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Association between commercial and traditional sugar-sweetened beverages and measures of adiposity in Costa Rica

Jinnie J. Rhee[1,2,3], **Josiemer Mattei**[2], and **Hannia Campos**[2,4]

[1]Department of Epidemiology, Harvard School of Public Health, 677 Huntington Ave., Boston, MA 02115, USA

[2]Department of Nutrition, Harvard School of Public Health, 665 Huntington Ave., Boston, MA

[3]Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, MA

[4]Centro Centroamericano de Población, Universidad de Costa Rica, San Pedro, Costa Rica

Abstract

Objective—Increasing trends in commercial sugar-sweetened beverages(SSB s) consumption have occurred in parallel with rising levels of obesity in Latin America, but data showing the relationship between these SSBs and obesity are limited. The current study examined the association between commercial and traditional SSBs and measures of adiposity in Costa Rica.

Design—A cross-sectional analysis was conducted in which the exposure, SSB intake, was defined as frequency of daily servings of fresco (a traditional homemade beverage), fruit drink (a commercially available SSB), soda, and fruit juice (made from fruits at home). Multivariate linear regression was used to estimate associations between SSB intake and BMI, waist-to-hip ratio, and skinfold thickness.

Setting—Central Valley, Costa Rica.

Subjects—Controls (N=2045) of a case-control study on diet and heart disease in Costa Rica.

Results—Fresco, fruit drink, soda, and fruit juice were consumed at least 1/d by 47%, 14%, 4%, and 14% of the population respectively. One serving/d of soda, fruit drink, and fresco was associated with 0.89, 0.49, and 0.21 kg/m^2 higher BMI respectively (all P<0.05). Fruit drink (≥1 s/d) was associated with higher waist to hip ratio (P=0.004), while soda and fresco were associated with higher skinfold thickness (P=0.02 and 0.01 respectively). Associations with fruit juice intake were modest and not statistically significant. Other factors associated with higher BMI were higher income and less education, smoking, and physical inactivity (all P<0.05).

Conclusion—Increasing intake of commercially available SSBs could be in part responsible for the high prevalence of obesity among Hispanic adults.

Keywords

Sugar-sweetened beverages; obesity; Hispanics; Latin America; nutrition transition

Correspondence to Hannia Campos, PhD, Department of Nutrition, Room 201, Harvard School of Public Health, 665 Huntington Ave, Boston, MA 02115, Phone: (617) 432-0100, Fax: (617) 432-2435, hcampos@hsph.harvard.edu.

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Introduction

According to the World Health Organization, more than 1 billion adults worldwide are overweight and at least 300 million of them are obese (1). Obesity is associated with numerous diseases, such as insulin resistance, type 2 diabetes, heart disease, and obesity-related cancers (2, 3); thus, preventing and controlling this metabolic condition has imperative public health impact. While a causal relationship between sugar-sweetened beverages (SSBs) and obesity remains unclear, numerous studies suggest that increased SSB consumption may lead to weight gain in both adults and children (3, 4). One possible explanation is that SSBs, especially high intake of energy-dense SSBs, increase total energy consumption to a point where it surpasses total energy expenditure (4), (5). Additionally, SSBs generate low satiety and may encourage individuals to consume more foods per meal, leading to a higher total daily caloric intake (6, 7). Both mechanisms may ultimately lead to unintentional weight gain.

Ecological data support the aforementioned association between SSBs and obesity, as the consumption of SSBs has increased in parallel with the escalating prevalence of obesity in many countries (8). For example, in Mexico, the prevalence of obesity among adults has increased dramatically since the late 1980s, with a 4% increase from 2000 to 2006 (9). Concurrently, the percentage of Mexican households consuming soda increased by 22% from 1989 to 2006 (10). In Mexico, SSBs now contribute approximately 8–9% of total caloric intake, making this country the second largest soda consumer in the world (10).

