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Is the serving size and household measure information on labels clear and standardized? Analysis of the labels of processed foods sold in Brazil

As informações sobre porção e medida caseira nos rótulos são claras e padronizadas? Uma análise em rótulos de alimentos industrializados brasileiros

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ABSTRACT

This study aimed to analyze the household measures reported on labels of processed foods, taking into account their adequacy with the type of food and their relationship with the declared serving size. We analyzed the labels of processed foods for sale in a Brazilian supermarket. Serving sizes were assessed according to the parameters of the Brazilian law, and household measures were assessed according to the term used. A chi-square heterogeneity test was performed, and a *p* value of <0.05 was considered indicative of statistical significance. We analyzed 1,102 processed foods and found that 72% declared the exact reference serving size prescribed by the Brazilian law. We found inappropriate household measures with regard to the way foods are customarily consumed (e.g., 2 ½ cookies) as well as subjective (e.g., 2 pieces) or incomplete (e.g., 1 spoon) measure terms. Household measures expressed as fractions were greater among products with measures that referred to the product's total weight (e.g., ½ package) and with serving sizes that complied with the Brazilian law ($p < 0.001$). Therefore, the serving size and household measure information on the labels of Brazilian processed foods are neither appropriate nor standardized. Consequently, this could complicate consumers' understanding and use of this information.

KEYWORDS: Food Legislation; Nutritional Information; Food Choices

RESUMO

Esta pesquisa objetivou analisar as medidas caseiras declaradas nos rótulos de alimentos industrializados, considerando sua adequação ao tipo do alimento e à porção declarada no rótulo. Foram analisados os rótulos de alimentos industrializados à venda em um supermercado brasileiro. As porções foram avaliadas conforme os parâmetros definidos pela Legislação Brasileira de Rotulagem Nutricional de Alimentos e as medidas caseiras foram avaliadas conforme o termo utilizado. Foi realizado Teste de Qui quadrado de heterogeneidade, sendo considerado p-valor < 0,05 como indicativo de significância estatística. Foram analisados 1102 alimentos industrializados, desses 72% declararam a porção de referência definida pela legislação brasileira. Encontrou-se medidas caseiras inadequadas à forma de consumo do alimento (2½ biscoitos doces), com termos de mensuração subjetivos (2 pedaços) e incompletos (1 colher). O fracionamento da medida caseira foi estatisticamente maior entre produtos com a medida caseira referente ao peso total (1/2 pacote) e com porção adequada à legislação brasileira (p < 0.001). Portanto, as informações sobre porção e medida caseira nos rótulos de produtos industrializados brasileiros não são precisas nem padronizadas. Como consequência, podem gerar dificuldade no entendimento e no uso dessas informações pelo consumidor brasileiro.

PALAVRAS-CHAVE: Legislação de Alimentos; Informação Nutricional; Escolhas Alimentares

INTRODUCTION

Nutrition labeling has been highlighted as a major public health strategy[1,2] and has been promoted by the World Health Organization (WHO), which emphasizes on the importance of accurate, standardized, and understandable information to inform consumers and facilitate food choices[3,4].

Nutrition labeling is mandatory in many countries, including the United States, Canada, New Zealand, Australia, Brazil, Argentina, Uruguay, Paraguay, China, Israel, and Malaysia[5,6]. In the European Union, nutrition labeling policies have been improved and are now applicable to most foods available for sale[7,8]. However, food labeling requirements vary from country to country[1,5,7].

In Brazil and other Mercosul countries (Argentina, Uruguay, and Paraguay), nutritional information on labels must be presented by the serving size and household measure. This policy aims to standardize the information on labels and enable comparisons between foods, facilitating food choices and promoting the intake of appropriate amounts[9,10].

For most foods, the Brazilian law defines the reference serving size in grams (g) or milliliters (ml) to be reported on labels. However, it allows reported serving sizes to vary from ±30% of the reference value. In addition, despite requiring household measure information, the law allows measures to be expressed as fractions and leaves it up to manufacturers to decide which household measure is the most appropriate for each type of processed food[9].

The lack of serving size standardization among foods can complicate food choices[11]. In addition, studies have indicated that food labels do not always present clear information about the serving size and type of household measure[12,13,14,15]. For example, terms such as small, medium, and large are used, which are open to subjective interpretation[14,16], thereby complicating serving size measurement and potentially leading to consumer error[14,15,17,18]. Such factors can compromise the objectives of nutrition labeling, complicating the understanding of nutritional information and the determination of food intake by consumers.

In this context, the present study aimed to analyze the household measures reported on labels for processed foods sold in Brazil, taking into account their adequacy with the type of food and their relationship with the declared serving size.

