Rapid Increases in Overweight and Obesity Among South African Adolescents: Comparison of Data From the South African National Youth Risk Behaviour Survey in 2002 and 2008

Sasiragha P. Reddy, PhD, Ken Resnicow, PhD, Shamagonam James, PhD, Itumeleng N. Funani, MBChB, Nilen S. Kambaran, AIA, Riyadh G. Omardien, BBusSc, Pardon Masuka, MPH, Ronel Sewpaul, BSc(Hons), Roger D. Vaughan, PhD, and Anthony Mbewu, MD

Objectives. To aid future policy and intervention initiatives, we studied the prevalence and correlates of overweight and obesity among participants in the South African National Youth Risk Behaviour Survey in 2002 and 2008.

Methods. The survey collected data from nationally representative cross-sectional samples of students in grades 8 through 11 (n = 9491 in 2002 and 9442 in 2008) by questionnaire and measurement of height and weight. We stratified data on overweight and obesity rates by age, socioeconomic status, and race/ethnicity.

Results. Among male adolescents, overweight rates increased from 6.3% in 2002 to 11.0% in 2008 ($P<.01$); among female adolescents, overweight rates increased from 24.3% in 2002 to 29.0% in 2008 ($P<.01$). Obesity rates more than doubled among male adolescents from 1.6% in 2002 to 3.3% in 2008 ($P<.01$) and rose from 5.0% to 7.5% among female adolescents ($P<.01$). We observed a dose–response relationship in overweight and obesity rates across socioeconomic categories. Rates of overweight and obesity were significantly higher among urban youths than among rural youths ($P<.01$).

Conclusions. South Africa is experiencing a chronic disease risk transition. Further research is needed to better understand and effectively address this rapid change. (*Am J Public Health.* 2012;102:262–268. doi:10.2105/AJPH.2011.300222)

Improving socioeconomic conditions, participation in global markets, exposure to world cultures, and many other aspects of globalization can convey tremendous benefits to developing societies. However, this progress can also have unintended deleterious health consequences. The World Health Organization has called this process risk transition[1]; others have called it epidemiological transition and nutrition transition.[2–4] Risk transition occurs as disease prevalence shifts from being primarily infectious in nature, such as diarrhea and pneumonia, to primarily noncommunicable conditions, such as cardiovascular disease and cancers. Factors that contribute to this shift include improved medical care, aging of the population, public health interventions such as education and vaccinations, improved sanitation, better economic conditions, and related lifestyle changes. Nutrition transition, which can be thought of as a subcategory of risk transition, is characterized by a decrease in undernutrition and the emergence of overnutrition.[4] Mid-transition, both types of conditions can be prevalent in the same population.[5]

Signs of risk transition have been observed in many developing countries, and data suggest that its pace may be faster than previously thought.[2,6–8] For example, in Ghana, the prevalence of overweight (body mass index [BMI; defined as weight in kilograms divided by the square of height in meters] ≥ 25 kg/m^2) in adolescent girls aged 15 to 19 years increased from 8% to 10.3% between 2003 and 2008.[9] Obesity rates in a pooled sample of adolescent girls and women aged 15 years and older living in urban areas of 6 African countries (Burkina Faso, Ghana, Malawi, Niger, Senegal, and Tanzania) rose from 17.9% to 25.4% between 1992 and 2003.[10] A study of Algerian children aged 6 to 10 years found an increase in overweight (including obesity) prevalence from 6.8% in 2001 to 9.5% in 2006.[11] A study among youths aged 7 to 18 years in 16 major cities across China found increases of 1.1 BMI units among boys and 0.8 units among girls from 1995 to 2005.[12] In a district in Kerala, India, overweight among youths aged 5 to 16 years increased significantly, from 4.9% in 2003 to 6.6% in 2005.[13]

Previous studies among adults and children suggest that the speed at which this transition appears to be occurring in South Africa is particularly striking.[14–19] To further document risk transition and aid policymakers' response to it, we studied the prevalence and correlates of overweight and obesity among South African high school students in 2002 and 2008.

