

Contribution of non-alcoholic beverages and frozen desserts in the daily sugars intake of adolescents

Contribuição de bebidas não alcoólicas e gelados comestíveis na ingestão diária de açúcares por adolescentes

DOI:10.34117/bjdv7n1-139

Recebimento dos originais: 08/12/2020

Aceitação para publicação: 08/01/2021

Priscila Alves Lima

Especialista em Farmacologia

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais, Brasil

E-mail: priscila.lima@funed.mg.gov.br

Liliane Fernandes dos Santos

Graduada em Engenharia de Produção

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais, Brasil

E-mail: liliane.santos@funed.mg.gov.br

Cláudia Aparecida de Oliveira e Silva

Doutora em Ciência de Alimentos

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais, Brasil

E-mail: claudia.aparecida@funed.mg.gov.br

Flávio Rodrigues Pereira

Especialista em Controle da Qualidade em Vigilância Sanitária

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais, Brasil

E-mail: flavio.rodriques@funed.mg.gov.br

Pedro Henrique Cabral de Souza

Graduado em Engenharia Química

Instituição: Universidade Federal de Minas Gerais – UFMG

Rua Basilicata, 338, Bairro Bandeirantes, Belo Horizonte, Minas Gerais, Brasil

E-mail: pedroh.c.souza@gmail.com

Gizele Barrozo Ribeiro

Graduada em História

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais, Brasil

E-mail: gizele.ribeiro@funed.mg.gov.br.

Cristiane Lúcia Goddard

Mestra em Ciência de Alimentos

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais,
Brasil

E-mail: cristiane.goddard@funed.mg.gov.br

Sara Araújo Valladão

Mestra em Ciência de Alimentos

Instituição: Fundação Ezequiel Dias - FUNED

Rua Conde Pereira Carneiro, 80, Bairro Gameleira, Belo Horizonte, Minas Gerais,
Brasil

E-mail: sara.valladao@funed.mg.gov.br

ABSTRACT

Most adolescents have a rich in calories and nutrient-deficient diet, mainly due to the intake of fat and sugar added foods. This work evaluated the sugar content of sweetened beverages and frozen desserts along with their contribution to daily sugar consumption. 11 samples of juices and nectars, 22 of liquid chocolate, 19 of chocolate powder and 17 of frozen desserts were analyzed. The contribution of these foods to the recommended daily sugar consumption was calculated based on the adolescent average total energetic intake and the food servings described on the RDC 359/2003 regulation. Juices, nectars and liquid chocolate presented higher sugar concentrations, 459 and 408 kJ, respectively. Powdered chocolate and frozen desserts measured energetic content were 289 and 221 kJ, respectively. The recommended intake of liquid chocolates, juices and nectars are two and three servings, respectively, resulting in contributions of 816 and 1360 kJ, which represents 97% and 162% of the daily reference values. The obtained results can be used to guide future revisions of the RDC 359/2003 regulation as well as the choice of priority foods for sugar reduction.

Keywords: Recommended Dietary Allowances; Food Consumption; Industrialized Foods; Sugars; Noncommunicable Diseases; Obesity.

RESUMO

A maioria dos adolescentes possui uma dieta com elevado conteúdo calórico e deficiência de nutrientes, devido principalmente a ingestão de alimentos ricos em gorduras e açúcares de adição. Neste trabalho avaliou-se os teores de açúcares de bebidas adoçadas e gelados comestíveis e a contribuição do consumo destes na ingestão diária de açúcares por adolescentes. Foram analisadas 11 amostras de sucos e néctares, 22 de bebida achocolatada, 19 de achocolatado em pó, 17 de gelados comestíveis. A contribuição desses alimentos para o consumo diário recomendado de açúcar foi calculada com base no valor energético total consumido por adolescentes e nas porções de alimentos determinadas na RDC 359/2003. Sucos, néctares e achocolatados líquidos apresentaram as maiores concentrações de açúcares por porção, 459 e 408 kJ, respectivamente. O conteúdo energético de achocolatado em pó e sobremesas congeladas foi de 289 e 221 kJ, respectivamente. A ingestão recomendada de bebidas achocolatadas, sucos e néctares é de duas e três porções, respectivamente, resultando em contribuições de 816 e 1360 kJ, o

que representa 97% e 162% dos valores energéticos de referência diários. Os resultados obtidos podem ser usados para orientar futuras revisões da regulamentação RDC 359/2003, bem como a escolha de alimentos prioritários para redução do açúcar.

