 1. The proportions from the various ethnic groups who participated were: Blacks 27%, Asians 12%, mixed ancestry 18%, and Whites 43%, with each group, except those of mixed ancestry, consisting of a nearly equal number of male and female respondents. More than 50% of the respondents in the Black, mixed ancestry, and Asian groups were between 25 and 45 years old, while the largest percentage in the White group were between 45 and 65 years old. The majority of Black (81.1%) and White (68.8%) participants were employed. These 2 groups also had the largest percentage of participants with a tertiary education. However, 56.8% of Black and 73.7% of mixed ancestry respondents fell into the low income category. Since the response rate was only 28%, we do not attempt to generalize our results. However, based on a paucity of data on risk factors for overweight/obesity in different South African populations, particularly those who are economically active, we believe that these findings contribute to a better understanding of this problem.

Table 1. Socio-demographic profile (%) of the study population (*N*=554)

Variable	Blacks *N*=149	Mixed Ancestry *N*=102	Asians *N*=63	Whites *N*=240	Chi-square *P* value
Gender:					
Females	48.7	60.8	49.2	53.3	.2636
Males	51.3	39.2	50.8	46.7	
Age (years):					
<25	8.8	15.8	14.3	7.5	<.0001
25–34	27.0	37.6	22.2	24.6	
35–44	37.2	17.8	34.9	19.2	
45–54	15.5	11.9	23.8	27.9	
55–65	11.5	16.8	4.8	20.8	
Highest level of education:					
Primary (grades 1–7)	12.2	21.8	3.2	0.0	<.0001
Secondary (grades 8–10)	15.0	39.6	27.0	12.6	
Secondary (grades 11–12)	29.3	25.7	36.5	32.6	
Tertiary	43.5	12.9	33.3	54.8	
Income (per month):					
Low (<R4000)	56.8	73.7	46.6	21.5	<.0001
Middle (R4000–7999)	36.0	19.7	34.5	34.7	
High (R8000+)	7.2	6.6	19.0	43.9	
Marital status:					
Single	29.1	33.3	22.2	15.0	.0006
Married/cohabiting	58.1	55.9	74.6	73.8	
Widowed/divorced	12.8	10.8	3.2	11.2	
Employment:					
Student/housewife	7.4	26.7	33.3	21.3	<.0001
Full time employed	81.1	44.6	57.1	68.8	
Unemployed	4.7	20.8	9.5	2.1	
Retired	6.8	7.9	0.0	7.5	

A large proportion of participants were overweight and obese, particularly Black women and women of mixed ancestry (Table 2). The mean BMIs of the women in these 2 ethnic groups were also significantly higher than those of the males, while this is not true for the other 2 ethnic groups (Table 3).

Factors associated with self-reported weight status of the study population, when adjusted for age and gender, include the following (Table 4).

Risk factors: Black ethnicity (OR=1.776, *P*=.0077), education status ≤grade 7 (OR=1.66, *P*=.0176), physical activity level when not at work

Table 2. Column percentages of ethnic group and gender by BMI categories (*N*=554)

	% in BMI Category							
	Black		MA†		Asian		White	
BMI Category	Males *N*=77	Females *N*=72	Males *N*=40	Females *N*=62	Males *N*=32	Females *N*=31	Males *N*=112	Females *N*=128
BMI <20 (underweight)	15.9	3.6	2.9	14.8	19.4	18.5	4.5	11.6
BMI 20–24.9 (normal weight)	34.8	21.8	51.4	19.2	45.2	44.4	39.1	46.2
BMI 25–29.9 (overweight)	29.0	34.6	25.7	21.3	25.8	18.5	41.8	24.0
BMI ≥30 (obese)	20.3	40.0	20.0	44.7	9.7	18.5	14.6	18.2

* Chi-square *P* value for gender in ethnic groups by BMI categories; Males, .0307; Females, .0004.
† MA = mixed ancestry = European/African/Malay origins.

rated as low (OR=1.927, *P*=.0285), self-rating of physical activity level as low (OR=2.707, *P*=.0032) or as moderate (OR=1.903, *P*=.0032), and an overweight father/mother (OR=2.456, *P*=.0129).