METHODS

The 2002 and 2008 South African National Youth Risk Behaviour Surveys shared a provincially stratified, 2-stage cluster sample design. To ensure that we used nationally representative data, the sampling frame for each survey year was the most recent list of all schools in the country, provided by the South African National Department of Education. Each sampling frame was first stratified by province. In all 9 provinces, schools were the primary sampling units and were selected with a probability proportional to schools' student enrollment in grades 8 to 11. At the second stage of sampling, classes within each participating school were randomly selected.

All students in the selected classes were eligible to participate. Each survey was cross-sectional and independent of the other. Self-administered questionnaires covering a broad range of sociodemographic characteristics and risk behaviors were administered to participants, and their heights and weights were measured. The survey questionnaire was adapted from

the US Youth Risk Behavior Survey, a school-based health survey conducted biennially since 1991, but height and weight are not measured in the United States.[20,21] Race was reported with the historical apartheid classifications: Black, Colored (mixed Black and White descent), Indian, White, or other. Additional details about the South African survey and methods are available elsewhere.[5,22,23]

Measures

Anthropometric measures were taken by trained staff with an electronic scale (Masskot, UC-321 Precision Health Scale, A&D Weighing, Tokyo, Japan) to measure weight. Each scale was calibrated daily with 2, 1-kilogram weights. Portable stadiometers provided by the same manufacturer were used to measure height. For a staff person to be employed to measure height, that person's height measurements had to meet the technical error of measurement criterion of 0.5% or lower.[24]

Students were required to remove their socks, shoes, jacket, and any heavy items and to lower their hair, if necessary, before height and weight were measured. Staff recorded the weight measurements to the nearest 0.01 kilogram and height to the nearest 0.001 meter. They measured each student's height twice. The height readings had to be within 0.005 meter of each other; if not, the measurements were repeated. The South African National Department of Education provided information to classify urbanicity and school poverty level; the latter was a proxy for socioeconomic status. Quintiles for school poverty level were derived from several factors computed from census data, including income, unemployment, and level of education in the local community (further details of the methods used to determine these quintiles are not publicly available). We collapsed the 5 quintiles (with quintile 1 representing the poorest schools) into 3 groups (1–2, 3–4, and 5) to increase average sample size per cell and to simplify the presentation of results.

The researchers who conducted the survey computed students' BMI from their height and weight measurements according to the International Obesity Task Force standards described by Cole et al.[25] This approach uses age- and gender-specific cutpoints in children aged 2 to 17 years that are consistent with a BMI of 25 (overweight) and 30 (obese), respectively, at age 18 years.

Analyses

For overweight and obesity prevalences, we used data weighted to approximate province-level distributions of gender and grade. In addition, weights accounted for nonresponse and province size. We first compared the sample demographics in the 2 survey years. Next, we stratified prevalence rates for overweight and obesity by gender and race and then further by socioeconomic quintiles and urbanicity. To compare overweight and obesity in 2002 and 2008, we merged the data sets. Then, we applied logistic regression to the pooled data set to compare the odds of overweight and obesity for 2002 to those for 2008. Odds ratios for the associations between selected independent variables and the 2 main outcome variables (obesity and overweight) are available from the corresponding author on request.

To account for nonindependence of students within schools, we used SAS version 9.2 PROC GLIMMIX (SAS Institute Inc, Cary, NC) to adjust for the sampling design effect by nesting students within schools. All analyses controlled for the hierarchical data structure and adjusted for age, gender, and race where applicable (i.e., total columns and rows in tables). We used logistic regression to explore the association of socioeconomic status and urbanicity with overweight and obesity rates, again accounting for the hierarchical data structure. We also tested interactions of socioeconomic status and urbanicity by year to explore whether these predictors functioned differently across survey years.

