The impact of the reduction of sodium content in processed foods in salt intake in Brazil

Impacto da redução do teor de sódio em alimentos processados no consumo de sódio no Brasil

Impacto de la reducción del contenido de sodio en los alimentos procesados en la ingestión de sodio en Brasil

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Abstract

This study aimed at assessing the potential impact of the reduction of sodium content in processed foods in the average salt intake in the Brazilian population. A total of 32,900 participants of the first National Dietary Survey *(NDS 2008-2009), age 10 years and older who provided information about food intake over two days were evaluated. The sodium reduction targets established by the Brazilian Ministry of Health in 2010 and 2013 were used as the reference to determine the maximum content of sodium in 21 groups of processed food. The results show that sodium reduction targets in processed food have small impact in mean Brazilian population intake of salt. For 2017, the expected mean reduction is of 1.5%, the average sodium intake being still above the recommended 2,000mg/day maximum. Therefore, it will hardly be possible to reach the necessary reduction in salt intake in Brazil from volunteer agreements like the ones made so far.*

Sodium; Dietary Sodium; Industrialized Foods; Diet Surveys

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Introduction

Excessive salt intake is associated with a progressive increase of blood pressure, and therefore to an increase in the risk of cardiovascular diseases, which are the main cause of deaths in Brazil and worldwide [1,2]. In 2013, the prevalence of self-reported high blood pressure in the Brazilian population was 24% [3].

According to data from the first *National Dietary Survey* (NDS) conducted in 2008-2009, the average salt intake among the Brazilian population was 3,190mg/day4, which is higher than the maximum tolerable level of 2,000mg/day for adults, as recommended by the World Health Organization (WHO) [5]. According to Sarno et al. [6], the intake of processed foods accounted for a mean salt intake increase from 17.2% to 20.5%.

In Brazil, the Ministry of Health has been coordinating national strategies aimed at reducing sodium intake, in addition to making agreements with the food industry for a gradual reduction in salt levels in the processed food categories considered as priority [7,8,9,10,11]. The aim of this investigation was to assess the potential impact of sodium content reduction in processed foods on the overall sodium intake in Brazil.

Methods

This study used data from the NDS, conducted in 2008-2009, in a subsample of 24% of the 55,790 families surveyed in the 2008-2009 *Household Budget Survey* conducted by the Brazilian Institute of Geography and Statistics (IBGE) [12].

The goal of the NDS was to collect food-intake data of all residents of the selected households, age 10 years and over. Food intake was estimated from the average intake recorded in two nonconsecutive days. A total of 32,900 NDS participants who provided data of their intake over two days were assessed.

The amount of grams of food intake and their sodium content in milligrams (mg) were estimated with the use of the Table of Reference Measures and Table of Nutritional Composition of Food Consumed in Brazil, respectively, both developed by the IBGE [12].

Salt reduction targets, agreed upon by the Brazilian Ministry of Health and the food industry associations, in 2011, to be reached the at completion of five years after the agreement, were used as the reference to determine the maximum amount of sodium in processed food categories considered a priority. The criteria were: (1) international references about sodium reduction; (2) lower limit of sodium content in the respective category, in the domestic market; (3) adjusted means of sodium levels and/or amount found in at least 50% of the products of the category found in the domestic market [7,8,9,10,11] (Table 1).

For the targets to be found, initially the mean amount of sodium (mg Na/100g of food) was calculated for each of the 21 food groups or items considered a priority. The sum of sodium content in each food group was divided by the amount of grams intake multiplied by 100. Mean sodium intake estimates (mg/day) were calculated for the years 2013, 2016 and 2017, taking in consideration the agreed sodium content reduction, with the overall average reduction proportion calculated at the completion of five years after the agreement. Afterward, for 2017, a further 25% reduction was added to the food whose maximum sodium content agreed upon was higher than the mean estimated by the 2008-2009 NDS, and to the food whose agreed reduction was lower than 25%. This proportion was chosen because, at this salt reduction level, no change in flavor is detected by the consumer [13]. The analyses were stratified according to sex and age group (10-19 years, 20-59 years, and 60 years and older).

All analyses took into consideration the sample weight and the study design, and were performed using SAS version 9.1.3 software (SAS Inst., Cary, USA).

The NDS was approved by the Ethics Research Committee of the Social Medicine Institute, State University of Rio de Janeiro, registry filing number CAAE 0011.0259.000-11.

Results

The maximum content of sodium agreed upon was higher than the estimated amount based on the food composition table, except for filling cookies, savory biscuit, bread loaf, breakfast cereal, mayonnaise, ham, French fries, sweet biscuit, soups, and French roll (Table 1).

The estimated mean sodium intake reduction 5 years after the agreement was 1.5%. After applying the 25% reduction for the year 2017, the estimated mean reduction was 6.3% (Table 2). The mean sodium intake reduction was similar among the sex and age groups, ranging between 5.6% among male adults and 7.6% among women.

