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Trend in dietary patterns among adults from Brazilian state capitals

Tendência de padrões alimentares entre adultos das capitais brasileiras

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ABSTRACT: ***Objective:*** To describe and analyze the trend in dietary patterns followed by the adult population aged 18 to 44 years living in Brazilian state capitals between 2007 and 2012. ***Methods:*** We identified dietary patterns using the principal component analysis (PCA). The analysis retained components with eigenvalues >1.0 and highlighted factor loadings (FLs) >|0.2|. After the identification of four patterns, they received standardized scores with zero mean. The mean scores were presented for each pattern according to gender, age group, schooling, and year of data collection. We estimated the temporal variation of the mean scores of the patterns by linear regression. ***Results:*** We identified four dietary patterns in the population: prudent, transition, western, and traditional. We found an increasing trend in the mean score of the patterns: prudent, western, and traditional and a reduced mean score in the transition pattern. Individuals with better education showed greater adherence to the prudent pattern. Less-educated individuals presented higher adherence to the western and traditional patterns. ***Conclusion:*** Public policies targeting the population with lower schooling and men are necessary due to their greater adherence to unhealthy dietary patterns.

Keywords: Feeding behavior. Surveillance. Adult.

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Conflict of interests: this article is part of the master's thesis of the author Iolanda Karla Santana dos Santos, entitled Patterns of food consumption and physical activity based on data from VIGITEL (*Padrões de consumo alimentar e de atividade física com base em dados do VIGITEL*), presented to the Graduate Program in Nutrition and Public Health from the School of Public Health at Universidade de São Paulo – **Financial support:** none.

RESUMO: ***Objetivo:*** Descrever e analisar a tendência dos padrões alimentares praticados pela população adulta de 18 a 44 anos das capitais brasileiras entre os anos de 2007 e 2012. ***Métodos:*** Padrões alimentares foram identificados com análise de componentes principais (ACP). Na análise, foram retidos os componentes com autovalores > 1,0 e foram destacadas cargas fatoriais (CF) superiores a |0,2|. Após a identificação de quatro padrões foram gerados escores padronizados com média zero para cada. As médias foram apresentadas para cada padrão segundo sexo, faixa etária, escolaridade e ano de monitoramento. A variação temporal da média dos escores dos padrões foi estimada por regressão linear. ***Resultados:*** Foram identificados quatro padrões alimentares na população: prudente, transição, ocidental e tradicional. Houve tendência de aumento das médias de escore dos padrões: prudente, ocidental e tradicional, e redução da média de escore do padrão transição. Maior aderência ao padrão prudente entre indivíduos mais escolarizados. Maior aderência aos padrões ocidental e tradicional entre indivíduos menos escolarizados. ***Conclusão:*** Políticas públicas direcionadas aos indivíduos menos escolarizados e homens são necessárias por causa da maior adesão aos padrões alimentares não saudáveis.

Palavras-chave: Comportamento Alimentar. Vigilância. Adulto.

INTRODUCTION

Inadequate nutrition is among the risk factors related to chronic non-communicable diseases (NCDs)[1-3] and obesity[1]. The 2013 National Health Survey (NHS) updated the prevalence of overweight, estimated at 56.9%, and obesity, at 20.8%[4], in Brazil.

With the nutritional transition, the culinary preparations made at home and usually based on fresh and minimally processed foods were replaced by ready-made and ultra-processed products, such as pizzas, sandwiches, and soft drinks[5,6]. The reduced supply of fresh food and the global distribution of supermarket chains standardized food consumption in the world[5]. Among the effects on the diet, we highlight: increased intake of refined carbohydrates, edible oils, sweetened drinks, and foods of animal origin, as well as reduced consumption of legumes, fruits, and vegetables[5,6].

In Brazil, according to data from the 2008–2009 Household Budget Survey (HBS), the dietary pattern of Brazilians exceeded the recommendations for energy density, protein, free sugar, trans fat, and sodium, and showed insufficient amounts of dietary fiber and potassium[7]. The 2013 NHS allowed describing the eating habits of the Brazilian population: the frequency of the regular consumption of beans was 71.9%[8]; 37.3% of the population met the recommended intake of fruits and vegetables[8]; the consumption of meat or chicken with excess fat was 37.2%[9]; the regular intake of soft drinks or processed juices was 23.4%[9].

