Energy density in the diet of workers from São Paulo, Brazil, and associated socio-demographic factors*

Densidade energética da dieta de trabalhadores de São Paulo e fatores sociodemográficos associados

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* The main study from which data for the present study originated was funded by the *Fundação de Amparo à Pesquisa do Estado de São Paulo* (FAPESP – State of São Paulo Research Support Foundation), process 2007/02540-1. Canella DS was granted a Ph.D. scholarship by the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES – Coordination for the Improvement of Higher Education Personnel).

* Article developed from the thesis by Canella DS entitled "Energy Density in the Diet Provided to Workers and in a Work Environment". School of Public Health, University of São Paulo; 2011.

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Abstract

Objective: This paper aims at analyzing the energy density (ED) of the diet of workers from the city of São Paulo, Southeastern Brazil, and the way this is associated with socio-demographic characteristics, as well as evaluating the relationship between ED and nutrient intake. **Methods:** A cross-sectional study evaluated the diet of 852 workers using the 24-hour dietary recall; one recall was applied to all individuals and a second one was applied to a sub-sample in order to adjust intrapersonal variability. The ED of the diet was calculated using three methods: inclusion of all solid foods and beverages, excluding water (ED 1); inclusion of all solid foods and beverages containing at least 5 kcal/100g (ED 2); and inclusion of all solid foods, excluding all beverages (ED 3). Linear regression was used to analyze the relationship between ED and socio-demographic variables and the relationship between ED and nutrients was evaluated using Pearson coefficient correlation. **Results:** Considering the workers' diet, the ED values observed were 1.18 kcal/g, 1.22 kcal/g and 1.73 kcal/g for the ED 1, ED 2, ED 3 methods, respectively. In the multiple regression models, only the age variable was maintained in the final model and showed an inverse association with all ED methods. ED 3 showed an increase in energy density for non-white individuals. Of all studied nutrients, protein was the only one that was not significantly correlated with ED 3 ($p = 0.899$). **Conclusion:** The young adults studied had a higher energy-density diet, representing a priority group for nutrition interventions. Regardless of the calculation method used, there is a correlation between ED and nutrients.

Keywords: Energy density. Food consumption. Energy intake. Workers.

Resumo

Objetivo: Analisar a densidade energética (DE) da dieta de trabalhadores da cidade de São Paulo e sua associação com características sociodemográficas, bem como avaliar a relação entre DE e ingestão de nutrientes. **Métodos:** Estudo transversal que avaliou a dieta de 852 trabalhadores, por meio de recordatório de 24 horas, sendo um recordatório aplicado a todos os indivíduos e um segundo para subamostra, a fim de corrigir a variabilidade intrapessoal. A DE da dieta foi calculada por três métodos: inclusão de todos os alimentos sólidos e das bebidas, excluindo apenas água (DE 1); inclusão de todos os alimentos sólidos e bebidas calóricas que contêm, no mínimo, 5 kcal/100g (DE 2); inclusão de todos os alimentos sólidos e exclusão de todas as bebidas (DE 3). Para analisar a relação entre a DE e as variáveis sociodemográficas utilizou-se regressão linear, e a relação entre DE e nutrientes foi avaliada por meio do coeficiente de correlação de Pearson. **Resultados:** Para a dieta dos trabalhadores, os valores de DE observados foram 1,18 kcal/g, 1,22 kcal/g e 1,73 kcal/g, considerando-se os métodos DE 1, DE 2 e DE 3, respectivamente. Nos modelos múltiplos de regressão, apenas a variável idade apresentou associação negativa com todos os métodos de DE. Para a DE 3, houve incremento da DE para indivíduos não brancos. Dentre os nutrientes estudados, o único que não apresentou correlação significativa foi a proteína, para DE 3 (p = 0,899). **Conclusão:** Os adultos jovens tinham uma alimentação com maior DE, sendo um grupo prioriatário para intervenções nutricionais. Além disso, independente do método de cálculo, há correlação entre a DE e os nutrientes da dieta.