A similar nutrition transition is rapidly taking place in other Latin American countries where urbanization has led people to become more sedentary while adopting a diet that is high in refined sugars (11, 12), heightening the public health concern of a predominantly overweight population (12, 13). Indeed, the prevalence of obesity is extremely high in Latin American countries (14), including an upward trend observed in Costa Rica. In Costa Rican women aged 20–44, the prevalence of overweight and obesity steadily increased from 35% in 1982 to 46% in 1996 (15). By 2009, 60% of Costa Rican women in this age range were considered overweight (15). A similar trend was observed in men aged 20–64, among whom the prevalence of overweight increased from 22% in 1982 to 62% in 2009 (15).

Unfortunately, there is limited data on consumption of SSBs and any potential relationship with adiposity in Latin American countries. Therefore, we investigated whether SSB consumption is associated with overweight and obesity status using body mass index (BMI) and other anthropometric measurements in Costa Rican adults.

Experimental Methods

Study Population

All participants in this study were control subjects of a population-based case-control study conducted in Costa Rica from 1994 to 2004. The details of the study are described elsewhere (16). Controls were randomly selected from the National Census and Statistics Bureau of Costa Rica, and matched with cases of a first acute myocardial infarction for age, sex, and area of residence. This study was approved by the Human Subjects Committee of the Harvard School of Public Health and the University of Costa Rica. All participants gave informed consent and the participation rate for controls was 88%.

Data Collection

Trained personnel visited study participants at their homes to collect anthropometric measurements and conduct interviews using close-ended questions to attain data on socio-demographic characteristics, smoking, physical activity, and medical history. The details of

anthropometric measurement collection method are explained elsewhere (17). All anthropometric measurements were taken from subjects wearing light clothing and no shoes, and collected in duplicate and averaged out for analyses. Fieldworkers measured triceps (posterior upper arm, midway between the elbow and acromion), subscapular (1 cm below the lower tip of the scapula), and suprailiac (at the midline and above the iliac crest) skinfolds using Holtain skinfold calipers. All measurements were taken on the right side of the body. Non-stretching fiberglass or metal tapes were used to measure the waist (smallest horizontal trunk circumference) and hip (largest horizontal circumference around the hip and buttocks) girths. A steel anthropometer and a Detecto bathroom scale or a Seca Alpha Model 770 digital scale accurate to 50g were used to measure height and weight respectively. The two scales were calibrated every other week. BMI was calculated as weight (kg) divided by height (m^2).

Dietary intake was assessed using the semiquantitative food frequency questionnaire that was developed and validated specifically for the Costa Rican population (18–21). The following sweetened beverage items were assessed: Coke, Pepsi, and other sodas (1 can, 12 oz.); Caffeine Free Coke, Pepsi, and other sodas (1 can, 12 oz.); orange juice (1 glass, 8 oz.); other fruit juices (1 glass, 8 oz.); commercially available sweetened beverages (1 serving, 8 oz.); and fresco (1 glass, 8 oz.). *Fresco* is a popular traditional homemade beverage in Latin America that is often made by blending together fresh fruits, sugar, and water. Commercially available sweetened beverages were defined as “fruit drink”, while natural home-made juices freshly squeezed from various fruits, mainly orange juice (76%), were combined into the category “fruit juice”. The variable “soda” consisted of all sugar-sweetened soda beverages, which were mostly regular Coke, Pepsi, and other colas (84%), followed by caffeine-free sodas (16%).

Statistical Analysis

The original population consisted of 2274 participants and 27% of them were women. Subjects with missing data on BMI (n=25), skinfold thickness (n=21), SSBs (n=38), and potential confounders (n=145) were excluded from the study. Thus, a total of 2045 subjects (90% of total studied population) were included in the study. In order to look at the distribution of demographic characteristics, age, which ranged from 18 to 86, was categorized into three age groups (≤44, 45–64, and ≥65 y), and income was categorized into tertiles. All beverage intakes were divided into the following categories based on the frequency of consumption: never, >0 and<1 serving/day, and ≥1 serving/day. Differences in group means and the distribution of continuous and categorical variables were assessed by performing analysis of variance and chi-square tests respectively, using “never” as the reference category. We did not find significant differences in demographic characteristics between excluded and included participants.