We excluded respondents who self-identified racially/ethnically as Indian or other because the sample had too few participants from

TABLE 1—Sample Characteristics: South African National Youth Risk Behaviour Survey, 2002 and 2008

Characteristic	2002	2008
Sex, no. (%)		
Adolescent boys	4757 (46.6)	4870** (49.1)
Adolescent girls	5458 (53.4)	5058** (50.9)
Race, no. (%)		
Black	7740 (75.8)	7961** (80.2)
Colored[a]	1571 (15.4)	1440** (14.5)
White	904 (8.8)	527** (5.3)
Age, y, no. (mean age)	9701 (16.7)	9672** (16.2)
Grade, no. (%)		
8	2774 (27.2)	2327** (23.4)
9	3451 (33.8)	2364** (23.8)
10	2300 (22.5)	2846** (28.7)
11	1690 (16.5)	2391** (24.1)
Location, no. (%)		
Urban	5483 (53.7)	5703** (57.4)
Rural	4732 (46.3)	4225** (42.6)
School-level poverty quintile, no. (%)		
1–2	4045 (41.6)	3391** (35.5)
3–4	3967 (40.8)	4902** (51.3)
5	1712 (17.6)	1259** (13.2)

Note. Numbers of respondents are unweighted.
[a]Mixed Black and White descent.
**$P < .01$ (proportions or mean significantly different between 2002 and 2008).

TABLE 2—Overweight and Obesity Rates by Race and Sex: South African National Youth Risk Behaviour Survey, 2002 and 2008

	2002			2008		
Race	Adolescent Boys (n = 4184), % (SE)	Adolescent Girls (n = 5338), % (SE)	Total (n = 9522), % (SE)	Adolescent Boys (n = 4565), % (SE)	Adolescent Girls (n = 4806), % (SE)	Total (n = 9371), % (SE)
Overweight						
Black	4.7 (0.5)	25.0 (2.2)	16.2 (1.3)	9.1** (0.9)	30.1** (1.4)	20.0** (1.2)
Colored[a]	8.0 (1.7)	16.6 (1.9)	12.6 (1.1)	12.7 (2.3)	22.5 (2.6)	17.8 (1.8)
White	19.6 (3.0)	25.5 (2.7)	22.8 (2.1)	27.0 (4.8)	27.5 (2.9)	27.2 (3.1)
Total	6.3 (0.7)	24.3 (1.9)	16.4 (1.1)	11.0** (1.0)	29.0** (1.3)	20.2** (1.1)
Obesity						
Black	1.2 (0.2)	5.0 (0.5)	3.3 (0.3)	2.5** (0.8)	7.6** (1.1)	5.1** (0.9)
Colored[a]	2.4 (1.1)	3.6 (0.9)	3.1 (0.7)	2.6 (0.6)	6.7* (1.2)	4.7 (0.8)
White	4.1 (1.7)	7.0 (1.7)	5.7 (1.5)	9.8 (2.8)	10.5 (1.8)	10.4 (1.9)
Total	1.6 (0.3)	5.0 (0.5)	3.5 (0.3)	3.3** (0.8)	7.5** (1.0)	5.5** (0.8)

Note. All analyses controlled for hierarchical data structure and for age, sex, and race where applicable (i.e., total columns and rows).
[a]Mixed Black and White descent.
*$P < .05$; **$P < .01$ (rates significantly different in 2002 and 2008).

these groups (n=251 in 2002 and 249 in 2008) to conduct meaningful analyses.

RESULTS

As shown in Table 1, the proportion of adolescent girls sampled decreased significantly from 2002 to 2008. The proportion of Black youths increased and the proportion of White students decreased significantly across surveys. Mean age was significantly lower in 2008 than in 2002, although the proportion of students in 8th and 9th grades significantly decreased, and the proportion of 10th- and 11th-grade students correspondingly rose. This apparent paradox was likely attributable to more students being enrolled in their appropriate grade and more students in the school system progressing to higher grades. The proportion of urban participants increased significantly from 54% in 2002 to 57% in 2008.

Trends in Overweight and Obesity

Rates of overweight among adolescent boys increased from 6.3% in 2002 to 11.0% in 2008; among adolescent girls, overweight increased from 24.3% to 29.0% (Table 2). After adjustment for age, race, and gender, these increases remained significant for the full sample as well as for boys and girls separately. Subgroup analysis by racial groups showed that Black boys and girls, who accounted for more than 80% of the study sample, showed significant increases between surveys; Black boys had the highest relative increase of all groups. Although the prevalence of overweight increased between surveys among Colored and White students, the changes were not statistically significant.