Palavras-chave: Recomendações nutricionais; Consumo alimentar; Alimentos industrializados; Açúcares; Doenças Crônicas não Transmissíveis; Obesidade.

1 INTRODUCTION

In the last decades, Brazil underwent several transformations in the patterns of food consumption, like the substitution of fresh or minimally processed foods for ready-to-eat, processed or ultra-processed products, resulting in a nutritionally inferior diet. The new dietary patterns and the lack of physical exercises are risk factors for the development of overweight, obesity and Noncommunicable Diseases (NCDs), such as stroke, infarction, hypertension, cancer, diabetes and chronic respiratory diseases (BRASIL, 2014). NCDs are the leading causes of mortality, accounting for 68% of deaths worldwide in 2012 (WHO, 2015).

In the period from 1974 to 2009, there was a continuous increase in overweight and obesity in the Brazilian adolescent population. The prevalence of overweight increased from 3.7% to 21.7% in male teenagers and from 7.6% to 19.4% in female adolescents. It was also verified that the prevalence of overweight and obesity in Brazilian adolescents of all genders was 20.5 and 4.9%, respectively (IBGE, 2010).

Adolescents undergo several physical, psychological and social changes, which makes this population group vulnerable in several aspects (WHO, 2009; ENES & SLATER, 2010). Studies have shown that the diet of most of them is unbalanced, with a high caloric content and deficient in some essential nutrients (COLUCCI et al., 2011; CHIARELLI et al., 2011). There is an expressive consumption of processed, rich in fat and sugar added foods. These dietary characteristics in the age group of 10 to 19 years are directly related to weight gain and to the development of NCDs in adolescence and adulthood (ENES & SLATER, 2010).

In this context, there is a concern about the high intake of free sugars, especially in the form of sugar added beverages, since there is an increase in caloric intake and a reduction of consumption of foods that present more adequate nutritional calorie balance. The high intake of sugar rich foods also promotes the development of caries and obesity (WHO, 2015, COLUCCI et al., 2011).

The World Health Organization (WHO) recommends a restriction in the intake of

sugars to less than 10% of the total caloric consumption (WHO, 2015). The average sugar consumption by Brazilian adolescents was 109 g per day in 2008-2009 (IBGE, 2011). According to the WHO recommendation, the sugar ingestion should be at most 50 g per day. Thus, the average consumption by adolescents exceeds by 118% the recommendation.

The Brazilian Ministry of Health has established the Strategic Action Plan for the NCDs in Brazil for the 2011-2022 period, which establishes actions and targets to face and mitigate NCDs. Among the main established actions to achieve a healthy diet is the control of the nutritional composition of processed foods, which includes the reduction of sugar content in foods (BRASIL, 2011). Several countries adopted measures to reduce sugar consumption, like the increase in taxation on sweetened drinks, reaching 20% (CARVALHO, 2017).

In a study conducted in the United States between 1977 and 2001, it was confirmed an increase in sugar intake from sweetened beverages (NIELSEN & POPKIN, 2004). In Brazil, the prevalence in sweetened beverages consumption by adolescents is significant, especially when it comes to reconstituted juices, soft drinks and powdered juices, which is 43.7% (IBGE, 2011; SOUZA & ENES, 2013).

Considering the relevance of these beverages in Brazilian adolescent diet, this study aimed to evaluate the average sugar content in sweetened non-alcoholic beverages (liquid and powdered chocolate, juices and nectars) and frozen desserts. It was also analyzed the contribution of intake of these foods in the recommended daily consumption of sugars considering a diet of 8400 kJ and the energetic contribution in adolescents meals.

2 MATERIAL AND METHODS

The Health Surveillance Program (VISA) of the Minas Gerais State implements the Food Quality Monitoring Program (PROGVISA) in partnership with the Ezequiel Dias Foundation (FUNED), Octávio Magalhães Institute - Central Laboratory of Public Health of the State (LACEN-MG), in order to verify the quality of the food marketed in the state.

In the years 2014 and 2015, multiple municipal health surveillance organizations of the state randomly collected, in commercial establishments, sugar added beverages, frozen dessert to attend the PROGVISA. Nineteen samples of powdered chocolate, 22 of liquid chocolate, 17 of frozen dessert and 11 of fruit juices and nectars were collected,

totaling 69 samples.