This study proposes to go beyond the estimates of traditional indicators of food consumption by using an approach that expresses the dietary intake variables in patterns. Individuals do not consume only a certain nutrient or food; the diet comprises different foods and eating practices. Dietary patterns can be used as the main analysis or to complement a study on the food intake of the population[10]. In Brazil, dietary patterns were identified based on data on food acquisition from the 2002–2003 HBS for each region. The study identified the dietary pattern characterized mainly by rice and beans in the five Brazilian regions[11]. Data from the 2008–2009 HBS determined the dietary patterns for breakfast: Northern Brazil (positive loading for meat, corn-based dishes, eggs, tubers/roots/potatoes, dairy products, snacks/cookies, fruit juices/fruit beverages/soy beverages); western (positive loading for fruit juices/fruit beverages/soy beverages, sandwiches/pizza, salted pastries/croquettes, chocolate/desserts, cake/cookies); Southeastern Brazil (positive loading for cold cuts, milk, cheese, coffee/tea, bread). The pattern of Southeastern Brazil was inversely associated with body mass index (BMI)[12].

Thus, we aimed to describe and analyze the trend in dietary patterns followed by the adult population aged 18 to 44 years living in Brazilian state capitals between 2007 and 2012.

METHODS

This is a cross-sectional study of selected individuals aged 18 to 44 years, based on data from the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (*Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* – VIGITEL) from 2007 to 2012. This study included 167,761 individuals: 31,291 from the 2007 survey; 30,051 from the 2008 survey; 29,310 from the 2009 survey; 28,371 from the 2010 survey; 27,133 from the 2011 survey; and 21,605 from the 2012 survey. Each year, VIGITEL calculates a probabilistic sample of the adult population (≥18 years) living in households with at least one landline telephone in the capitals of the 26 Brazilian states and the Federal District[13].

The sampling weight allows obtaining estimates for the adult population residing in households covered by the landline telephone network. The calculation of the sampling weight is the product of two factors: the first is the inverse of the number of phone lines available in the household of the interviewee, and the second is the number of adults living in the household of the interviewee[13]. The raking method estimates the post-stratification weight of each individual. This weight equals the sociodemographic composition estimated for the adult population living in households with at least one landline to the sociodemographic composition estimated for the adult population living in households in each city[13]. We used the raking weight variable in all analyses.

According to data from the 2013 NHS, the prevalence of obesity increases with age until the individual reaches 65 years and is lower at the start of adulthood than in the age group 45–64 years[4]. The impact of increased body mass on the quality of life and its association with morbidities can influence food choices[14]. The sample selected in this study comprises adults aged 18 to 44 years to minimize the effect of changes in dietary patterns due to the current nutritional status. The period selected in this study is from 2007 to 2012. In 2006, some dietary intake variables did not have the same encoding used as of 2007, so that year was not included. Another publication will present additional analyses conducted using the variable weight at 20 years, which was collected only up to 2012; therefore, this study only covers the period until 2012.

We excluded pregnant women and those who did not know if they were pregnant. This study used sociodemographic variables: gender, age group (18–24 years, 25–34 years, 35–44 years), and schooling (0–8 years, 9–11 years, 12 or more years). The variables related to eating habits were: weekly consumption of beans, vegetables, raw vegetables, cooked vegetables, red meat, chicken, fruit, soft drinks or processed juices, and milk; daily intake of vegetables; and consumption of visible fat. In this study, we used more than one variable for vegetables because each one describes a different dimension of food consumption. Cooked and raw vegetables are assessed by their weekly intake, while daily intake of vegetables refer to the daily consumption at main meals.

The variables of weekly frequency have the same encoding:

- 0: never;
- 0.5: rarely;
- 1.5: 1 to 2 days;
- 3.5: 3 to 4 days;
- 5.5: 5 to 6 days;
- 7: every day.

The score of the daily consumption of vegetables corresponds to the sum of the answers given to the questions: "On a typical day, do you eat this type of salad?" and "On a typical day, do you eat cooked vegetables?". If the individual declared eating vegetables at lunch or dinner, these questions received a score of 1; at both meals, the score of 2. The dichotomous variable consumption of visible fat related to answers to the questions: "When you eat red meat with fat, do you usually..."; "When you eat chicken with skin, do you usually..."; the answers "eat the fat" and "eat the skin" received the value of 1.