Palavras-chave: Densidade energética. Consumo alimentar. Ingestão de energia. Trabalhadores.

Introduction

All over the world, developed and developing countries have experienced an epidemic of obesity. In Brazil, according to data from the 2008-2009 Household Budget Survey, the prevalence of overweight and obesity among adults is 49.0% and 14.8%, respectively, with a higher frequency after the age of 35 years in both sexes[1].

Considering the secular trend of overweight and obesity in adults according to income level, the increase was steady among men and, in the case of women, among those belonging to the first two quintiles of income. Among women belonging to the three higher quintiles, the increasing trend was interrupted between 1989 and 2002/2003, subsequently returning in 2008/2009[1].

The increase in the prevalence of overweight is associated with the changes in the eating pattern of Brazilians. The temporal evolution of household food availability in metropolitan areas of Brazil between 1974 and 2008 showed important variations in diet composition, whether in the distribution of macronutrients or in the relative contribution of foods. It should be emphasized that the increase in the proportion of fats and reduction in that of carbohydrates in the diet, in addition to the greater contribution of sausages, oils and vegetable oils, cookies, ready-to-consume meals, sugar and sodas. In contrast, the contribution of fruits and vegetables remained relatively stable throughout this period, with values lower than the recommendations[2,3].

In practical terms, diets comprised of foods with a high content of fat and added sugar and a low content of water and fibers have high energy density (ED), which is defined as the amount of energy available per weight unit (kcal/g)[4,5]. Thus, the increase in ED promotes weight gain and increases the prevalence of overweight.

In addition, the following are associated with diet characteristics: age, sex[6] and socioeconomic conditions such as income, level of education and occupation[7-9].

In view of the lack of information about energy density and its associated factors, the present study primarily aimed to analyze the ED of the diet consumed by workers of the city of São Paulo and its association with socio-demographic characteristics. Additionally, the correlation between ED and the supply of nutrients of this diet was assessed.

Methods

Study design and population

A cross-sectional study was conducted with 852 white-collar workers of four companies (a pharmaceutical company, a communication company and two service companies) in the city of São Paulo. The data used in this study were included in the baseline of the main research project entitled "Impact of an Intervention for the Prevention of Body Weight Gain in the Work Environment", which was a controlled community study[10]. The following were excluded from this study: pregnant women and individuals who reported weight loss through diet in the previous six months and/or the use of drugs that can influence body weight. All individuals with available information about food consumption were included.

Energy density assessment

Data from a 24-hour dietary recall (24hR) were used to assess ED, conducted through a telephone interview, between August and October 2008.

A 24hR was collected for the entire sample population (n = 852) and another was collected for a sub-sample of 37% (n = 315). Water consumption during and in between meals was not collected.

Data from the R24h were converted into energy and nutrients using the NutWin software, whose database was initially updated with data from the *Tabela Brasileira de Composição de Alimentos* (TACO – Brazilian Food Composition Table)[11], in addition to the USDA Food Composition Table, version 17[12]. Apart from data of these tables, standard recipes were used to better describe the preparations consumed.

The use of the second 24hR enabled the correction of the distribution of food consumption data through intrapersonal variability, aiming to estimate the usual energy and nutrient intake. This analysis was processed in the PC Side software, version 1.0, which uses the method developed by the Iowa State University[13].

Dietary recall items were also categorized as "foods", "type 1 beverages" (those providing less than 5kcal/100g) and "type 2 beverages" (the remaining ones).

The analysis of supply of nutrients in the diet assessed the intake of macronutrients (carbohydrates, proteins and total fats), saturated fat, cholesterol, fibers and sodium.

The diet's energy density indicator was calculated with the application of three methods, described in the literature by LEDIKWE[14]: inclusion of all solid foods and beverages, only excluding water (ED 1); inclusion of all solid foods and caloric beverages containing at least 5 kcal/100g (ED 2); and inclusion of all solid foods and exclusion of all beverages (ED 3). The selection of these methods was due to their promoting the comparison between this and other studies on food consumption and energy density.