Protective factors: describing one's own weight as under/normal weight (OR=0.019, *P*=.0001), hardly ever or never binging (OR=0.343, *P*=.0004), not having tried to lose weight during the past year (OR=0.322, *P*=.0001), and describing one's own health as excellent (OR=0.373, *P*=.0227). Being single is a significant protective factor when not adjusted for age and gender, but this relationship disappears when adjusted.

Factors not associated with the weight status of the study group: employment status, income, smoking, meal patterns, intake of high fat food items, alcohol intake, and "sick" days taken off from work in the prior 6 months.

DISCUSSION AND IMPLICATIONS FOR INTERVENTION

The ethnic profile of the economically active South Africans represented in the South African National Database does not reflect the country's general demographic profile, according to which 77.2% South Africans are Black, 8.8% of mixed ancestry, 2.6% Asian, and 10.7% White.[23] The same can be said of the educational and employment status of the respondents in our sample. All the respondents in the sample had at least primary school education, while literacy figures for South Africans for 1991 (newest official figures) were 54% for Blacks, 66% for those of mixed ancestry, 84% for Asians, and 99% for Whites.[24] The 1997 unemployment figures for the country indicate that 29.3% of Blacks, 16% of those of mixed ancestry, 10.2% of Asians, and 4.6% of Whites were unemployed.[25] The unemployment figures found for our sample were much lower. It can, therefore, be said that the sample is more representative of the educated employed South African population, irrespective of ethnic group, rather than of the general population. This fact must be borne in mind when formulating recommendations for interventions, as the educational level and financial resources of our sample could have definite implications for the content of programs, as well as the educational model/approach, educational tools, and materials to be used.

The prevalence of obesity (BMI≥30) in our sample also did not follow the general trends reported for South Africans (national average for 15–65 year olds),[17] especially for Africans and those of mixed ancestry. We found obesity prevalence rates of: 20.3% for Black males (national average: 7.9%), and 40% for Black females (national average: 34.4%); 20% for males of mixed ancestry (national average: 6.1%), and 44.7% for females of mixed ancestry (national average: 25.9%); 9.7% for Asian males (national average: 3.2%), and 18.5% for Asian females (national average: 21.6%); and 14.7% for White males (national average: 14.6%), and 18.2% for White females (national average: 18%). Our data depicted a sharp rise in the prevalence of obesity among people who seem to be better educated and financially more privileged than the general South African population. This can possibly be explained by the well documented positive association be-

Table 3. Mean ± standard deviation (SD) BMI for males and females in the ethnic groups studied (*N*=554)

	Black		MA*		Asian		White	
	Males *N*=77	Females *N*=72	Males *N*=40	Females *N*=61	Males *N*=32	Females *N*=31	Males *N*=112	Females *N*=128
Mean BMI (±SD)	25.57 (6.96)	29.76 (6.50)	25.38 (4.17)	29.12 (7.92)	23.80 (4.27)	24.50 (5.45)	26.15 (6.51)	25.82 (6.55)
P†	.0012		.0129		.5858		.6977	

* MA = mixed ancestry = European/African/Malay.
† Student *t* test value difference between mean BMI for males and females

Table 4. Association (unadjusted and adjusted for age and sex) between weight status (BMI <25=under/normal weight; BMI ≥25=overweight/obese) and exposure variables (*N*=505)