We identified the dietary patterns using the principal component analysis (PCA). This analysis is factorial and reduces the data into patterns based on the correlations between the variables[15]. The two basic properties of PCA are the eigenvalues and eigenvectors of the matrix. Eigenvalues indicate the total variance of each component, sorted according to those that have the greatest retention of the original variability[16]. Eigenvectors are the main components; factor loadings (FLs) correspond to cosines of the angles between the main components and the original variables, and they define the main component[17]. Positive FL (FL+) represents a positive impact of the variable on the component, while negative FL (FL-) points to a negative impact. The higher the value, the greater the contribution of the variable to that component[16].

The analysis retained components with eigenvalues >1.0, according to the Kaiser criterion, and highlighted FLs>|0.2|[16]. The Kaiser-Meyer-Olkin (KMO) test assessed the adequacy of the patterns formed to the data set. The KMO ranges from 0 to 1; values below 0.5 are considered unacceptable, 0.50–0.59 miserable, 0.60–0.69 mediocre, 0.70–0.79 middling, 0.80–0.89 meritorious, and 0.90–1.0 marvelous[18].

PCA is a technique that recognizes or describes patterns; it does not classify them[17]. Nevertheless, labels were assigned to maintain communication with the area, but they should not restrict the interpretation of dietary patterns. After the identification of patterns, they received standardized scores with zero mean; therefore, each individual had scores for all patterns. The analysis was performed on data collected from 2007 to 2012. The components retained in this period showed correlations higher than 0.90, with the patterns retained in each year separately. After extraction, we did not use any kind of rotation, as rotation effects are unique for each data matrix.

Mean scores and the linearized standard error of dietary patterns were presented according to the year of data collection, gender, and age group. We elaborated a dietary pattern mean score graph according to schooling and the year of data collection. We estimated the temporal variation of dietary pattern mean scores between the years of data collection by linear regression. The dependent variable of the model was the dietary pattern, and the independent variable was the year of data collection. Temporal variations were expressed by the angular coefficient of the straight line. Given the sample size, p was not presented. The time trend analysis incorporated weighting factors by using the *svy* command of the Stata software.

This study used data collected by VIGITEL, and its microdata are available on the website http://svs.aids.gov.br/bases_vigitel_viva/vigitel.php. The interviewees gave their informed consent orally, at the time of phone contact. The National Human Research Ethics Committee of the Ministry of Health approved VIGITEL[13]. The Research Ethics Committee of the School of Public Health from Universidade de São Paulo evaluated and approved the present study under report number 1,885,826 on January 5, 2017.

RESULTS

We estimated the dietary patterns for the data set from 2007 to 2012, and the KMO value corresponded to the middling classification (0.7301). Together, the four components retained explained 55.9% of the total variability. The main components or dietary patterns were labeled according to the characteristics identified in the PCA. Table 1 presents the patterns and their respective FLs, eigenvalues, and percentage of explained variance.

The first pattern, labeled prudent, was characterized by variables with FL+ for weekly and daily consumption of vegetables, raw vegetables, cooked vegetables, and fruits; it explained 23.8% of the total variability. The second pattern, transition, was identified by variables with FL+ for beans, red meat, fat, and soft drinks or processed juices and FL- for chicken; it explained 13.1% of the total variability. The third pattern, western, showed variables with FL+ for chicken, fat, and soft drinks or processed juices and FL- for fruit, red meat, and milk; it explained 9.8% of total variability. The fourth pattern, traditional, presented variables with FL+ for beans, chicken, and milk; it explained 9.2% of the total variability.

Table 2 describes the dietary pattern mean scores according to gender, age group, and year of data collection. The prudent pattern mean score showed an increasing trend. The mean score of this pattern was negative among men and positive in women, indicating a greater adherence among women. Among individuals aged 18 to 24 years, the prudent pattern mean score remained negative with increasing trend, while in those aged 34 to 44 years, it remained positive. The transition pattern mean score presented a decreasing trend. The mean score for this pattern was positive among men and negative in women, pointing to a higher adherence among men. In individuals aged 18 to 24 years, the transition pattern mean score remained positive, while among those aged 35 to 44 years, it remained negative.