Characterization of workers

Standard questionnaires to characterize workers were applied in person at the workplace by trained interviewers. Data were collected from the following socio-demographic variables: workers' age (in years), level of education (in years of study), self-reported ethnicity (white, black and Asian-descendant), sex (female and male) and marital status (married, cohabiting, single, divorced and widowed). The statistical analyses considered "ethnicity" and "marital status" to be dichotomous, with the following possible responses: white and non-white (black and Asian-descendant), and with a partner (married and cohabiting)

and without a partner (single, divorced and widowed), respectively.

Data analysis

Workers were characterized through descriptive analysis of variables, including the central trend measure (mean) and dispersion measure (standard deviation and minimum and maximum values). Qualitative variables were described by frequency.

The adherence of ED indicators to the normal distribution was tested and confirmed with the Kolmogorov-Smirnov test.

Aiming to assess the relationship between the diet's ED, calculated with the three previously described methods, and workers' socio-demographic characteristics, tests were applied to compare means for independent samples (Student's t-test and one-way variance analysis). Additionally, multiple linear regression analyses were used to assess socio-demographic factors associated with ED, where this density was the dependent variable and characteristics such as sex, age, level of education, ethnicity and marital status were the independent variables. "Age" and "level of education" were considered as continuous for the analyses performed in the construction of the linear regression models, and "female", "white" and "with a partner" were the reference categories for "sex", "ethnicity" an "marital status", respectively. Variables that achieved a significance level of 0.20 in the univariate analyses were included in the multiple model. A significance limit of p-value < 0.05 was taken into consideration.

Pearson correlation coefficient was used in the analysis of the correlation between ED and the supply of nutrients.

The SPSS statistical package (version 13.0) was used in the data analysis, considering a confidence interval of 95% and significance level of 5%.

Ethical aspects

The present study was conducted in accordance with the Resolution 196/96 of the National Health Council and approved by the Research Ethics Committee of the School of Public Health of the University of São Paulo (Protocol 1996). All participants signed an informed consent form to be included in this study.

Results

Considering the methods of calculation used in this study (ED 1, ED 2 and ED 3), the mean values and standard deviations found for the diet of workers studied were 1.18 kcal/g (± 0.08), 1.22 kcal/g (± 0.08) and 1.73 kcal/g (± 0.16), respectively (Table 1).

Table 1 - Characterization of the energy density (ED 1, ED 2 and ED 3) the diet of workers. São Paulo (SP), 2008.

Tabela 1 - *Caracterização da densidade energética (DE 1, DE 2 e DE 3) da dieta dos trabalhadores estudados. São Paulo (SP), 2008.*

Variables	Minimum[d]	Maximum[d]	Mean (SD)[d]	Median[d]
ED 1[a]	0.94	1.47	1.18 (0.08)	1.17
ED 2[b]	0.99	1.54	1.22 (0.08)	1.22
ED 3[c]	1.27	2.37	1.73 (0.16)	1.73

[a] Energy density of the diet (kcal/g), considering all foods and beverages.
[a] *Densidade energética da dieta (kcal/g), considerando todos os alimentos e todas as bebidas.*
[b] Energy density of the diet (kcal/g), considering all foods and only the beverages with a caloric value higher than or equal to 5 kcal/100g.
[b] *Densidade energética da dieta (kcal/g), considerando todos os alimentos e somente as bebidas com valor calórico maior ou igual a 5 kcal/100g.*
[c] Energy density of the diet (kcal/g), considering all foods and excluding all beverages.
[c] *Densidade energética da dieta (kcal/g), considerando todos os alimentos e excluindo todas as bebidas.*
[d] Values corrected with intrapersonal variability.
[d] *Valores corrigidos pela variabilidade intrapessoal.*

Of all 852 workers studied, 60% were women, 65.6% were white, 69.9% had an incomplete higher education level, 40.5% were in the 18-to-29-year age group and 54.2% did not have a partner (Table 2).