Among adolescent boys, the rate of obesity more than doubled, from 1.6% in 2002 to 3.3% in 2008; among adolescent girls, it rose from 5.0% to 7.5%. These increases were statistically significant for the full sample, for Black boys and girls, and for Colored girls. Increases in other groups were not statistically significant.

Socioeconomic Status and Urbanicity

In the full sample, we observed a dose–response relationship in overweight and obesity rates across categories of school-level poverty in both 2002 and 2008: increasing socioeconomic status was associated with greater risk of overweight and obesity. This pattern is evident in most of the race and gender groups (Tables 3 and 4). Across both genders in both surveys, rates of overweight and obesity were significantly higher among urban youths than among rural youths (Table 4). This pattern was again evident in most of the race-by-gender groups.

We assessed whether the association of socioeconomic status and urbanicity with overweight and obesity rates differed across study years. We tested 4 models: school-level poverty by year and urbanicity by year for overweight and for obesity. We only tested interactions for the full sample, not by gender or racial subgroups. Of the 4 interactions tested, 1 was significant. For obesity, we observed an interaction of school level poverty by year. The interaction was driven by a larger increase in the prevalence of obesity rates in the middle and upper quintiles of socioeconomic status than in the lower quintiles.

DISCUSSION

National cross-sectional data from 2002 and 2008 indicated that rates of overweight and obesity increased substantially among South African adolescents. This suggests that a chronic disease transition in South Africa may be looming.

We observed this increased prevalence among all race and gender groups, but not with equal significance. Prevalence changes were significant among Black youths but not among Colored and White youths. This difference may have been attributable to the smaller number of students sampled from these subgroups as well as the nested sampling (i.e., the design effect), which further reduced our effective sample size.

In the United States, between the second National Health and Nutrition Examination Survey (1976–1980) and the third (1988–1994),

TABLE 3—Overweight and Obesity Rates by Race, Sex, and School-Level Poverty Quintile: South African National Youth Risk Behaviour Survey, 2002 and 2008