Regarding the western pattern mean score, it showed an increasing trend. Men had higher adherence to this pattern. The western pattern mean score presented an increasing trend among individuals from the three age groups. The traditional pattern mean score demonstrated an increasing trend. The mean score for this pattern was positive among men and negative in women, indicating a greater adherence among men. The traditional pattern mean score showed an increasing trend among individuals from the three age groups.

Table 1. Description of dietary patterns of individuals aged 18 to 44 years. VIGITEL, 2007–2012*.

Variables	Factor loadings			
	Prudent	Transition	Western	Traditional
Beans	0.0308	**0.2522**	-0.0816	**0.8095**
Vegetables	**0.5056**	0.1235	0.0901	-0.0958
Cooked vegetables	**0.4620**	0.1655	0.0566	-0.1096
Raw vegetables	**0.4337**	0.0604	0.1478	0.0198
Daily consumption of vegetables	**0.4399**	0.1723	0.1038	0.0501
Fruits	**0.2841**	-0.1703	**-0.2972**	-0.0359
Red meat	-0.0636	**0.5859**	**-0.2933**	-0.0579
Chicken	0.0615	**-0.3712**	**0.5507**	**0.4102**
Fat	-0.1471	**0.4366**	**0.2324**	0.1388
Soft drinks or processed juices	-0.1636	**0.3762**	**0.3247**	-0.0441
Milk	0.1069	-0.1349	**-0.5588**	**0.3556**
Eigenvalues	2.6132	1.4416	1.0767	1.0161
% Variance	23.8%	13.1%	9.8%	9.2%
% Cumulative variance	23.8%	36.9%	46.7%	55.9%

*Factor loadings higher than |0.2| were highlighted.

Table 2. Mean score and standard error (SE) of dietary patterns of individuals aged 18 to 44 years, according to the year of data collection, gender, and age group. VIGITEL, 2007–2012.

Dietary patterns	Year of data collection						Coefficient [b] (95%CI)
	2007 Mean (SE)	2008 Mean (SE)	2009 Mean (SE)	2010 Mean (SE)	2011 Mean (SE)	2012 Mean (SE)	
Prudent – Total	0.01 (0.06)	-0.04 (0.06)	-0.05 (0.07)	-0.07 (0.06)	0.07 (0.07)	0.09 (0.06)	0.02 (0.01; 0.03)
Gender							
Male	-0.23 (0.06)	-0.30 (0.05)	-0.29 (0.05)	-0.30 (0.07)	-0.17 (0.07)	-0.13 (0.05)	0.02 (0.02; 0.03)
Female	0.24 (0.07)	0.20 (0.08)	0.18 (0.09)	0.14 (0.08)	0.29 (0.08)	0.30 (0.08)	0.02 (0.01; 0.02)
Age group							
18–24 years	-0.34 (0.08)	-0.32 (0.07)	-0.39 (0.06)	-0.29 (0.08)	-0.20 (0.07)	-0.18 (0.05)	0.04 (0.02; 0.05)
25–34 years	0.05 (0.07)	-0.03 (0.06)	-0.03 (0.08)	-0.07 (0.06)	0.07 (0.08)	0.12 (0.07)	0.02 (0.01; 0.03)
35–44 years	0.27 (0.06)	0.18 (0.06)	0.23 (0.07)	0.10 (0.07)	0.28 (0.08)	0.26 (0.06)	0.00 (-0.02; 0.02)
Transition – Total	0.07 (0.08)	-0.02 (0.09)	-0.06 (0.09)	0.03 (0.09)	0.02 (0.09)	-0.03 (0.09)	-0.01 (-0.01; 0.00)
Gender							
Male	0.30 (0.08)	0.23 (0.09)	0.17 (0.08)	0.25 (0.09)	0.26 (0.09)	0.19 (0.08)	-0.01 (-0.02; 0.00)
Female	-0.16 (0.08)	-0.27 (0.09)	-0.27 (0.10)	-0.19 (0.09)	-0.22 (0.08)	-0.26 (0.09)	-0.01 (-0.01; 0.00)
Age group							
18–24 years	0.09 (0.07)	0.02 (0.08)	0.02 (0.09)	0.07 (0.07)	0.11 (0.08)	0.03 (0.08)	0.00 (-0.01; 0.01)
25–34 years	0.12 (0.09)	0.02 (0.09)	-0.03 (0.09)	0.09 (0.11)	0.05 (0.08)	-0.02 (0.08)	-0.01 (-0.02; -0.01)
35–44 years	-0.01 (0.10)	-0.11 (0.10)	-0.15 (0.09)	-0.09 (0.10)	-0.11 (0.11)	-0.11 (0.10)	-0.01 (-0.02; 0.00)

Continue...