With regard to the differences between the diet's energy density and the socio-demographic characteristics studied, higher values for ED 1 were found among non-white and younger individuals. Younger individuals had a diet with higher energy density for ED 2. Finally, non-white and younger individuals and those living without a partner had diets with higher energy density for ED 3 (Table 2).

The univariate analyses revealed an association between ED1 and age and ethnicity, between ED 2 and age, and between ED 3 and age, ethnicity and marital status. In the multiple models, the variables that remained were age for ED 1 and ED 2, and age and ethnicity for ED 3. In both models, age was inversely associated with the diet's ED. In the case of ED 3, there was an increase in ED among non-white individuals (Table 3).

Statistically significant correlations ($p < 0.05$) were found between ED 1, ED 2 and ED 3 and all nutrients studied, except for ED 3 and protein. It should be emphasized that there was a positive correlation between total and saturated fats for the three ED calculation methods, in addition to a negative correlation between energy density and fibers, especially when the method considered is ED 3 (Table 4).

Discussion

The present study assessed the energy

Table 2 - Energy density (ED 1, ED 2 and ED 3) (mean and standard deviation), according to socio-demographic characteristics of workers. São Paulo (SP), 2008.
Tabela 2 - *Densidade energética (DE 1, DE 2 e DE 3) (média e desvio-padrão), segundo variáveis sociodemográficas dos trabalhadores estudados. São Paulo (SP), 2008.*

Variables	Categories	N (%)	ED 1[a]		ED 2[b]		ED 3[c]	
			Mean (SD)	p	Mean (SD)	p	Mean (SD)	p
Sex	Female	511 (60.0)	1.18 (0.08)	0.241[f]	1.23 (0.08)	0.068[f]	1.73 (0.17)	0.899[f]
	Male	341 (40.0)	1.17 (0.07)		1.22 (0.07)		1.73 (0.15)	
Ethnicity[d]	White	558 (65.6)	***1.17 (0.08)***	***0.006[f]***	1.22 (0.08)	0.104[f]	***1.72 (0.16)***	***0.003[f]***
	Non-white	292 (34.4)	***1.19 (0.08)***		1.23 (0.08)		***1.76 (0.17)***	
Level of education[e]	Complete secondary education	182 (21.4)	1.18 (0.08)	0.512[g]	1.22 (0.08)	0.474[g]	1.72 (0.17)	0.716[g]
	Incomplete higher education	595 (69.9)	1.18 (0.08)		1.23 (0.08)		1.74 (0.16)	
	Complete higher education	74 (8.7)	1.17 (0.08)		1.22 (0.07)		1.74 (0.15)	
Age group[e]	18 to 29 years	345 (40.5)	***1.19 (0.08)***	***<0.001[g]***	***1.24 (0.07)***	***<0.001[g]***	***1.76 (0.16)***	***<0.001[g]***
	30 to 39 years	277 (32.5)	***1.17 (0.08)***		***1.22 (0.07)***		***1.73 (0.17)***	
	> 40 years	229 (27.0)	***1.16 (0.08)***		***1.21 (0.08)***		***1.69 (0.16)***	
Marital status	With a partner	390 (45.8)	1.17 (0.08)	0.101[f]	1.22 (0.07)	0.191[f]	***1.72 (0.16)***	***0.041[f]***
	Without a partner	462 (54.2)	1.18 (0.08)		1.23 (0.08)		***1.74 (0.17)***	