Race/Ethnicity by Poverty Quintile[a]	2002 Adolescent Boys (n = 4184), % (SE)	2002 Adolescent Girls (n = 5338), % (SE)	2002 Total (n = 9522), % (SE)	2008 Adolescent Boys (n = 4561), % (SE)	2008 Adolescent Girls (n = 4810), % (SE)	2008 Total (n = 9371), % (SE)
Overweight						
Black						
1–2	4.0 (0.6)	21.5 (2.0)	13.7 (1.3)	6.1 (1.0)	27.5 (2.2)	17.4 (1.8)
3–4	4.5 (0.7)	29.2 (4.7)	18.7 (2.9)	11.0 (1.7)	31.0 (2.2)	21.4 (1.9)
5	10.6* (2.6)	30.3** (5.0)	22.2** (2.1)	12.2** (1.8)	32.8 (4.2)	23.2* (2.4)
Colored[b]						
1–2	10.5 (6.2)	8.1 (3.5)	9.1 (3.1)	2.8 (2.6)	12.9 (4.8)	8.2 (3.3)
3–4	7.1 (1.8)	20.6 (1.8)	13.7 (1.0)	12.8 (3.0)	22.3 (3.1)	17.8 (1.9)
5	8.3 (3.0)	18.8* (1.5)	13.9 (1.8)	13.0 (4.4)	29.8 (3.8)	21.5 (3.4)
White						
1–2	5.7 (4.1)	27.3 (9.7)	18.0 (5.6)	5.9 (4.8)	9.0 (5.3)	8.2 (3.9)
3–4	22.3 (5.5)	21.3 (7.4)	21.7 (5.3)	20.8 (10.0)	37.1 (8.2)	27.1 (3.4)
5	18.4 (4.1)	26.9 (2.6)	23.1 (2.2)	29.5 (5.5)	26.4 (3.1)	28.0 (3.6)
Total						
1–2	4.3 (0.7)	20.8 (1.9)	13.5 (1.2)	5.9 (1.0)	26.7 (2.2)	16.9 (1.8)
3–4	6.1 (0.9)	27.9 (4.1)	18.4 (2.5)	11.9 (1.5)	29.6 (2.1)	20.9 (1.7)
5	12.9 (2.1)	27.0** (2.8)	20.9** (1.3)	19.8** (3.3)	30.1 (2.5)	25.0** (2.2)
Obesity						
Black						
1–2	1.0 (0.3)	4.4 (0.8)	2.9 (0.5)	1.2 (0.4)	5.6 (0.6)	3.5 (0.4)
3–4	1.2 (0.4)	4.4 (0.7)	3.0 (0.4)	3.3 (1.6)	8.4 (1.9)	6.1 (1.8)
5	2.6 (0.9)	9.0 (2.2)	6.3 (1.0)	5.0** (1.2)	10.6* (3.2)	7.9** (1.8)
Colored[b]						
1–2	0.5 (0.5)	1.0 (0.5)	0.8 (0.3)	1.9 (1.7)	2.8 (1.4)	2.3 (1.3)
3–4	1.9 (0.4)	2.8 (0.7)	2.3 (0.3)	2.7 (0.7)	7.1 (1.6)	5.0 (1.0)
5	5.0 (3.4)	6.0 (2.0)	5.5* (1.9)	2.5 (1.8)	8.1 (2.2)	5.3 (2.0)
White						
1–2	0.0 (0.0)	3.1 (2.6)	1.7 (1.5)	1.2 (1.3)	0.0 (0.0)	0.6 (0.7)
3–4	5.7 (4.0)	6.6 (4.5)	6.2 (4.2)	5.1 (2.0)	10.9 (3.8)	7.4 (1.6)
5	4.0 (2.3)	7.3 (1.8)	5.8 (1.4)	11.4 (3.2)	11.0 (1.9)	11.6 (2.1)
Total						
1–2	0.9 (0.3)	4.2 (0.8)	2.8 (0.5)	1.2 (0.4)	5.4 (0.6)	3.4 (0.4)
3–4	1.6 (0.5)	4.4 (0.7)	3.2 (0.5)	3.8 (1.6)	8.1 (1.7)	6.1 (1.6)
5	3.6 (1.2)	7.9* (1.3)	6.0** (0.8)	7.4** (1.6)	10.1** (1.6)	8.9** (1.3)

Note. All analyses controlled for hierarchical data structure and for age, sex, and race where applicable (i.e., total columns and rows).
[a]School-level poverty quintiles; quintile 5 is the highest socioeconomic status.
[b]Mixed Black and White descent.
*$P < .05$; **$P < .01$ (rates significantly different in 2002 and 2008).

rates of obesity (previously referred to as overweight but corresponding to the 95th percentile) in adolescent boys aged 12 to 17 years increased from 4.7% to 11.4% and in adolescent girls from 4.9% to 9.9%.[26] Another analysis of data from the same 2 surveys, reporting on youths aged 12 to 19 years, found an increase from 4.8% to 11.3% in boys and from 5.3% to 9.7% in girls.[27] Thus, in the United States it took almost 13 years for obesity rates among adolescents to broadly double; a similar increase occurred in only 6 years in South Africa.

We detected a dose–response relationship between socioeconomic categories (according to school-level poverty classification) and overweight and obesity in both the South African surveys: higher socioeconomic status was associated with greater risk of overweight and obesity. Moreover, the relationship between socioeconomic status and obesity changed significantly across the 2 surveys driven by a larger

TABLE 4—Overweight and Obesity Rates by Race and Urbanicity: South African National Youth Risk Behaviour Survey, 2002 and 2008