Multivariate regression was used to estimate least square means and β coefficients for the association between SSB and continuous markers of adiposity, including BMI, waist-to-hip ratio, and subscapular, suprailiac and triceps skinfolds. The main model was adjusted for age, sex, education, income, area of residence, smoking, and physical activity. Subsequent models considered other food items that have been shown to be associated with SSB consumption: intake of added sugars, dietary fiber intake, alcohol intake, intake of the ratio of polyunsaturated fatty acids to saturated fatty acids (PUFA:SFA), and depending on the model, consumption of other SSBs other than the main exposure. None of these variables altered the initial model and thus were not included for the final analysis. To determine if total caloric intake would mediate the association between SSB and adiposity outcomes, we adjusted for total energy intake in a separate model. All *P*-values were two-sided and analyses were performed at an alpha level of 0.05. Statistical Analysis Systems statistical software packagever. 9.1 (SAS Institute Inc., Cary, NC) was used for all statistical analyses.

Results

The distribution of average demographic and anthropometric characteristics as well as average beverage intake are presented by sex and three categories of BMI (Table 1). Men with higher levels of income were more overweight and obese. Current smokers tended to have lower BMI, for both males and females. Men who drank one or more servings of fruit drink and fruit juice per day, and women who drank one or more servings of soda per day presented higher frequencies of obesity compared to those who never drank. Fresco, fruit drink, soda, and fruit juice were consumed at least 1/d by 47%, 14%, 4%, and 14% of the population respectively (data not shown).

We examined general characteristics and potential confounders by frequency of intake of different SSBs (Table 2). In general, males and younger participants consumed more SSBs. Participants who consumed ≥1 serving of fruit juice were less physically active than those who did not consume it. Participants who consumed ≥1 serving of SSBs, except for fruit drinks, had higher years of education and income, while those who never consumed SSB had lower caloric intake than those who did. Consuming more fresco and fruit juice but less fruit drink was observed among those residing in urban and peri-urban areas.

Overall, higher consumption of SSBs was associated with increased measures of adiposity (Table 3). Increased soda intake was associated with an increase in BMI. Those who consumed ≥1 serving of soda/day had 6% higher mean BMI than never drinkers. Participants who consumed soda <1 s/day and ≥1/day had 2% and 14% higher total skinfold thickness respectively (P=0.02), compared to those who did not consume soda (data not shown). Increased fruit drink intake at <1 s/day and ≥1s/day were associated with 3% and 4% increases in mean BMI respectively (P=0.007). Those who consumed fruit drink ≥1/day had 4% higher waist-to hip ratio than never drinkers (P=0.004). Subscapular skinfold thickness was higher in those who consumed fruit juice ≥1s/day compared to never drinkers (17.3 vs. 16.1 cm, P=0.04); no other measures of adiposity were significantly associated with fruit juice intake. Those who consumed fresco <1 s/day and ≥1/day had significantly higher mean skinfold thickness at the three measured sites, with total skinfolds being 0.5 cm and 2.6 cm thicker than never drinkers (P=0.01, data not shown). Increased consumption of fresco was not associated with BMI or waist-to-hip ratio. None of the results reported in Table 3 were altered when we adjusted for total caloric intake in a separate model.

We also examined the associations between the four different SSBs and lifestyle factors, and difference in BMI, adjusted for age and sex (Figure 1). An increase of 1 serving per day of soda or fruit drink was associated with 0.89 kg/m^2 and 0.49 kg/m^2 higher BMI respectively (P=0.001 and 0.0005). An increase of 1 serving per day of fresco was associated with 0.21 kg/m^2 higher BMI (P=0.04). Additional servings of fruit juice were not significantly associated with increases in BMI. One SD (14.3 MET) increase in physical activity was associated with 0.01 kg/m^2 lower BMI. Education and income were associated with BMI in opposite directions: one SD (5.44 years) increase in education was associated with lower BMI (−0.30 kg/m^2) whereas one SD ($427) increase in income was associated with higher BMI (+0.38 kg/m^2). Smoking was significantly associated with lower BMI (−1.54 kg/m^2, P<.0001).