METHODS

This was a cross-sectional study.

Description of study location

A Brazilian supermarket in the city of Florianópolis (SC) was intentionally selected because it sells a national range of processed foods and belongs to 1 of the 10 largest supermarket chains in the country[19].

Sample

Ready-to-consume foods were included and classified as processed and ultra-processed[20]. This classification was chosen to represent foods that are becoming increasingly common in the Brazilian diet[21,22,23] and are related to an increase in chronic diseases[24].

Foods considered processed are those directly derived from fresh foods and converted into less perishable and more palatable and attractive food products by adding salt, sugar, and/or fat and subjecting them to techniques such as baking and smoking. Ultra-processed foods are those that are ready or semi-ready to consume and are totally or partially derived from industrial ingredients. They have a low nutritional value and fiber content as well as large amounts of calories, simple carbohydrates, sodium, and trans and/or saturated fats[20].

Of the food products eligible for this study and available for sale, we excluded from the sample all concentrated, powdered, dehydrated, and mixed food products that required to be reconstituted by adding other ingredients. In addition, bakery products prepared and packaged by the supermarket itself were not included because they are not required to have nutrition labeling. We also excluded all foods lacking information about the serving size and/or household measure on their labels as well as products that do not have a reference serving size by the law[9].

Information was collected on the following processed food products: crackers, sweet biscuits, dairy drinks, yogurts, fermented milk, dairy desserts, processed bread, toast, patés, cheese bread, salty snacks, popcorn, cakes, chocolates, and nuts.

Data collection

Data collection was performed in August 2011 by nutritionists and trained nutrition students. The instrument used to collect data had been previously tested in a pilot study. The instrument had the following information: type of processed food, flavor, total weight (g or ml), brand, origin (location of the food's production), serving size (g or ml), and household measure. When the same food was available in packages of different sizes, each was recorded as a new product because of potential differences in serving sizes and household measures.

Data treatment

The information was double entered into the Microsoft Excel® program in 2 distinct databases and validated in the EpiData® version 3.1 statistical program (EpiData Association, Odense, Denmark).

Serving sizes reported on the processed food labels (g or ml) were categorized according to their compliance with reference serving sizes set by the Brazilian nutrition labeling law[9], as presented in Table 1.

Table 1. Classification of the serving size (g or ml) reported on labels in relation to the reference serving size set by the Brazilian nutrition labeling law.

Classification[1]	Serving Size Significance	Compliance with Brazilian Law[2]
<70%	more than 30% below the reference serving size (g or ml)	Inadequate
70-99%	up to 30% below the reference serving size (g or ml)	Adequate
100%	identical to the reference serving size (g or ml)	Adequate
101-130%	up to 30% above the reference serving size (g or ml)	Adequate
>130%	more than 30% above the reference serving size (g or ml)	Inadequate

[1]Classification of the serving size in g or ml as presented on label in relation to the reference serving size set by the Brazilian law. [2]RDC n°359/2003.

Household measure information was categorized according to whether it was expressed as a fraction or not (e.g., ½ cookie or ½ teaspoon). In addition, foods were categorized into 4 groups according to the term used to present the household measure on the label: common household measures (measures that use domestic utensils to measure food, e.g., tablespoons and cups), measures that are defined by the industry and are generally consumed on an occasion (e.g., a single cookie or a container of yogurt), measures referring to the package's total weight (when the household measure refers to the package's total content, e.g., ½ package), and individual units (when the serving size is equal to the package's total weight).

Analysis

Central trend and dispersion values were calculated for the declared serving sizes (g or ml) for each food group. We described the terms used to present household measures in each group as well as the prevalence of household measures expressed as fractions. Furthermore, we present examples of the serving sizes and household measures found on the analyzed labels.

To analyze the association of the household measures expressed as fractions with the type of household measure and the serving size's compliance with the Brazilian law, we applied the chi-square test for heterogeneity. A p value of <0.05 was considered indicative of statistical significance. All analyses were performed with the Stata version 11.0 statistical program (StataCorp, College Station, Texas, USA).

RESULTS

Information was collected from the labels of 1,102 processed foods, 72% of which [95%CI (confidence interval) 69.2; 74.5] declared the exact reference serving size prescribed by the Brazilian law[9]. Among those that did not follow the reference serving size, 13.6% (95%CI 11.0; 15.1) and 1.1% (95%CI 0.4; 1.7) complied with the law, having 70%-99% and 101%-130% adequacies, respectively. The other products presented serving sizes that did not comply with the Brazilian law[9], with 9.8% (95%CI 7.3; 10.8) being classified as <70% and 3.6% (95%CI 2.0; 4.1) being classified as >130%.