Race/Ethnicity by Urbanicity	2002 Adolescent Boys (n = 4184), % (SE)	2002 Adolescent Girls (n = 5338), % (SE)	2002 Total (n = 9522), % (SE)	2008 Adolescent Boys (n = 4561), % (SE)	2008 Adolescent Girls (n = 4810), % (SE)	2008 Total (n = 9371), % (SE)
Overweight						
Black						
Urban	5.5 (0.7)	27.1 (1.6)	18.0 (1.1)	11.6 (1.4)	32.0 (2.0)	21.9 (1.6)
Rural	4.3 (0.7)	23.8* (3.4)	15.1** (2.0)	6.7** (1.2)	28.5* (2.1)	18.2** (1.7)
Colored[a]						
Urban	7.5 (1.1)	19.4 (1.2)	13.7 (0.8)	14.4 (2.9)	26.4 (2.8)	20.5 (2.0)
Rural	9.9 (6.3)	8.4 (3.8)*	9.1 (3.6)	6.6 (1.9)	11.8** (3.2)	9.4** (2.1)
White						
Urban	18.4 (2.8)	23.9 (2.8)	21.3 (2.0)	30.1 (5.4)	27.8 (3.3)	28.9 (3.4)
Rural	28.7 (12.9)	34.9 (6.6)	32.5 (6.5)	10.2 (3.0)	26.1 (4.7)	18.0 (3.0)
Total						
Urban	8.1 (0.9)	25.5 (1.3)	17.9 (0.9)	14.2 (1.7)	30.7 (1.6)	22.5 (1.4)
Rural	4.9 (0.9)	23.4* (3.3)	15.2** (1.9)	7.1** (1.1)	27.1* (2.2)	17.6** (1.7)
Obesity						
Black						
Urban	1.9 (0.5)	7.5 (0.9)	5.2 (0.6)	4.0 (1.6)	10.5 (2.0)	7.3 (1.8)
Rural	0.8** (0.3)	3.5** (0.7)	2.3** (0.4)	1.0** (0.3)	5.0** (0.7)	3.2** (0.4)
Colored[a]						
Urban	3.1 (1.4)	3.9 (1.0)	3.5 (0.9)	3.4 (0.7)	8.5 (1.6)	5.8 (1.0)
Rural	0.0 (0.0)	2.8 (1.7)	1.6 (0.8)	1.1 (0.8)	1.8* (0.7)	1.5* (0.6)
White						
Urban	2.8 (1.4)	6.4 (1.9)	4.7 (1.6)	11.6 (2.9)	12.0 (1.6)	12.1 (1.9)
Rural	14.8** (7.9)	10.9 (2.7)	12.4* (3.4)	0.3 (0.3)	3.1 (1.1)	1.6* (0.5)
Total						
Urban	2.3 (0.4)	6.8 (0.7)	4.9 (0.5)	4.9 (1.5)	10.1 (1.6)	7.5 (1.5)
Rural	1.0* (0.4)	3.6** (0.6)	2.5** (0.5)	1.4** (0.6)	4.8** (0.6)	3.2** (0.4)

Note. All analyses controlled for hierarchical data structure and for age, sex, and race where applicable (i.e., total columns and rows).
[a]Mixed Black and White descent.
*$P < .05$; **$P < .01$ (rates significantly different in 2002 and 2008).

increase in obesity among students in the middle socioeconomic quintile than among those in the lower quintiles.

A second indicator of overweight and obesity was urbanicity. Urban youths had significantly higher rates of overweight and obesity than did rural youths. Significant urban in-migration has occurred in South Africa over the past 3 decades, particularly among Black and Colored South Africans.[28] Between 1985 and 2001, the urban concentration of Black South African citizens increased from 37% to 48%.[28]

Our data cannot be used to empirically explain why rates of overweight and obesity have increased so rapidly nor why higher socioeconomic status and urbanicity are associated with higher rates of overweight and obesity. However, studies in the United States and elsewhere suggest that likely contributing factors include increasing intake of sweetened beverages (particularly those including high-fructose corn syrup),[6,29–39] eating at fast-food restaurants and other restaurants,[40–42] and increased sedentary behavior and decreased physical activity.[43–45] These changes are likely enabled by urban environments that provide easy access to calorie-dense foods[42,46,47] and that discourage physical activity.[38,48] Absolute income levels increased among Black and Colored South Africans over the past decade, and this enhanced their ability to afford Western foods. However, significant racial discrepancies in income persist.[49] This access to calorie-dense foods has been accompanied by intensified advertisements for them.[50]