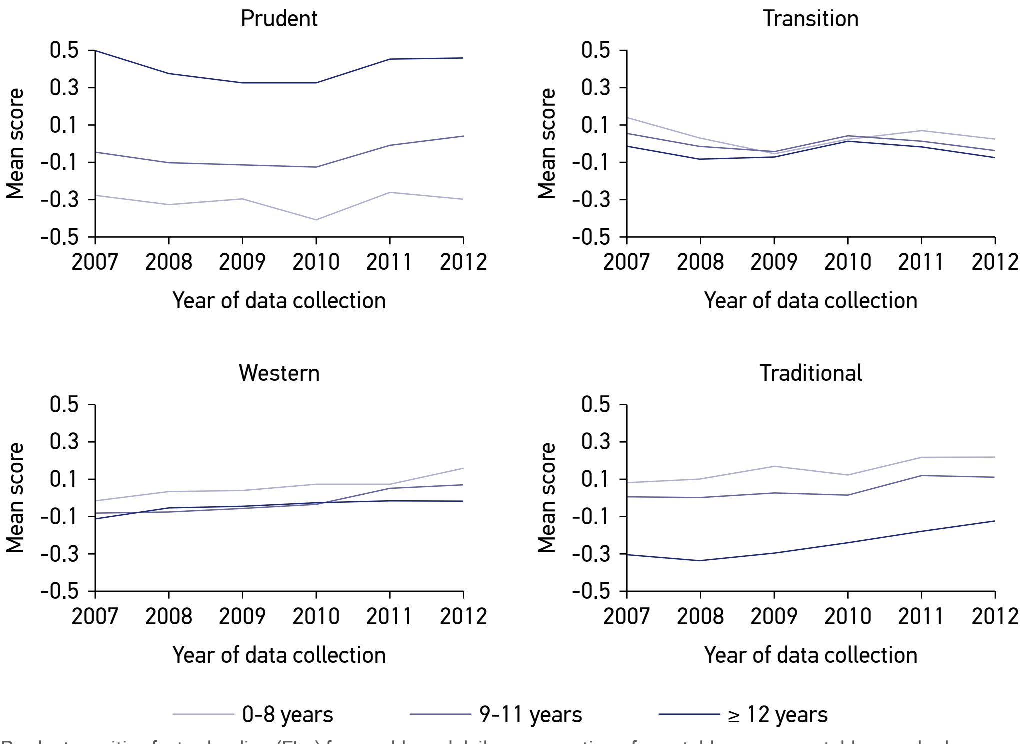
Table 2. Continuation.