Most food groups presented a median serving size that was identical to the reference serving size under the Brazilian law[9], except for the yogurt, fermented milk, and dairy dessert groups, which presented serving sizes less than the reference serving size (Table 2). However, only the cheese bread, popcorn, and

Table 2. Description of serving size and household measure information declared on the labels of processed foods in Brazil. Florianópolis (SC). 2011.

Processed foods (N = 1102)	*n*	Reference serving sz. (g or ml)[1]	Declared serving size		Household measure	
			Median (g or ml)	Range (g or ml)	Terms	Presence of fractionation[2] (%)
Dairy drinks	47	200	200	(90-300)	Cup; container; and unit	0.0
Sweet biscuits	269	30	30	(14-60)	Bar; cookie; package; rolls; and unit	23.0
Crackers	85	30	30	(21-30)	Cracker; sticks; package; serving; unit; and cup	17.6
Cakes	53	60	60	(30-60)	Slice and unit	11.3
Chocolates	157	25	25	(10.4-41)	Bar; stick; bonbon; tablespoon; *cucharadas*; drop; package; piece; square; pat; triangle; unit; and cup	49.7
Peanut candy	19	20	20	(15-40)	Piece; serving; and unit	15.8
Yogurt	75	200	180	(90-200)	Cup; bottle; container; and unit	0.0
Fermented Milk	64	200	100	(75-200)	Cup; bottle; container; and unit	0.0
Salty nuts	30	15	15	(15-25)	Tablespoon; cup; and teacup	13.3
Processed breads	101	50	50	(40-75)	Slice and unit	29.7
Cheese bread	7	50	50	(50-50)	Units	42.9
Patés	22	10	10	(10-100)	Spoon; teaspoon; and tablespoon	9.1
Popcorn	31	25	25	(25-25)	Tablespoon; cup; and teacup	3.2
Salty snacks	96	25	25	(10-38)	Tablespoon; package; packet; unit; and cup	43.8
Dairy desserts	20	120	105	(40-200)	Cup; container; and unit	0.0
Toast	26	30	30	(30-30)	Toasts; unit; and cup	0.0

[1]Reference serving size under the Brazilian nutrition labeling law (RDC n°359/2003). [2]Household measures that were expressed as fractions (e.g., ½ cookie or ½ spoon).

toast groups had the exact reference serving size reported on all their products. The remaining groups demonstrated variability in serving size declaration. The greatest variability in serving size declaration was found in the dairy drink group (333%) and the least variability was found in the salty cracker group (142%).

The declaration of household measures included various terms in each food group, as shown in Table 2. The chocolate group had the greatest variety, with 13 different terms. Notably, the terms used in most groups were not very specific, i.e., the terms did not clearly indicate the size of the household measure (e.g., cup, glass, spoon, piece, and serving). Therefore, there was no specification of such measures as tea or coffee cup or even teaspoon or tablespoon. The declaration of terms in other languages without translation (such as *cucharada* in Spanish) was also found. More than 40% of the foods in the chocolate, cheese bread, and salty snack groups declared the household measure expressed as a fraction. Five groups did not declare household measures as fractions for any product: dairy drinks, yogurt, fermented milk, dairy desserts, and toast.

In Figure, examples of serving sizes and household measures found on the analyzed processed foods are presented. Products with different serving sizes (g) and ways of presenting household measures were found for the same type of processed food. Household measures were found that were inappropriate in the way they were presented and/or in relation to the food's consumption (e.g., 1 ½ tablespoon of salted nuts, ½ cup of crackers, and 2 tablespoons of popcorn). In addition, we observed the fractionation of foods that are consumed in their entirety (e.g., 2 ½ sweet biscuits and 6 ½ crackers). We also observed subjective measurement terms (e.g., 2 pieces) and incomplete terms (e.g., 1 cup of popcorn, in which the cup's size is not indicated). We further observed fractionation that used difficult divisions (e.g., 1/20 chocolate bar and 3 ½ chocolate squares).