Discussion

This study shows that increased intake of sugar sweetened beverages, especially commercially available SSBs such as fruit drinks and soda, is significantly associated with higher measures of adiposity including BMI and waist-to-hip ratio. Stronger associations were found for commercially available SSBs (soda and fruit drink) than for traditional fresco

or fruit juice. An increase of one soda or fruit drink per day was associated with higher BMI. Increasing servings of fresco were also associated with higher BMI, though to a lesser extent. Intake of fruit drink or soda at least 1s/d was also associated with higher waist-to-hip ratio compared to no intake.

Epidemiologic data, including evidence from large prospective cohort studies and short-term feeding trials, strongly support the hypothesis that higher intake of SSBs is associated with a higher risk of obesity (3, 4, 22–24). The major findings of our study are consistent with those reports. For example, results from analysis conducted with data of the Nurses' Health Study II showed that an increased intake of SSBs over two 4-year periods resulted in the largest amount of weight gain, and an increased intake of fruit punch was also associated with weight gain (23). It has been hypothesized that in addition to the weight gain due to increased energy intake other mechanisms could lead to the increased overweight associated with higher SSB intake (3, 22). The observed positive associations between SSB intake and increased adiposity after adjusting for total energy in the present study are in agreement with this hypothesis.

Our study findings show that the association between soda and commercially available fruit drinks and obesity is stronger than the association between traditional homemade drinks (fresco) and obesity. This could have important public health implications in Latin American countries where there has been an upward trend in soda consumption. For example in Chile, SSBs are one of the top 3 food items purchased (25), and in Mexico, soda purchases have been increasing from 1984 to 1998 (26). In our study, only 4% of the adults consumed at least one can of soda per day while 14% of them consumed at least one serving of commercially available fruit drink per day. Although this is a low intake of soda compared to intakes in other Latin American countries, consumption was higher for younger adults, highlighting the importance of targeting programs that seek to control advertising of soda and other commercially available sweetened beverages toward younger adults to prevent weight gain and obesity at older ages. The potential long-term effects of fresco consumption on overweight and obesity in the Costa Rican population should not be ignored. Although the association between increasing serving of fresco and BMI was not as strong as that between increasing serving of soda and BMI, a higher percentage of our subjects consumed fresco (47%) than soda (4%). As such, the potential impact of fresco on health should be examined further and be addressed in Costa Rican dietary recommendations in the future.

Based on earlier findings, it has been hypothesized that the burden of obesity shifts to disadvantaged groups with lower socioeconomic status, especially in low-income countries (27–29). CARMELA, a cross-sectional, population-based observational study done in seven major Latin American cities, supported this hypothesis by showing an inverse gradient between socioeconomic status and BMI, waist circumference and metabolic syndromein women (27). In a recent trend study published by Singh *et al.* (29), higher obesity prevalence was observed in immigrants in the U.S. with lower education, income, and occupation levels in each time period examined, but over time higher socioeconomic groups experienced more rapid increases in prevalence. In our study, higher income was associated with higher BMI. Overweight and obesity prevalence has been increasing rapidly in Latin America, and this emerging problem could partially be explained by rapid socioeconomic development and urbanization, and adoption of Western diet patterns and sedentary behaviors (30). For developing countries, a higher socioeconomic level may allow individuals to afford "Western" foods and beverages, including commercial SSBs, which tend to be more costly than the traditional drinks (31). Such findings render support to the notion that improved socioeconomic status and lifestyles are associated with an increased risk of obesity (28, 30, 32). Opposite to the results for income, we observed that higher education was associated with lower BMI. While a report showed that education has a minimal effect on obesity

among foreign-born Hispanics living in the US (33), intake of added sugar has been inversely associated with educational attainment in US Hispanic men (34). Although education and income tend to be linked, higher education may counterbalance the association between high income and obesity, as individuals become well-informed about health and diet in general. Therefore, considerations should be given to obesity prevention measures that seek to improve education along with socioeconomic progress in Latin American countries.