[a] Energy density of the diet (kcal/g), considering all foods and beverages. / [a] *Densidade energética da dieta (kcal/g), considerando todos os alimentos e todas as bebidas.*
[b] Energy density of the diet (kcal/g), considering all foods and only the beverages with a caloric value higher than or equal to 5 kcal/100g. / [b] *Densidade energética da dieta (kcal/g), considerando todos os alimentos e somente as bebidas com valor calórico maior ou igual a 5 kcal/100g.*
[c] Energy density of the diet (kcal/g), considering all foods and excluding all beverages. / [c] *Densidade energética da dieta (kcal/g), considerando todos os alimentos e excluindo todas as bebidas.*
[d] Data not available for two workers. / [d] *Dados não disponíveis para dois trabalhadores.*
[e] Data not available for one worker. / [e] *Dados não disponíveis para um trabalhador.*
[f] P-value according to Student's t-test. / [f] *Valor de p, segundo teste t-Student.*
[g] P-value according to the one-way variance analysis test. / [g] *Valor de p, segundo teste de análise de variância oneway.*

Table 3 - Association between ED of the diet and socio-demographic variables for adult workers. São Paulo (SP), 2008.
***Tabela 3** - Associação entre a DE da dieta e variáveis sociodemográficas para trabalhadores adultos. São Paulo (SP), 2008.*

Dependent variable	Independent variable	Univariate analysis		Multiple analysis	
			95%CI[e]	β[d]	95%CI[e]
ED 1	**Age**	-0.002	[-0.002; -0.001]	***-0.002***	***[-0.002; -0.001]***
	Ethnicity	0.016	[0.004; 0.027]	0.010	[-0.001; 0.021]
	Level of education	-0.004	[-0.009; 0.000]	-	-
	Marital status	0.009	[-0.002; 0.020]	-	-
	Sex	-0.006	[-0.017; 0.005]	-	-
ED 2	**Age**	-0.002	[-0.002; -0.001]	***-0.002***	***[-0.002; -0.001]***
	Sex	-0.010	[-0.020; 0.001]	-	-
	Ethnicity	0.009	[-0.002; 0.020]	-	-
	Marital status	0.007	[-0.003; 0.017]	-	-
	Level of education	-0.001	[-0.005; 0.003]	-	-
ED 3	**Age**	-0.004	[-0.005; -0.003]	***-0.004***	***[-0.005; -0.003]***
	Ethnicity	0.035	[0.012; 0.058]	***0.028***	***[0.004; 0.051]***
	Marital status	0.023	[0.001; 0.045]	-0.006	[-0.029; 0.018]
	Level of education	0.001	[-0.008; 0.010]	-	-
	Sex	-0.001	[-0.024; 0.021]	-	-

[a] Energy density of the diet (kcal/g), considering all foods and beverages. / [a] *Densidade energética da dieta, considerando todos os alimentos e todas as bebidas.*
[b] Energy density of the diet (kcal/g), considering all foods and only the beverages with a caloric value higher than or equal to 5 kcal/100g. / [b] *Densidade energética da dieta, considerando todos os alimentos e somente as bebidas com valor calórico maior ou igual a 5 kcal/100g.*
[c] Energy density of the diet (kcal/g), considering all foods and excluding all beverages. / [c] *Densidade energética da dieta, considerando todos os alimentos e excluindo todas as bebidas.*
[d] Adjusted regression coefficient. / [d] *Coeficiente de regressão ajustado.*
[e] 95% confidence interval. / [e] *Intervalo de confiança de 95%.*
* For the dichotomous variables (sex, ethnicity and marital status), the reference categories were female, white and with a partner, respectively. / * *Para as variáveis dicotômicas, sexo, cor da pele e situação conjugal, as categorias de referência foram feminino, branco e com companheiro, respectivamente.*

Table 4 - Correlation between the supply of nutrients in the diets of workers and the energy density (ED 1, ED 2 and ED 3). São Paulo (SP), 2008.
***Tabela 4 -** Correlação entre o aporte de nutrientes das dietas dos trabalhadores estudados e a densidade energética (DE 1, DE 2 e DE 3). São Paulo (SP), 2008.*