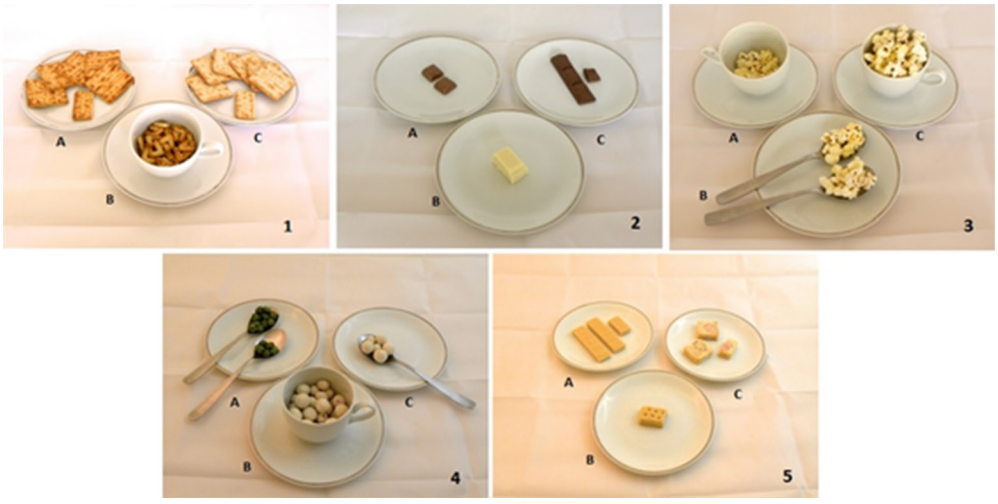
The type of household measure was statistically associated with the declaration of household measure as a fraction, as shown in Table 3. We observed that most processed foods with household measures referring to the total weight presented household measures as fractions. No food that presented its household measure as an individual unit declared it as a fraction. Serving size adequacy was also associated with the presence of household measures expressed as fractions ($p < 0.001$). Processed foods that were in 100% compliance with the Brazilian law were found to declare household measures as fractions more frequently, followed by processed foods classified as >130%.

DISCUSSION

The results show that the serving size and household measure information on processed food labels in Brazil are neither appropriate nor standardized. Consequently, this irregularity can complicate consumers' understanding of this information.

In 81.2% of the groups analyzed, variability was found in the presentation of serving sizes among foods of the same group. The lack of serving size standardization in nutrition labeling was shown in another study that analyzed the labels of yogurts, dairy drinks, and fermented milk sold in southeastern Brazil. That study found a serving size range of 100g to 200g, although the serving size prescribed by the law is 200g[25]. In the present study, we found an even greater variability for these foods, ranging from 75g to 300g.

Similar results have been found in studies conducted in other countries where labeling is presented per serving. In Australia, 1,070 processed foods were analyzed, which had a range of 18g to 100g in the serving sizes presented on snacks, demonstrating low uniformity[11]. A study in the United Kingdom found that the serving sizes on processed meat pie labels varied between



(1) Cracker's serving sizes: A - 5 ½ units (30g), B - ½ cup (25g), C - 6 ½ units (30g); (2) Chocolates' serving sizes: A - 2 pieces (25g), B - 1/20 chocolate bar (25g), C - 3 ½ chocolate squares (25g); (3) Popcorn's serving sizes: A - ¼ cup (25g), B - 2 tablespoons (25g), C - 1 cup (25g); (4) Salty nuts' serving sizes: A - 1 ½ tablespoon (25g), B- ½ cup (25g), C- 1 tablespoon (15g); (5) Sweet biscuit's serving sizes: A - 2 ½ units (25g), B - ½ unit (30g), C - 2 ½ units (30g).

Figure. Examples of serving sizes and household measures presented on the labels of processed and ultra-processed foods sold in Brazil. Florianópolis (SC). 2011.

Table 3. Association between the household measure expressed as a fraction and the household measure type and serving size adequacy. Florianópolis (SC). 2011.

Variables	n	Household measure expressed as a fraction[1] (%)	95%CI	p-value
Household Measure Type				
Common household measure[2]	412	22·8	(18·2-26·4)	<0·001◊
Industry-defined household measure[3]	512	15·6	(12·0-18·4)	
Household measure referring to total weight[4]	76	94·7	(85·3-97·8)	
Individual unit[5]	102	0	(0·0-0·0)	
Adequacy of serving size[6]				
<70%	108	2·8	(2·2-6·5)	<0·001◊
70-99%	149	7·4	(3·2-11·9)	
100%	794	28·4	(24·8-31·2)	
101-130%	12	8·3	(2·1-38·4)	
>130%	39	15·4	(5·8-30·5)	

[1]Household measures that were expressed as fractions (e.g., ½ cookie or ½ spoon). [2]Utensils commonly used to measure foods (e.g., tablespoon and cup). [3]Measures generally consumed on a single occasion (e.g., 1 cookie). [4]Household measure referring to the total weight of package (e.g., ½ package). [5]When the serving weight is equal to the total package weight. [6]Classification of the serving size (g or ml) presented on the label in relation to the reference serving size under the Brazilian law. ◊Chi-square test with Yates correction.

138g and 300g[26]. This suggests that such factors can compromise product comparability and the use of nutrition labeling for its intended purpose when making food choices.