Discussion

The goals of salt reduction in processed foods have small impact in the average sodium intake by the Brazilian population, which remains above

Table 1

Mean sodium content, maximum content of sodium agreed for the years 2013, 2016 and 2017, and final proportion of reduction at the end of five years after the agreement, for the food groups assessed by the *National Dietary Survey* (NDS 2008-2009).

Food groups	mg Na/100g				
	2008-2009	2013	2016	2017	Reduction (%)
Margarine	526.0	1,089.0	715.0	-	-
Filling cookies	405.0	389.0	265.0	-	34.6
Mozzarella cheese	415.0	-	559.0	512.0	-
Curd cheese	296.0	-	587.0	541.0	-
Instant noodles	429.0	1,920.7	-	-	-
Hamburger	465.0	-	780.0	740.0	-
Nuggets	704.0	-	690.0	650.0	7.7
Savory biscuits (cream cracker)	838.0	923.0	699.0	-	16.6
Corn chips	602.0	1090.0	852.0	-	-
Bread loaf	537.0	645.0	522.0	-	2.8
Breakfast cereals	445.0	579.0	418.0	-	6.1
Small dinner rolls	429.0	531.0	430.0	-	-
Mayonnaise	8,853.0	1,283.0	1,051.0	-	88.1
Ham	1,313.0	-	1,180.0	1,160.0	11.6
Frankfurter	960.0	-	1,140.0	1,120.0	-
French fries	734.0	650.0	586.0	529.0	27.9
Sweet cookies (cornstarch)	394.0	419.0	359.0	-	8.9
Sausage	1104.0	-	1,316.7	1,223.3	-
Instant/Ready-made soup	356.0	-	330.5	322.0	9.5
Bologna	823.0	-	1,325.0	1,265.0	-
French roll	648.0	616.0	586.0	-	9.6

Table 2

Impact estimates of the processed food sodium content reduction in the mean intake of sodium (mg/day), standard error (SE) and mean reduction of the proportion of sodium intake in 2017, according to sex and age group.

	2008-2009		2013		2016		2017		2017 *		Reduction (%)	
	mg/day	SE	mg/day	SE	mg/day	SE	mg/day	SE	mg/day	SE	2017	2017 *
Total	3,163	17.0	3,153	17,0	3,120	16.9	3,116	16.8	2,965	16.1	1.5	6.3
Sex												
Male												
Adolescents	3,468	43.9	3,446	44.1	3,420	43.4	3,417	43.3	3,253	41.4	1.5	6.2
Adults	3,628	26.5	3,615	26.5	3,582	26.3	3,578	26.3	3,424	25.3	1.4	5.6
Aged	3,221	44.8	3,208	44.7	3,180	44.4	3,175	44.2	3,014	40.7	1.4	6.4
Female												
Adolescents	2,918	33.8	2,919	33.9	2,876	33.3	2,873	33.3	2,724	31.1	1.5	6.6
Adults	2,817	18.6	2,806	18.6	2,777	18.4	2,773	18.4	2,629	17.5	1.6	6.7
Aged	2,647	38.4	2,635	38.3	2,605	37.1	2,599	36.9	2,447	34.8	1.8	7.6

* Aplying the 25% sodium content reduction in the food groups whose maximum sodium content agreed upon was higher than the estimated in the *National Dietary Survey* (NDS) and in those whose proportion of reduction was lower than 25%.

the maximum recommended limit of 2,000mg/day. The estimated reduction is below the 20% observed by Grimes et al. [14], who assessed the reduction of sodium in processed foods in the average salt intake of Australian children and adolescents. However, the food intake standards of countries like Australia are quite different than Brazil's, and that should be taken into account when assessing the impact of these policies. In addition, a possible explanation for our findings is the fact that higher proportion of reduction had been agreed upon for food with lower sodium content. For instance, for the filling cookies, with sodium density of 405mg/100g, the total reduction proportion agreed upon was 34.6%. However, when compared to ham, whose sodium density is 1,313mg/100g, about three times higher than the cookie's, the agreed reduction was 11.6%, around three times lower.

Most of the reduction amounts agreed upon were higher than the mean sodium content estimates presented in the 2008-2009 NDS nutritional composition table. This fact may be explained by differences between the brands of food included in the table and the brands analyzed to determine the mean content agreed upon. Moreover, there is no knowledge about the market share of the brands of food included in the agreements.