Dietary patterns	Year of data collection						Coefficient [b] (95%CI)
	2007 Mean (SE)	2008 Mean (SE)	2009 Mean (SE)	2010 Mean (SE)	2011 Mean (SE)	2012 Mean (SE)	
Western – Total	-0.06 (0.05)	-0.03 (0.05)	-0.02 (0.06)	0.00 (0.05)	0.04 (0.05)	0.07 (0.06)	0.03 (0.02; 0.03)
Gender							
Male	0.00 (0.04)	0.02 (0.05)	0.04 (0.06)	0.06 (0.04)	0.10 (0.05)	0.12 (0.05)	0.03 (0.02; 0.03)
Female	-0.12 (0.07)	-0.08 (0.06)	-0.08 (0.06)	-0.06 (0.06)	-0.01 (0.06)	0.02 (0.06)	0.03 (0.02; 0.03)
Age group							
18–24 years	-0.08 (0.04)	-0.08 (0.05)	-0.05 (0.06)	-0.03 (0.05)	0.06 (0.05)	0.13 (0.05)	0.04 (0.03; 0.05)
25–34 years	-0.01 (0.05)	0.03 (0.06)	0.02 (0.05)	0.02 (0.04)	0.09 (0.06)	0.08 (0.04)	0.02 (0.01; 0.02)
35–44 years	-0.11 (0.07)	-0.07 (0.06)	-0.04 (0.07)	-0.01 (0.06)	-0.02 (0.06)	0.01 (0.08)	0.02 (0.01; 0.03)
Traditional – Total	-0.04 (0.04)	-0.05 (0.05)	-0.02 (0.04)	-0.02 (0.04)	0.06 (0.04)	0.07 (0.04)	0.02 (0.02; 0.03)
Gender							
Male	0.11 (0.04)	0.09 (0.04)	0.13 (0.05)	0.08 (0.05)	0.18 (0.04)	0.20 (0.04)	0.02 (0.01; 0.03)
Female	-0.18 (0.04)	-0.18 (0.06)	-0.16 (0.04)	-0.13 (0.04)	-0.05 (0.04)	-0.06 (0.05)	0.03 (0.02; 0.03)
Age group							
18–24 years	-0.04 (0.04)	-0.01 (0.04)	-0.03 (0.04)	0.00 (0.04)	0.11 (0.05)	0.13 (0.04)	0.03 (0.02; 0.04)
25–34 years	-0.05 (0.04)	-0.07 (0.05)	-0.01 (0.05)	-0.07 (0.04)	0.04 (0.05)	0.05 (0.04)	0.02 (0.02; 0.03)
35–44 years	-0.04 (0.05)	-0.05 (0.04)	-0.01 (0.05)	0.01 (0.05)	0.05 (0.04)	0.03 (0.04)	0.02 (0.01; 0.03)

Prudent: positive factor loading (FL+) for weekly and daily consumption of vegetables, raw vegetables, cooked vegetables, and fruits; Transition: FL+ for beans, red meat, fat, and soft drinks or processed juices and negative factor loading (FL-) for chicken; Western: FL+ for chicken, fat, and soft drinks or processed juices and FL- for fruits, red meat, and milk; Traditional: FL+ for beans, chicken, and milk; 95%CI: 95% confidence interval.

Figure 1 demonstrates the dietary patterns according to schooling and the year of data collection. We conducted linear regression analysis for each schooling range in each pattern to estimate the temporal variation. This article does not provide these values, but this section highlights the most relevant results. Individuals with 12 or more years of schooling showed greater adherence to the prudent pattern. Among the interviewees with up to 8 years of schooling, the mean score remained negative. In participants with 9 to 11 years of schooling, the prudent pattern mean score presented an increasing trend.

Concerning the transition pattern, we could not identify trends related to schooling. The curves of the western pattern among individuals with 9 to 11 years and 12 or more years of schooling were similar until 2010. After 2010, the western pattern showed a positive slope of the score curve in participants with up to 8 years and 9 to 11 years of schooling. Interviewees with up to 8 years of schooling presented greater adherence to the traditional pattern. Among individuals with 12 or more years of schooling, the traditional pattern mean score increased as of 2008.



Prudent: positive factor loading (FL+) for weekly and daily consumption of vegetables, raw vegetables, cooked vegetables, and fruits; Transition: FL+ for beans, red meat, fat, and soft drinks or processed juices and negative factor loading (FL-) for chicken; Western: FL+ for chicken, fat, and soft drinks or processed juices and FL- for fruits, red meat, and milk; Traditional: FL+ for beans, chicken, and milk.

Figure 1. Dietary pattern mean score of individuals aged 18 to 44 years, according to the year of data collection and schooling. VIGITEL, 2007–2012.

DISCUSSION

Our results for 2007–2012 indicate that:

- the prudent pattern mean score increased, especially among women, older individuals, and those with better education;
- the western pattern showed higher scores in men and participants with less schooling;
- the transition and traditional patterns presented similar distribution regarding their mean scores – higher among men and younger individuals, and with an inverse gradient to the level of schooling;
- the transition and traditional patterns differed in their mean score trend – decreasing and increasing, respectively – and food compositions.