Variable	ED 1[a]		ED 2[b]		ED 3[c]	
	r[d]	p	r[d]	p	r[d]	p
Carbohydrate (g)	0.149	***<0.001***	0.093	***0.006***	0.099	***0.004***
Protein (g)	0.159	***<0.001***	0.141	***<0.001***	0.004	0.899
Total fats (g)	0.416	***<0.001***	0.431	***<0.001***	0.444	***<0.001***
Saturated fat (g)	0.392	***<0.001***	0.418	***<0.001***	0.464	***<0.001***
Cholesterol (mg)	0.227	***<0.001***	0.227	***<0.001***	0.097	***0.005***
Fibers (g)	-0.108	***0.002***	-0.157	***<0.001***	-0.367	***<0.001***
Sodium (mg)	0.205	***<0.001***	0.169	***<0.001***	0.098	***0.004***

[a] Energy density of the diet (kcal/g), considering all foods and beverages. / [a] *Densidade energética da dieta, considerando todos os alimentos e todas as bebidas.*
[b] Energy density of the diet (kcal/g), considering all foods and only the beverages with a caloric value higher than or equal to 5 kcal/100g. / [b] *Densidade energética da dieta, considerando todos os alimentos e somente as bebidas com valor calórico maior ou igual a 5 kcal/100g.*
[c] Energy density of the diet (kcal/g), considering all foods and excluding all beverages. / [c] *Densidade energética da dieta, considerando todos os alimentos e excluindo todas as bebidas.*
[d] Pearson correlation coefficient. / [d] *Coeficiente de correlação de Pearson.*

density of the diet of workers from the city of São Paulo, Brazil, and its association with socio-demographic factors. For this reason, three methods were used to calculate energy density, as proposed by Ledikwe[14] in the literature and here described as ED 1, ED 2, and ED 3. The mean values found were 1.18 kcal/g, 1.22 kcal/g and 1.73 kcal/g, respectively, considering both sexes as there were no significant differences between women and men.

In certain studies, when the same calculation methods were considered, different results for the energy density of the diet of adults were found. In a population-based study conducted in the city of São Paulo, energy density values of 1.32 kcal/g, 1.35 kcal/g and 1.95 kcal/g were observed, respectively[15]. There were two surveys with representative samples of the adult American population that obtained the following mean values of energy density: 0.94 kcal/g, 1.52 kcal/g and 1.85 kcal/g[14]; and 0.92 kcal/g, 1.30 kcal/g and 1.92 kcal/g[16].

Divergent values found for ED 1 probably point to a greater consumption of non-caloric beverages among Americans[14,16]. This hypothesis is corroborated by the steady increase in the consumption of diet sodas by this population[17]. However, even when all beverages are excluded from the analysis, the present study showed a lower energy density value, compared to the previously mentioned studies, indicating that the diet of the population studied is less dense than the remaining ones.

Some studies considered the consumption of water in the method here described as ED 1, thus finding lower values for this method than that of the present study[18,19]. Nonetheless, with regard to the two other methods (ED 2 and ED 3), identical to those used in the present study, the same studies found substantially higher values for the diet of company workers of the metropolitan area of São Paulo, 1.49 kcal/g and 1.95 kcal/g respectively[18], and lower values in the assessment of the diet of English adults, 1.17 kcal/g and 1.36 kcal/g respectively[19].

Understanding that diets with high energy density can promote excessive weight gain and thus cause the onset of other diseases, the World Cancer Research Fund defined that, as a public health goal, the mean energy density of a diet should be 1.25 kcal/g, excluding all beverages from the calculation[20]. In view of this, the value of 1.73 kcal/g observed in this study exceeds the recommendation by approximately 40%, characterizing it as a high-energy density diet. Nonetheless, even the minimum value found (1.27 kcal/g) for this calculation method exceeds such recommendation.

In the present study, as observed in the American population, there was a difference between ED for all methods and age[13]. In the regression model, the inverse association was confirmed, i.e. the older the age, the lower the diet's energy density. The same association was found in the diet of workers of a company in the city of São Paulo[18], although only for ED 3.