These samples were sent to the Bromatological Chemistry Laboratory (LQB) of LACEN-MG, where the total sugar content was measured.

2.1 TOTAL SUGAR CONTENT DETERMINATION

Total sugar content determination was performed by the Lane-Eynon method, based in the 040/IV technique from the physicochemical methods for food analysis compendium of the Adolfo Lutz Institute (BRAZIL, 2005).

2.2 EVALUATION OF BEVERAGES AND FROZEN DESSERTS CONTRIBUTION TO SUGAR INTAKE

Legislation standardizes the Brazilian diet at the total energy value of 8400 kJ per day (BRASIL, 2003a; BRASIL, 2003b). According to IBGE's Family Budget Survey Evaluation, the average energy consumption for adolescents is approximately 8400 kJ (IBGE, 2011). Thus, in this study it was considered that the Recommended Daily Intake (RDI) for the consumption of sugars is 840 kJ, which corresponds to 10% of the total energy value.

The calculation of the contribution percentage on sugar consumption of beverages and frozen desserts evaluated in this study was performed based on the described servings and the number of recommended servings in RDC 359/2003 of ANVISA and the RDI of sugar.

Juices and nectars, liquid chocolate, chocolate powders, frozen desserts are included in groups III (fruit, juices, nectars and fruit soft drinks), IV (Milk and milk products) and VII (Sugars and energy products from carbohydrates and fats), respectively (BRASIL, 2003a).

The number of recommended servings is 3 for group III, 2 for group IV, and one for group VII. The servings represent the average amount of food that should be consumed by a healthy, older than 36 months person in a meal. The defined servings for the drinks evaluated in this work were: 20 g for chocolate powder, 200 ml for liquid chocolate, juices and nectars and 60 g for frozen desserts (BRASIL, 2003a).

Based on the total sugar results, for the samples evaluated, a standardization of the sample servings was performed according to the values specified in RDC 359/2003. Subsequently, calculations of sugar content per serving in g/g or in g/ml and energy amount in kJ were performed. Then, the energetic contribution percentage of one food

servicing consumption on the sugar RDI was calculated. Finally, it was also calculated the consumption contribution percentage of the number of servings recommended by the ANVISA's RDC 359/2003 regulation.

Data evaluation was performed using descriptive statistics, by measuring central tendency (average) and dispersion (variation coefficient).

3 RESULTS AND DISCUSSION

Juices and nectars presented the highest average sugar content per serving (27 g/200 mL) followed by liquid chocolate (24 g/200 mL) (Table 1). Reconstituted juices, refreshments and powdered juices represent the highest average per capita daily consumption amount among adolescents (167.8 g/day). In addition, there is a high prevalence of consumption of this beverage (43.7%) in this age group (IBGE, 2011). Taking into account these factors, it is suggested a careful evaluation of composition of juices and nectars, since there is a need to reduce the sugar content in these beverages. According to IBGE (2011), dairy drinks, such as liquid chocolates present an average daily *per capita* consumption of 43.5 g and a 14.7% prevalence. These values are lower compared to juices and nectars, which results in a weaker concern about the consumption of these foods by adolescents, despite their high sugar content.

Chocolate powders present the lowest intake prevalence (5.3%) and a 1.8 g/day *per capita* consumption among adolescents (IBGE, 2011). The average content found in these samples is 17 g/20 g, an intermediate value considering the other foods analyzed. Frozen desserts presented the lowest average sugar content per serving (13 g/60 g). Their consumption prevalence is 6.9% and the *per capita* intake is 9.2 g/day (IBGE, 2011). Therefore, frozen desserts are not as critical as other foods in terms of sugar content.

The variation coefficients (VCs) were low among foods, which indicates that the variation of the sugar content per serving in sweetened beverages and frozen desserts is small; there may be a standardization of the amount of added sugars in these foods (FERREIRA, 1991).

Papers that evaluate sugar content in sweetened beverages - liquid and powdered chocolate, juices and nectars - and frozen desserts usually comprises a small amount of samples, which makes it difficult to compare the contents presented in this work. HANAN et al. (2012) evaluated the sugar content in three samples of chocolate-flavored milk drinks and three samples of artificial orange fruit juice and found the average content of 37.16 g/100 g and 32.60 g/100 g of total and reducing sugars, respectively. The results

presented in this study (Table 1) were lower, while the number of samples was higher compared to HANAN et al. (2012).