Interestingly, the increase in overweight and obesity in South Africa, particularly among young people, has not received the same amount of public and media attention as in many Western countries, where problems related to overweight and obesity are rife. This may be because overweight and obesity in South Africa have not yet produced massive increases in the burden of chronic diseases. Another reason that overnutrition is not yet perceived as a serious condition may be that a well-fed body has traditionally signified health and wealth in South Africa.[51,52]

When we examined perceived weight, the proportions of male and female overweight

students who did not perceive themselves to be overweight increased from 53.9% in 2002 to 56.4% in 2008 among adolescent girls and from 46.2% in 2002 to 59.7% in 2008 among adolescent boys. Fewer overweight students were actively trying to lose weight in 2008 (42.5% of girls and 44.3% of boys) than in 2002 (53.6% of girls and 55.5% of boys). These data suggest that growing social acceptance may be supporting the increases in overweight and obesity.

Limitations of our study were lack of other measures of overweight and obesity (e.g., skinfold measurements), data on chronic disease biomarkers (e.g., lipids, insulin), and robust measures of diet and activity. Another limitation was that the survey data, although nationally representative, were from only 2 cross-sectional surveys, which limited our ability to determine change over time within a defined cohort. Establishing and tracking a childhood cohort, as in the Bogalusa study in the United States,[53] could be extremely useful in further understanding trends over time. The National Youth Risk Behaviour Survey also did not include measures of environment, such as availability and quality of food stores and restaurants or physical activity facilities.

Our study suggests several avenues for future research. Foremost, it would be useful to elucidate how diet, activity, and psychosocial and environmental factors contribute to the changes we observed. For example, how does urbanicity affect diet and activity patterns among South African adolescents? What is the influence of improving economic conditions on the diet and activity patterns of South African youths, particularly among those previously at the greatest economic disadvantage? To effectively address the coming wave of chronic disease that will no doubt affect South Africa and other developing countries, intensified efforts will be needed to curb the present trend in unhealthy eating patterns and sedentary lifestyles through policy and environmental change as well as effective prevention and treatment programs. A more detailed understanding of diet and activity patterns would greatly aid these efforts. ■

About the Authors

Sasiragha P. Reddy, Shamagonam James, Itumeleng N. Funani, and Ronel Sewpaul are with the Medical Research Council of South Africa, Cape Town. Ken Resnicow is with the School of Public Health, University of Michigan, Ann Arbor. Nilen S. Kambaran, Riyadh G. Omardien, and Pardon Masuka are with ARCH Actuarial Consulting, Cape Town, South Africa. Roger D. Vaughan is with the Department of Biostatistics, Columbia University, New York, NY. Anthony Mbewu is with the Department of Medicine, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa.

Correspondence should be sent to Pardon Masuka, ARCH Actuarial Consulting, PO Box 12573, Mill St, 8010, Cape Town, South Africa (e-mail: pardon@archac.com). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints/Eprints" link.

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Contributors

S.P. Reddy, K. Resnicow, N.S. Kambaran, R.G. Omardien, P. Masuka, R. Sewpaul, R.D. Vaughan, and A. Mbewu carried out the statistical analysis. S.P. Reddy, K. Resnicow, N.S. Kambaran, and R.G. Omardien contributed to the design of the study. S.P. Reddy, S. James, I.N. Funani, and R. Sewpaul collected data. S.P. Reddy, K. Resnicow, S. James, I.N. Funani, N.S. Kambaran, R.G. Omardien, and A. Mbewu drafted the article. S.P. Reddy, S. James, and I.N. Funani supervised the study and provided technical and administrative support. S.P. Reddy is the guarantor, had full access to the data in the study, and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors interpreted results, revised the article, and approved the final version.

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Human Participant Protection

Ethical approval for the study was obtained from the South African Medical Association research ethics committee.

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