There were no significant differences between sexes for any of the methods studied, as observed in a representative sample of the city of São Paulo[15]. However, in the diet of workers of a company in this city, a higher value of ED 2 was found in women[18] and American individuals, among which higher values for ED 1 and ED 3 were observed in men[16]. Furthermore, in studies conducted in the United States, men had denser diets for the three methods[14,21].

The relationship between ethnicity and energy density is not clear, with divergent results among studies. In the present study, after adjustment in the multiple regression model, the association remained for ED 3 exclusively, in which non-white individuals had higher energy density values. A study that assessed the population of the city of São Paulo found a similar result: in the multiple model, ED 3 was directly associated with being non-white[15]. In a cohort study that included five ethnic groups and was conducted in the United States, there were no significant differences among these ethnic groups[21], whereas the same was not observed for the general American population, for which differences among such

groups stood out[14].

In the analysis of the level of education, there were no differences among groups with any of the calculation methods. The absence of the effect of level of education on energy density was confirmed in the regression models, in which this variable was not even significant in the univariate analysis in general. However, an inverse association was found between this variable and the ED 1 and ED 2 methods for the population of the city of São Paulo[15].

Considering the level of education as a proxy of income and the increasing prevalence of overweight and obesity in all quintiles of income[1], it could be inferred that the diet's high energy density is independent from individuals' income. However, it should be emphasized that the population studied had a high level of education, with a low frequency of individuals with few years of education.

Concerning workers' marital status, differences were found for ED 3 exclusively, with a higher energy density among those living alone, although this variable lost effect in the multiple model. No differences were observed for the population of the city of São Paulo[15]. In a study on the relationship between diet and socio-demographic factors conducted with Australian women, there were great differences in marital status. Women who lived without a partner had a more monotonous diet with fewer nutrients, a lower consumption of vegetables and, probably, higher energy density[22].

The assessment of the supply of nutrients in relation to the energy density of the diet did not find a correlation with protein in the ED 3 method exclusively, showing that ED can be used as an indicator of overall diet quality. With regard to the same nutrients analyzed in this study, there was no correlation between ED 2 and carbohydrates and fibers for the population of the city of São Paulo; nonetheless, the remaining results were similar[15]. In a study conducted with workers from a company of São Paulo, carbohydrates, fibers and cholesterol were not correlated with ED 2, nor was protein correlated with ED 2 and ED 3[18]. When lean English individuals were analyzed, there was a positive correlation between total fats and carbohydrates and ED 1 and between total fats and ED 2[19].

Due to the lack of standardization of cut-off point and calculation method to assess the diet's energy density, it could not be affirmed that the values found in this study are high. However, considering the existing reference and the strong correlation between energy density and the intake of total and saturated fats, there is evidence that these values are high.

Although the sample size had not been calculated to assess the diet's energy density, it should be emphasized that the present population has been the largest one found in a Brazilian study until now. Additionally, the 24-hour dietary recall used to obtain information about food consumption, the issue of data on one exclusive day was minimized by a second recall collected from a sub-sample. This enabled intrapersonal variability to be corrected, so that it could be affirmed that the data used in the analyses represent the usual consumption of the population studied.

In conclusion, there was an inverse association between age and the diet's energy density, regardless of the calculation method used. This finding is relevant as it indicates the need for dietary interventions aimed at young adults to prevent the consumption of high-energy density diets and body weight gain. Furthermore, energy density is a valid indicator to assess the overall quality of a diet, as there is a correlation between this indicator, regardless of the calculation method, and the diet nutrients.

Participation in the study: Canella DS participated in the data analysis and interpretation and was responsible for the article writing. Bandoni DH and Jaime PC participated in the study design, data collection, data analysis review and article writing.

Conflicts of interest: The authors declared no conflicts of interest.

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Received: 10/12/10
Final version: 04/03/12
Approved: 24/05/12