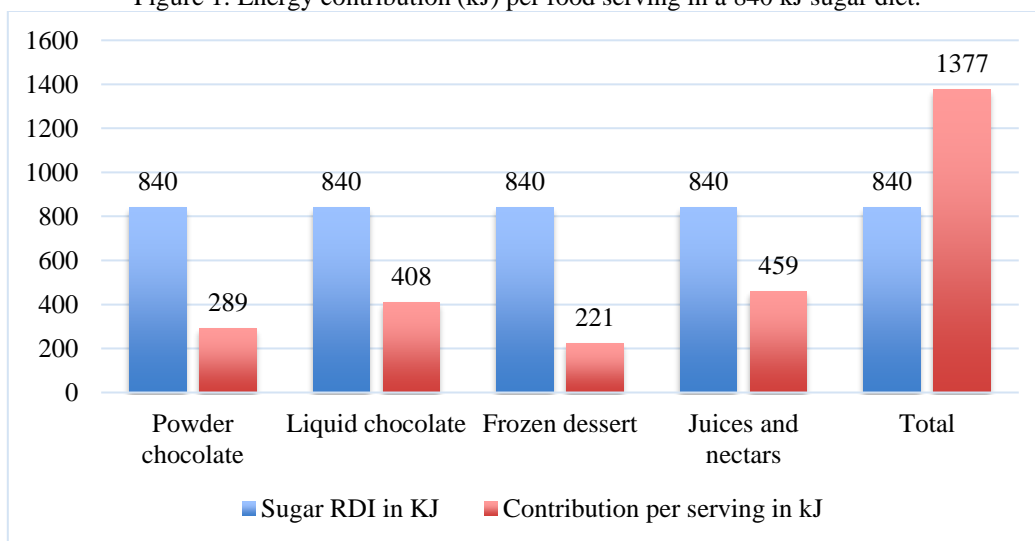
Table 1. Average sugar content in grams per serving.

Food	Serving	Average (g)	Minimum (g)	Maximum (g)	VC (%)
Chocolate powder	20 g	17	14	19	7
Liquid chocolate	200 mL	24	19	30	14
Frozen dessert	60 g	13	11	16	12
Juices and nectars	200 mL	27	22	32	11

Because of the lower average sugar content per serving, frozen desserts had the lowest contribution to the daily intake of sugars (221 kJ), which represents 26.3% of the RDI for sugars (840 kJ). Otherwise, juices and nectars were the beverages with the highest energy contribution in the daily consumption of sugars (459 kJ), which represents 55% of the sugar RDI (Figure 1).

The high contribution of each food in the sugar RDI makes it difficult to establish a balanced diet. Consumption of a serving of all foods evaluated in one day results in a total 1377 kJ of energy, exceeding the sugar RDI by 64% (Figure 1). Assuming a serving of liquid chocolate (408 kJ) for breakfast, a serving of juice (459 kJ) at lunch, a serving of ice cream (221 kJ) for dessert and a serving of juice (459 kJ) at dinner , a total of 1547 kJ of energy from the sugars is obtained, extrapolating the RDI of sugars by 84%.

Figure 1. Energy contribution (kJ) per food serving in a 840 kJ sugar diet.