A major strength of this study is the separate analysis of commercially prepared and home-made traditional beverages rather than a combined analysis. This allowed us to determine differences in association with adiposity by type of beverage, and provide targeted recommendations on limiting in take of specific types of beverages. The study also benefited from a large sample size, high participation rate, and the use of detailed dietary assessment using the standardized food frequency questionnaire designed and validated specifically for Costa Ricans. A main limitation of this study is its cross-sectional design, which cannot establish directionality of the association. Our study results may be applicable only to other Hispanic ethnic groups with similar patterns of beverages consumption. As there are scarce data on such dietary preferences among Hispanics (14), our study is a major contribution to such body of work, and encourages future epidemiological research in this field, particularly in Latin America.

In conclusion, increased intake of commercially available SSBs could partly explain the increasing prevalence of obesity in Latin America. Whether preventing SSB consumption will stop or diminish levels of obesity warrants further examination, but our results are consistent with other study findings and possible biological mechanisms that could explain weight gain from increased intake of SSBs. Because obesity and overweight are major risk factors for various chronic diseases, it is important to establish dietary recommendations that can raise public awareness on the potential health risks of high consumption of SSBs.

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Abbreviations

BMI	body mass index
PUFA:SFA	ratio of polyunsaturated fatty acids to saturated fatty acids
SSB	sugar-sweetened beverage

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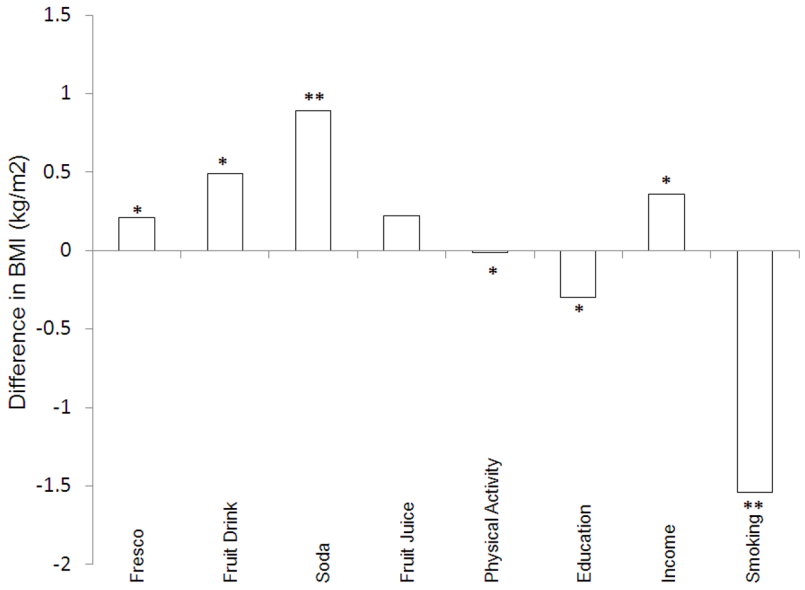

Figure 1.

Differences in BMI (in kilograms per meters squared) are shown for varying units of intake of sugar sweetened beverages and of lifestyle factors. The units for each exposure variable and lifestyle factor are as follows: fresco: an increase of 1 glass/day, 8 oz.; fruit drink: an increase of 1 serving/day, 8 oz.; soda: an increase of 1 can/day, 12 oz; fruit juice: an increase of 1 glass/day, 8 oz.; physical activity, 1 SD MET (14.3 MET); education, 1 SD years (5.44 years); income, 1 SD $ ($427); and smoking. The model was adjusted for age, sex, and total caloric intake. All *P*-values were significant at the $\alpha = 0.05$ level except for fruit juice.