			Unadjusted			Adjusted for Age & Sex			
Exposure Variable	Level	*N*	Odds Ratio	95% Wald Confidence Interval	Chi-Square *P* Value*	Odds Ratio	95% Wald Confidence Interval	Chi-Square *P* Value*	LS† Means
Sex	Male	255	0.877	0.623–1.262	.5050				
	Female	250	1.00						
Age	≥35	188	0.443	0.257–0.763‡					
	36–55	228	0.645	0.379–1.096	.0090				
	56+	78	1.00						
Race	Black	124	1.598	1.026–2.489‡	.0109	1.776	1.129–2.794‡	.0077	27.2 a
	Mixed ancestry	82	1.402	0.844–2.330		1.613	0.951–2.735		27.9 a
	Asian	58	0.593	0.327–1.074		0.675	0.369–1.236		24.1 b
	White	231	1.00			1.00			25.8 b
Marital status	Married/cohabiting	334	0.711	0.387–1.305	.0039	0.768	0.411–1.434	.1021	26.8 a
	Single	109	0.372	0.187–0.739‡		0.476	0.223–1.012		25.6 a
	Widowed/divorced	51	1.00			1.00			25.6 a
Education status	≤Grade 7	119	1.832	1.202–2.807‡	.0046	1.66	1.080–2.562‡	.0176	26.7 a
	Grade 8+	374	1.00			1.00			25.8 a
Physical activity when not at work	Low	141	1.946	1.137–3.332‡	.0251	1.927	1.116–3.326‡	.0285	27.3 a
	Moderate	252	1.203			1.195	0.729–1.960		25.9 b
	High	89	1.00			1.00			24.4 b
Physical activity: self evaluation/rating	Low/very low	128	2.756	1.556–4.880‡	.0020	2.707	1.519–4.823‡	.0032	27.4 a
	Moderate	282	1.924	1.161–3.188‡		1.903	1.142–3.172‡		26.3 a
	High	83	1.00			1.00			24.0 b
Overweight father/mother	Yes	256	2.152	0.997–4.646‡	.0462	2.456	1.121–5.384‡	.0219	30.3 a
	No	239	1.00			1.00			25.8 b
Describe own weight	Underweight	34	0.022	0.006–0.077‡	.0001	0.019	0.005–0.068‡		20.8 a
	Normal weight	296	0.156	0.099–0.247‡		0.143	0.089–0.230‡	.0001	24.7 b
	Overweight	161				1.00			30.7 c
Binge	Never/hardly	427	0.384	0.218–0.676‡	.0001	0.343	0.193–0.609‡	.0004	25.9 a
	1–3×/week	66	1.00			1.00			27.9 b
Tried to loose weight in past year	No	307	0.347	0.236–0.059‡	.0001	0.322	0.216–0.482‡	.0001	25.1 a
	Yes	184	1.00			1.00			28.3 b
Describe own health	Excellent	84	0.342	0.127–0.198†	.0124	0.373	0.138–1.012	.0227	23.8 a
	Good	260	0.718	0.288–1.791		0.755	0.300–1.901		26.5 b
	Fair	125	0.783	0.303–2.023		0.837	0.320–2.186		26.7 b
	Poor	21	1.00			1.00			26.7 ab

* Chi square for general association followed by PROC LOGISTICS (logistic regression, maximum likelihood estimates) to compute odds ratios and confidence intervals and PROC GLM to compute means.

† Significant differences ($P<.05$) between LS means (only included for adjusted values) are indicated by different letters (a, b, c); where the letters are the same, the means do not differ significantly.

‡ Significant odds ratio.

tween improved socioeconomic status and increased BMI.[26–29] Further, our respondents were classified as urban dwellers because they resided either in cities or small towns. According to Kalk,[30] living in an urban area constitutes a risk for the development of obesity (possibly owing to the effect of nutrition in transition), especially in Black men. This factor could also be partially responsible for the the prevalence of obesity among the Black men in our sample, which was more than twice that of the national average.

Considering the growing global prevalence of obesity, it is perhaps not surprising that many of the factors found to be associated with overweight/obesity in the present study are similar to those found in both developing[31] and developed countries.[32,33] These include the most commonly reported factors, namely low education,[34–36] inactivity,[31,37–39] parental obesity,[40–41] and ethnicity.[42,43] The latter includes specific groups who are more prone to obesity, such as Black women (American, South African) compared to White women (American, South African, and European).[44] The apparent association between maternal/paternal overweight/obesity and overweight/obesity prevalence in this sample population can possibly be

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explained using a model developed by Hill et al.[45] According to this model, body weight and composition are determined both by current environmental conditions (eg, lifestyle factors, including dietary composition and level of physical activity), and by the individual's functional phenotype. The latter represents the behavioral and metabolic characteristics of the individual as determined by the interaction of genetics and past environmental experiences (including lifestyle factors). Some data suggest that lifestyle characteristics of offspring, such as physical activity, dietary preference, and macronutrient intake, are modelled on attributes found in the household of origin.[46] Therefore, social learning may play an important role in the eventual expression of the functional phenotype, and should be considered in any intervention program aimed at addressing obesity and diseases associated with lifestyle practices.