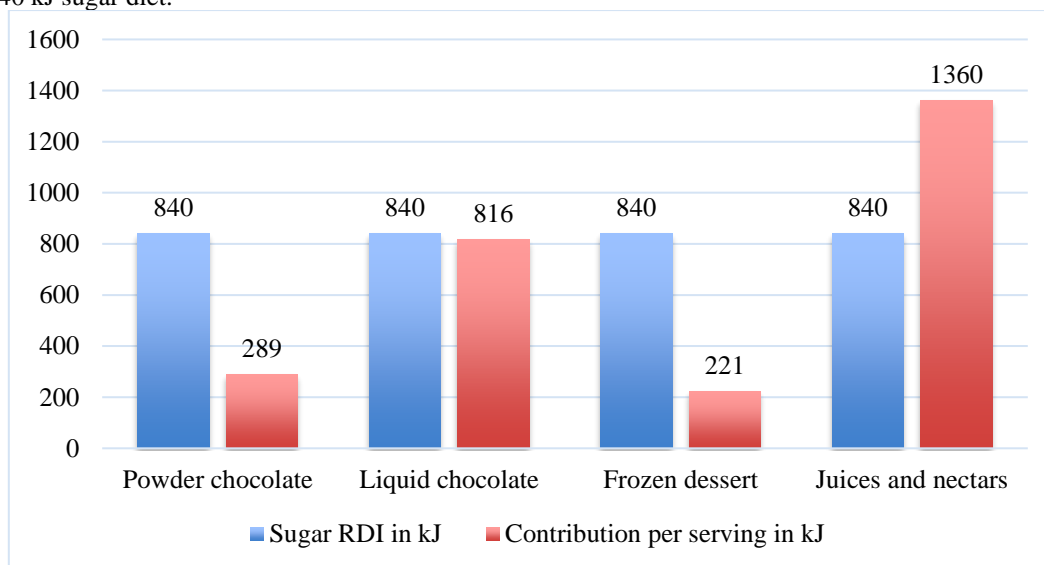


RDC 359/2003 recommends the number of servings to be consumed per day

according to the food group. Among all foods evaluated in this study, juices and nectars present the highest number of recommended servings and the liquid chocolates have the second largest number of servings, which is contradictory, once these contain the highest average sugar content.

Legislation indicates the consumption of three servings of fruits, juices, nectars and fruit soda. However, considering the consumption of these servings of the evaluated juices and nectars, which had an average sugar content of 27 g/200 mL, there would be a contribution of 1360 kJ, which exceeds the sugar RDI by 62%. For liquid chocolate, the indicated consumption number of servings is two, but this study showed that the consumption of this quantity generates approximately 816 kJ, which corresponds to 97% of the sugar RDI (Figure 2).

Figure 2. Energy contribution (kJ) following the number of servings from the RDC 359/2003 regulation for a 840 kJ sugar diet.



Given the sugar content found in the analysis, the number of servings recommended in ANVISA's RDC 359/2003 and the sugar RDI contributions, an evaluation and revision of this legislation is recommended in order to adjust the specified serving quantity and the number of servings.

Brazil, like other countries, seeks to reduce the sugar content in food, due to the constant increase of obesity and NCDs. In the United Kingdom, in the coming years, studies show that there will be a 20-30% reduction in sugar in food (DIARY, 2014; WHO, 2017). The results obtained in this work can guide the reduction of sugar content in foods, facilitating the establishment of priorities according to consumption and sugar

concentration of sugar added beverages and frozen desserts.

In the Brazilian House of Representatives, there is a bill (8541/2017) that proposes the increase of taxes on Industrialized Products on sweetened drinks from 4 to 5%, aiming to curb the consumption of these foods. In contrast to the increase in taxation, the Ministry of Health suggests the reduction of prices of *in natura* products, such as fruits and vegetables (BRASIL, 2011). Some countries have already adopted this measure, such as Hungary, where there was an increase in taxation in 2011, reducing sales from 117 to 69 million liters and France, where the increase in taxation in 2012 led to a fall of 3.3% in sales of these products (CARVALHO, 2017).

If this bill is approved, this study of the energy levels and contributions made with sugar added drinks and frozen desserts will help in the selection of foods that will need to increase taxation.

4 CONCLUSIONS

The evaluation of sugar content and food consumption contributions in daily sugar intake suggests the conclusion that juices, nectars and liquid chocolate have the highest impact in the dietary balance. Thus, their compositions should be carefully evaluated for an adequate definition of the necessary reduction of sugars in these foods. It is noticeable that the high sugar content in the evaluated foods makes it difficult to establish a balanced diet for adolescents, since all foods contribute significantly to the daily intake of sugars.

The gathered information may direct the regulatory agencies in the elaboration and revision of legislation and in the implementation of public policies, aiming the application of the strategic action plan for confronting NCDs, reducing the sugar content in foods.

REFERENCES

BRASIL. Ministério da Saúde (2003a). Aprova Regulamento Técnico de Porções de Alimentos Embalados para Fins de Rotulagem Nutricional (RDC nº 359, de 23 de dezembro de 2003). Diário Oficial da União.

BRASIL. Ministério da Saúde (2003b). Aprova Regulamento Técnico sobre Rotulagem Nutricional de Alimentos Embalados, tornando obrigatória a rotulagem nutricional (RDC nº 360, de 23 de dezembro de 2003). Diário Oficial da União, Brasília.