* $P<0.05$

** $P \leq 0.0001$

TABLE 1

Demographic and anthropometric characteristics and dietary intake by sex and BMI categories in Costa Rican population-based adults

	Sex					
	Male			Female		
	BMI (kg/m^2)			BMI (kg/m^2)		
	<25	25–29.9	≥30	<25	25–29.9	≥30
N(%)	626 (41.0%)	680 (44.0%)	228 (15.0%)	161 (31.0%)	214 (42.0%)	136 (27.0%)
Demographic characteristics						
Age (%)						
≤44 years	40.0	44.0	16.0	37.0	29.0	34.0
45–64 years	39.0	44.0	17.0	29.0	41.0	30.0
≥65 years	45.0	44.0	11.0	33.0	45.0	22.0
Education (%)						
Primary education or less	42.0	44.0	14.0	30.0	41.0	29.0
Secondary education	41.0	42.0	17.0	32.0	44.0	24.0
Post-secondary education	36.0	49.0	15.0	38.0	43.0	19.0
Area of residence (%)						
Rural	42.0	44.0	14.0	33.0	44.0	23.0
Peri-urban	41.0	45.0	14.0	35.0	37.0	28.0
Urban	40.0	45.0	15.0	29.0	44.0	27.0
Income, *tertiles* (%)						
Low	48.0	40.0	12.0	33.0	42.0	25.0
Medium	42.0	44.0	14.0	26.0	48.0	26.0
High	33.0	49.0	18.0§	34.0	36.0	30.0
Current smoking (%)	52.0	38.0	10.0§	50.0	28.0	22.0§
Physical activity (METs)	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
	38.0 19.0	36.0 17.0	34.0 16.0	31.0 8.0	32.0 9.0	31.0 8.0
Anthropometric Characteristics						
Waist-to-hip ratio	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
	0.95 0.06	0.99 0.05	1.01 0.05§	0.86 0.06	0.89 0.06	0.89 0.06§
Subscapular skinfold (cm)	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
	12.5 3.7	17.4 5.5	22.1 8.6§	14.0 6.7	18.6 8.7	21.1 9.4§

	Sex											
	Male						Female					
	BMI (kg/m^2)						BMI (kg/m^2)					
	<25		25–29.9		≥30		<25		25–29.9		≥30	
Suprailiac skinfold (cm)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	8.3	3.8	11.3	4.7	15.0	6.7§	14.3	6.1	18.2	7.8	19.1	8.5§
Triceps skinfold (cm)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	9.3	3.1	12.4	3.6	16.6	6.4§	16.6	5.6	19.5	7.9	21.1	8.4§
Sugar sweetened beverage intake Fresco* (1 glass, 8 oz.) (%)												
Never	46.0		39.0		15.0		20.0		51.0		29.0	
>0 and <1/day	41.0		42.0		47.0		35.0		38.0		27.0	
≥1/day	39.0		48.0		13.0		32.0		43.0		25.0	
Fruit drink† (1 serving, 8 oz.) (%)												
Never	44.0		43.0		13.0		34.0		41.0		25.0	
>0 and <1/day	37.0		48.0		15.0		30.0		43.0		27.0	
≥1/day	36.0		43.0		21.0§		23.0		43.0		34.0	
Soda (1 can, 12 oz.) (%)												
Never	42.0		44.0		14.0		31.0		44.0		25.0	
>0 and <1/day	40.0		45.0		15.0		35.0		35.0		30.0	
≥1/day	30.0		46.0		24.0		0.0		50.0		50.0§	
Fruit juice‡ (1 glass, 8 oz.) (%)												
Never	45.0		40.0		15.0		30.0		42.0		28.0	
>0 and <1/day	39.0		46.0		15.0		28.0		44.0		28.0	
≥1/day	33.0		51.0		16.0§		44.0		36.0		20.0	

METs, metabolic equivalents

*Fresco is defined as intake of homemade, non-commercially available sugar sweetened fruit beverage

†Fruit drink is defined as intake of commercially available sugar sweetened beverage

‡Fruit juice is defined as intake of natural orange juice and other fruit juices made at home

§Mean values were significantly different from those of the reference group (“Never”): $P < 0.05$, assessed by analysis of variance and chi-square tests for continuous and categorical variables respectively

TABLE 2

Potential confounders by categories of sugar sweetened beverage intake for Costa Rican population-based adults