Our results demonstrate how gender and health relations are still relevant in Brazil. Women are more careful about their health and more prone to adopting a healthy lifestyle[19]. The present study revealed that men adhered to dietary patterns with different food compositions. In an investigation conducted in São Paulo, women also presented greater adherence to the prudent pattern and men to the traditional pattern[20]. In this study, older individuals showed higher adherence to the prudent pattern. A possible explanation for this finding is that experience leads to a reflection about their health and increases their awareness about food choices. In research carried out in São Paulo, the prevalence of the healthy lifestyle was 36.9% among older adults, 15.4% in adults, and 9.8% among adolescents[19].

The use of schooling as a proxy for socioeconomic status is based on the premise that more educated individuals have greater chances of having higher income[21,22], and lower income is associated with food insecurity[23]. Regardless of income, better education affects healthy food choices[24]. The prudent pattern mean score was greater among participants with higher schooling. From this perspective, we can identify inequality in a dietary pattern with foods considered protective factors for chronic diseases[1].

The greater adherence to the western pattern among less-educated individuals can be the result of reduced access to information about healthy nutrition, lower income[21,22], and limited access to healthy foods[25].

Three PCA characteristics help to explain and understand the evolution of nutrition in Brazilian capitals, as described in VIGITEL: the first is that the patterns formed are independent, in the same way that food combinations can be interpreted as independent expressions of eating habits of the population under study. The second is that all individuals have scores for each pattern formed, which allows estimating their social and demographic distribution. The third is that components are proportionately formed depending on the ability of each pattern to explain the variability of the set. Thus, the order of the patterns matters for explaining the food variability found in the population of Brazilian capitals. Therefore, it is possible to identify an increase in patterns with different characteristics, such as the prudent and western ones, in the same period. When analyzing the curves according to schooling, we found the highest adherence to the prudent pattern among individuals with better education, and the greatest adherence to the western pattern in less-educated participants. In this scenario, the groups with the greatest adherence are different.

PCA is a statistical technique that involves decisions made by a researcher and supported by theoretical references. The decisions attributed to the researcher include choosing the variables, food grouping, determining the component retention criterion, using a rotation method, establishing the cut-off point for FLs, and defining labels for the patterns[26]. We found patterns similar to those described in this work in the literature. The 2008 Health Survey in the City of São Paulo (ISA-Capital 2008)[20] identified patterns similar to the prudent, western, and traditional ones. Research carried out in Córdoba, Argentina[27], detected a pattern similar to the prudent one. A study conducted in Quebec, Canada[28] revealed a pattern similar to the western one.

Lastly, we need to present the strengths of this study:

- the use of VIGITEL data allowed us to perform a time-series analysis in the same geographical area;
- in the capitals and the Federal District, the population is more exposed to determinant factors behind the disease process;
- the capitals and the Federal District represent a geographic and social space in which the vectors for change are more intense;
- the sample size of this study enables robust stratifications.

All variables collected from VIGITEL are self-reported, so the information is subject to recall bias. A study conducted by Monteiro et al.[29] indicated good reproducibility and adequate validity of VIGITEL indicators for food and beverage consumption. In general, we can draw a parallel between the VIGITEL questions and those present in food frequency questionnaires. The main limitations of this method involve the predetermined frequency[30], the high aggregation level of foods[30], the closed list of foods[30], the lack of food detail[31], and the semiquantitative nature of data[31]. Another limitation is that VIGITEL only uses the records of landline telephone numbers. A study conducted by Bernal et al.[32] recommended the inclusion of a sub-sample with only cell phones.

CONCLUSION

The results of this study demonstrate how the tensions between healthy and unhealthy dietary patterns are established, and the trends presented herein can be assessed in combination with other factors, such as the practice of physical activity, to monitor the Strategic Action Plan for Tackling NCDs.

With respect to gender differences, it is essential to develop strategies for improving the adherence of men to healthy dietary patterns. Considering the inequality between social strata, policies that promote access to healthy foods are crucial, including: subsidized market;

incentives that favor the production of foods from family farming, organic, and agroecological; adoption of frontal labeling in foods.

Given the percentage of consumption of ultra-processed foods revealed in the 2008–2009 HBS[7] and the dynamic characteristics of the population studied in VIGITEL, we suggest the addition of an indicator for the intake of processed and ultra-processed foods in the VIGITEL questionnaire. The 2017 VIGITEL survey included questions related to the consumption of ultra-processed foods.

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