Perhaps less well documented are the effects of dieting, binge-eating episodes, and self-evaluation of weight status as overweight, all of which were associated with overweight/obesity in the present study. The fact that an individual's not having dieted for the prior 6 months is significantly protective against the development of overweight/obesity in economically active South Africans suggests that the worldwide trend of dieting without long-term success[47–49] may also be prominent in our study group. Weight cycling, which is often the result of unsuccessful dieting, also has the potential to contribute to the development of chronic diseases of lifestyle.[47,50] Further, it is also well known that continuous attempts to lose weight also predispose a person to developing a distorted body image, unusual attitudes toward weight and eating, and, ultimately, eating disorders.[50,51] The finding that never, or almost never, binging is a significant protective factor against the development of overweight/obesity in our study population implies that disordered eating might already be associated with the overweight/obese among the economically active groups in South Africa. Another factor that needs to be considered is the fact that, compared to White women, non-Westernized, and some groups of Westernized, Black women adopt a larger ideal body size, report greater body image satisfaction, are more accepting of being overweight, and are less likely to aspire to being thin.[44,52,53] This fact could make it difficult to prevent or treat overweight/obesity in Black women. On the other hand, these obesity-tolerant attitudes could prevent Black women from developing eating disorders. Care should therefore be taken in the planning of weight management interventions to avoid unidimensional and simplistic emphasis on energy intake reduction through dieting and/or increase of energy expenditure.[54] Rather, intervention planners should focus on all aspects of the prevention, treatment, and management of weight related problems, bearing in mind the particular cultural context, as is suggested in the multidimensional weight management paradigm developed by Senekal et al.[51]

The lack of association between the intake of high fat food items and overweight/obesity in our study population could reflect the fact that we examined intake frequency of high fat food items, rather than total energy and total fat intake. Therefore, we still recommend that caution about the amount and the type of fat consumed should remain an important feature of any intervention program aimed at addressing obesity and diseases associated with lifestyle behaviors.

Bearing in mind the limitations of the sample, as well as of the self-reported data, we concluded that, in order to develop effective interventions aimed at the prevention or treatment of overweight/obesity as part of initiatives taken to address chronic diseases of lifestyle among economically active South Africans of all ethnic groups, the following should be borne in mind:

- Because all the respondents in the study had achieved at least primary school level education, educating students at the primary school level about healthful lifestyle behaviors will ensure that all South Africans become aware of the actions necessary to decrease the prevalence of obesity and chronic diseases of lifestyle at an early age. To achieve this type of approach, governmental legislation regarding the inclusion of the necessary messages in the content of primary school syllabi will be essential.
- Risk factors which need specific attention in the development of interventions for economically active South Africans include the following:
  - Generating early awareness of the genetic and environmental factors conducive to the development of obesity. Specific emphasis should be placed on the possibility of "inheriting" lifestyle patterns conducive to disease development in particular families.
  - Generating early awareness of the possibility that certain ethnic groups (Black and mixed ancestry) might be more susceptible to the development of obesity.
  - Generating early awareness of the importance of adequate levels of physical activity for health throughout the life cycle.
- To ensure effective weight loss and maintenance (preventing weight cycling), and to prevent the development of abnormal eating attitudes and behav-

ior such as binging, any weight management component of intervention program should follow the suggested multidimensional approach.[51]

In the development of a targeted intervention program, specific ethnic characteristics (eg, eating habits and obesity tolerant attitudes) should be taken into consideration.

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