	Fresco*				Fruit Drink†				Soda				Fruit Juice‡			
	Never		≥1/day		Never		≥1/day		Never		≥1/day		Never		≥1/day	
N (%)	279 (14.0%)		968 (47.0%)		1146 (56.0%)		283 (14.0%)		1267 (62.0%)		84 (4.0%)		895 (44.0%)		280 (14.0%)	
Age (y)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	59.0	11.0	58.0§	11.0	60.0	11.0	55.0§	12.0	60.0	11.0	53.0§	12.0	60.0	11.0	59.0§	11.0
Physical activity (METs)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	36.0	17.0	36.0	17.0	36.0	16.0	36.0	16.0	35.0	15.0	39.0	23.0	36.0	18.0	33.0§	12.0
Total energy (kcal)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	2183	675	2619§	785	2391	754	2625§	821	2352	706	3063§	906	2335	729	2629§	799
Sex (%)																
Male	13.4		48.2		54.8		14.8		58.8		4.8		42.6		13.6	
Female	14.3		44.6		59.9		11.0§		71.4		2.0§		47.4		14.1	
Area of residence (%)																
Rural	18.0		46.6		54.0		16.8		64.6		4.4		49.2		11.5	
Peri-urban	13.3		47.1		54.0		12.5		60.8		4.1		39.3		12.5	
Urban	11.3		47.9§		59.1		13.2§		61.3		4.0		41.3		16.1§	
Education (yrs)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	7.08	5.46	8.02§	5.30	7.73	5.53	7.55	4.82	7.57	5.49	9.74§	5.33	6.27	4.72	10.5§	5.91
Income ($)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	536	439	595	418	578	446	567	388	553	422	621§	414	467	366	802§	507
Current smoking (%)	16.4		46.4		54.6		16.1		57.1§		3.9		48.6		11.1§	

METs, metabolic equivalents

*Fresco is defined as in take of homemade, non-commercially available sugar sweetened beverage

†Fruit drink is defined as intake of commercially available sugar sweetened beverage

‡Fruit juice is defined as intake of natural orange juice and other fruit juices made at home

§Mean values were significantly different from those of the reference group ("Never"): $P < 0.05$, assessed by analysis of variance and chi-square tests for continuous and categorical variables respectively

TABLE 3

Adjusted mean adiposity measurements by categories of sugar sweetened beverage intake for Costa Rican population-based adults

	BMI (kg/m^2)	Waist-to-Hip Ratio	Subscapular (cm)	Skinfolds* Suprailiac (cm)	Triceps (cm)
Fresco†					
Never (*N* = 279)	26.2	0.92	16.2	13.0	14.6
>0 and <1/day (*N* = 798)	26.1	0.92	16.1	13.2	15.0
≥1/day (*N* = 968)	26.2	0.92	16.9¶	13.9//¶	15.5//
P-value	0.82	0.29	0.03	0.01	0.02
Fruit drink‡					
Never (*N* = 1146)	26.0	0.90	16.6	13.6	15.3
>0 and <1/day (*N* = 616)	26.8	0.93	15.8	13.3	14.7
≥1/day (*N* = 283)	27.1//	0.94//	16.1	13.1	14.6
P-value	0.007	0.004	0.24	0.50	0.09
Soda					
Never (*N* = 1267)	26.1	0.92	16.3	13.3	15.0
>0 and <1/day (*N* = 694)	26.0	0.92	16.7	13.7	15.4
≥1/day (*N* = 84)	27.7//¶	0.93//	18.8//¶	15.3//¶	16.6//
P-value	0.005	0.10	0.03	0.03	0.05
Fruit juice§					
Never (*N* = 895)	26.0	0.92	16.1	13.3	15.1
>0 and <1/day (*N* = 870)	26.2	0.92	16.5	13.6	15.0
≥1/day (*N* = 280)	26.3	0.92	17.3//	13.9	15.7
P-value	0.50	0.30	0.04	0.30	0.19

*Means are adjusted for age, sex, education, income, area of residence, smoking, and physical activity

†Fresco is defined as intake of homemade, non-commercially available sugar sweetened beverage

‡Fruit drink is defined as intake of commercially a vailable sugar sweetened beverage

§Fruit juice is defined as intake of orange juice and other fruit juices made at home

//P <0.05 when ≥1/day is compared to never

¶ $P<0.05$ when ≥1/day is compared to 0–1/day