BRASIL. Ministério da Saúde (2005). Normas Analíticas do Instituto Adolfo Lutz (IAL). Métodos Físico-Químicos para Análise de Alimentos. Brasília, 4th Edition, 1.018 p.

BRASIL. Ministério da Saúde (2011). Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis (DCNT) no Brasil 2011-2022. Brasília: Ministério da Saúde, 160 p.

BRASIL. Ministério da saúde (2014). Guia Alimentar para a População Brasileira. Brasília: Ministério da Saúde, 2^a ed.

CARVALHO, B.M., SILVA, L.O. (2017). O consumo de açúcar e o Código de Defesa do Consumidor. O impacto das políticas públicas para a redução do consumo de açúcar. Revista Jus Navigandi. Available at: <<https://jus.com.br/artigos/59063/o-consumo-de-acucar-e-o-codigo-de-defesa-do-consumidor>>. [Accessed 25/04/2020].

CHIARELLI, G., ULBRICH, A.Z., BERTIN, R.L. (2011). Composição corporal e consumo alimentar de adolescentes da rede pública de ensino de Blumenau (Brasil). Revista Brasileira de Cineantropometria e Desenvolvimento Humano, 13(4), 265-271.

COLUCCI, A.C.A., CESAR, C.L.G., MARCHIONI, D.M.L., FISBERG, R.M. (2011). Relação entre o consumo de açúcares de adição e a adequação da dieta de adolescentes residentes no município de São Paulo. Revista de Nutrição, 24(2), 219-231.

DIARY (2014). Action on sugar in food. Perspectives in Public Health, 134(2). Available at: <[://journals.sagepub.com/doi/pdf/10.1177/1757913914521928](https://journals.sagepub.com/doi/pdf/10.1177/1757913914521928)>. [Accessed 27/04/2020].

ENES, C.C. & SLATER, B. (2010). Obesidade na adolescência e seus principais fatores determinantes. Revista Brasileira de Epidemiologia, 13(1), 163-171.

FERREIRA, P.V. (1991). Estatística experimental aplicada à agronomia. Maceió, EDUFAL. 437p.

HANAN, S.A., SILVA, A.A, PACHECO, A.M., SIMÕES, R.H., ZACARIAS FILHO, R.P. (2012). Concentração de açúcares presentes em alimentos infantis industrializados consumidos por crianças de Manaus – AM. Pesquisa Brasileira em Odontopediatria e Clínica Integrada, 12(3), 419-424.

Instituto Brasileiro de Geografia e Estatística – IBGE (2010). Pesquisa de orçamentos

familiares 2008-2009: antropometria e estado nutricional de crianças adolescentes e adultos no Brasil. Coordenação de Trabalho e Rendimento. Rio de Janeiro.

Instituto Brasileiro de Geografia e Estatística – IBGE (2011). Pesquisa de orçamentos familiares 2008-2009: análise de consumo alimentar pessoal no Brasil. Coordenação de Trabalho e Rendimento. Rio de Janeiro.

NIELSEN, S.J. & POPKIN, B.M. (2004). Changes in beverage intake between 1977 and 2001. *American journal of preventive medicine*. 27(3), 205-210.

Projeto de Lei PL 8541/2017 (2017). Aumenta a alíquota do Imposto sobre Produtos Industrializados incidente sobre a importação ou saída de bebidas não alcoólicas adoçadas com açúcar. Paulo Teixeira - PT/SP. Available at: <<http://www.camara.gov.br/proposicoesWeb/fichadetramitacao?idProposicao=2150996>>. [Accessed 25/04/2020].

SOUZA, J.B., ENES, C.C. (2013). Influência do consumo alimentar sobre o estado nutricional de adolescentes de Sorocaba – SP. *Journal of the Health Sciences Institute*, 31(1), 65-70.

World Health Organization – WHO (2009). *Child and adolescent health and development: progress report 2009*. Geneva.

World Health Organization – WHO (2015). *Diretriz: Ingestão de açúcares por adultos e crianças*. Geneva.

World Health Organization Regional Office for Europe – WHO (2017). *Incentives and disincentives for reducing sugar in manufactured foods an exploratory supply chain analysis. A set of insights for Member States in the context of the WHO European Food and Nutrition Action Plan 2015–2020*. Geneva.