Furthermore, although the Brazilian law allows for 60% variability in serving size declaration, we found that 13.4% of the analyzed foods presented serving sizes that did not comply with the law, falling outside of the wide range of variability permitted. This situation requires greater inspection and enforcement of food label information in Brazil.

With regard to household measures, we observed variability in the terms used among foods of the same group. In Australia, Vartania and Sokol[27] evaluated 3,344 processed foods and found household measure information on only 701 products as well as variability in this information for foods of the same group. Notably, household measures are defined by manufacturers in both Australia and Brazil.

Imprecise terms (e.g., spoon, glass, and "cup") were used to present household measures on labels. Lack of specificity about the size of household measures can represent a difference of up to 50% in the amount served, as in the difference between a tablespoon and a teaspoon[9]. We observed the use of inappropriate terms in relation to the way a food is typically consumed (e.g., a tablespoon of popcorn) as well as terms that are open to subjective interpretation (e.g., serving and piece).

Other studies have also highlighted the use of subjective terms on labels, in which the measure depends on the consumer and can differ from person to person, e.g., piece or slice[14,16]. A study of English consumers showed that a tablespoon may be interpreted as equivalent to 3 or just 1 dessert spoon[28]. Some studies have indicated that the use of images can facilitate perceptions of household measures and promote a greater accuracy in estimating them[29,30].

Household measures expressed as fractions were statistically greater among processed foods that were in 100% compliance with the reference serving sizes set by the law[9]. However, this suggests that the reference serving sizes under Brazilian law are smaller than serving sizes typically consumed by the public, possibly leading to household measure fractionation on labels. On the other hand, this may also suggest that manufacturers are not adapting their products to present more appropriate and precise household measures for consumers.

Household measures expressed as fractions were also statistically greater among products with measures referring to the total weight. This result is justified because in these cases, household measures that are less than the product's total weight are generally fractionated (e.g., ½ package). However, we observed the fractionation of foods that are normally consumed in complete units, such as cookies, breads, and cheese. Moreover, we observed household measures that are difficult to use in practice (e.g., 1/3 square of chocolate). The findings of the present study are in agreement with those of a study conducted in the United States that showed household measure fractionation for processed foods typically consumed on a single occasion, requiring the U.S. consumer to make calculations to determine the amount being consumed[31]. Researchers suggest that these factors can compromise the control of consumption[13,32].

Although consumers visualize and interpret household measure information better than serving size information (g)[14,27], the results of the present study indicate that presenting household measure information probably does not facilitate its understanding and use to determine consumption. According to a study conducted to assess household measure perceptions among U.S. students, only 1/3 of the students adequately estimated the serving sizes presented on labels[32]. These results highlight the need for clearer and more coherent rules for the presentation of household measures on labels for each food type.

One limitation of this study is that only information presented on the food labels was used, without actually weighing the foods. However, the study aimed to analyze the same labeling information that is available to consumers at the time of purchase, which guides food choices. Therefore, considering consumer rights and the goals of labeling as a public health policy, the reliability of this information should be guaranteed by manufacturers and be subject to verification in light of the current law. Another potential limitation of this study was the inclusion of processed foods from a single supermarket. However, the store we studied is part of a large supermarket chain and many of the processed foods we evaluated are sold throughout Brazil. Finally, the present data reflect the nutrition labeling on processed foods sold in Brazil in August 2011. However, because the Brazilian nutrition labeling legislation has not changed, we do not expect any significant change with respect to the serving size and the household measure on food products currently for sale in Brazil.

CONCLUSION

We conclude by emphasizing on the importance of standardizing the serving size and household measure information on food labels to facilitate their understanding and use. We suggest reviewing the variation permitted in serving sizes reported on Brazilian nutrition labeling, which can represent up to ±30% of the reference serving size at present. The present data suggest that the current permitted range may be too wide, making it impracticable to compare foods within the same group. We also recommend defining specific terms to present household measures to consumers as well as limiting fractionation to only those foods that are typically consumed in fractions. Finally, we recommend evaluating the possibility of including pictures of household measurements on food labels to improve consumer understanding. Further studies are required to assess labeling information, in particular, to determine the best way to declare such information.

Therefore, the present study has shown the need to improve the Brazilian nutritional labeling legislation. This is important, although the use of labels in making food choices and its effect on consumer health remain controversial. Nutrition labeling provides access to information, which is a consumer right, and its improvement is essential for strengthening consumers' ability to analyze products and make decisions. Hopefully, the data presented here can help in discussions and reviews of nutrition labeling rules in other countries, raising questions and issues for nutrition labeling research.

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