In 2013, WHO established a 30% global reduction goal for the total sodium intake by 2025, and one of the key actions is to reduce the content of sodium in processed products [15]. Some 17 countries have developed volunteer or legally imposed sodium content reduction in processed foods, with bread being the main target of these actions [16]. In Brazil, the agreed proportion of salt content reduction for the French roll was low, despite its high sodium density and high prevalence of consumption (it is the third type of food eaten the most in Brazil) [4,17]. For the French roll, the total reduction was about 10%. However, a 55% reduction in the sodium content of this type of food, considering the lowest figure found in an American food composition table [18], would lead to a 9% reduction in the mean salt intake (data not shown). Of note is the fact that food with low sodium density, but eaten more frequently, like rice and beans, are among those that contribute the most for the intake of sodium among the Brazilian population [4]. Despite the contribution of processed foods to the mean sodium intake, the contribution of table salt and salt-based seasoning is noteworthy [6]. Therefore, in Brazil, it will be difficult to achieve the necessary sodium intake reduction with voluntary agreements like the ones that were made to date. Considering the increase of intake of ultraprocessed food, reviewing the targets or including other groups of foods will likely not suffice. For that, public policies that encourage behavioral changes towards reducing the use of salt in the preparation of food, and lower intake of ultraprocessed foods, based on the new *Dietary Guidelines for the Brazilian Population* [19] play a crucial role in effectively changing sodium intake standards in the Brazilian population.

Contributors

A. de Moura Souza contributed to the data analysis and interpretation, writing of the article, critical review of the academic content and approval of the final version to be published. B. S. N. Souza and I. N. Bezerra contributed to the data analysis and interpretation, critical review of the academic content and approval of the final version to be published. R. Sichieri contributed to the data design, project and interpretation, critical review of the academic content and approval of the final version to be published.

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Resumo

O objetivo do presente estudo foi avaliar o potencial impacto da redução do teor de sódio em alimentos processados no consumo médio de sódio na população brasileira. Um total de 32.900 participantes do primeiro Inquérito Nacional de Alimentação *(2008-2009), com 10 anos e mais de idade, que forneceram dados de dois dias de consumo foram avaliados. As metas de redução de sódio pactuadas pelo Ministério da Saúde em 2010 e 2013 foram utilizadas como referência para determinar o teor máximo de sódio em 21 grupos de alimentos processados. Os resultados indicam que as metas de redução de sódio em alimentos processados têm pequeno impacto no consumo médio de sódio na população brasileira. Em 2017, a redução média esperada é de 1,5%, ficando os valores de consumo médio de sódio ainda acima do limite máximo recomendado de 2.000mg/dia. Portanto, dificilmente será possível alcançar a redução necessária no consumo de sódio no Brasil a partir de acordos voluntários nos moldes dos que aconteceram até o momento.*

Sódio; Sódio na Dieta; Alimentos Industrializados; Inquéritos sobre Dietas

Resumen

El objetivo del presente estudio fue evaluar el potencial impacto de la reducción del contenido en sodio en alimentos procesados en el consumo medio de sodio de la población brasileña. Un total de 32.900 participantes de la primera Encuesta Nacional de Alimentación *(2008-2009), con 10 años y más de edad, proporcionaron datos sobre dos días de consumo, que fueron evaluados. Las metas de reducción de sodio, indicadas por el Ministerio de Salud en 2010 y 2013, fueron utilizadas como referencia para determinar el contenido máximo de sodio en 21 grupos de alimentos procesados. Los resultados indican que las metas de reducción de sodio en alimentos procesados tiene un pequeño impacto en el consumo medio de sodio en la población brasileña. En 2017, la reducción media esperada es de un 1,5%, quedando los valores de consumo medio de sodio todavía por encima del límite máximo recomendado de 2.000mg/día. Por tanto, difícilmente será posible alcanzar la reducción necesaria en el consumo de sodio en Brasil, a partir de acuerdos voluntarios en los términos de los que se han ido sucediendo hasta el momento.*

Sodio; Sodio en la Dieta; Alimentos Industrializados; Encuestas sobre Dietas

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The journal has been informed about some errors in the paper. The corrections are follows:
A revista foi informada sobre alguns erros no artigo. As correções seguem abaixo:
La revista fue informada sobre algunos errores en el artículo. Siguen las correcciones:

- On page 2, second column, 6th paragraph, line 2, where the text reads:

After applying the 25% reduction for the year 2017, the estimated mean reduction was 6.3% (Table 2). The mean sodium intake reduction was similar among the sex and age groups, ranging between 5.6% among male adults and 7.6% among women.

it shoud read:

After applying the 25% reduction for the year 2017, the estimated mean reduction was 9.2% (Table 2). The mean sodium intake reduction was similar among the sex and age groups, ranging between 8.5% among male adults and 10.4% among aged women.

- On Table 1, where the text reads:

Table 1

Mean sodium content, maximum content of sodium agreed for the years 2013, 2016 and 2017, and final proportion of reduction at the end of five years after the agreement, for the food groups assessed by the *National Dietary Survey* (NDS 2008-2009).

Food groups	mg Na/100g				
	2008-2009	2013	2016	2017	Reduction (%)
Margarine	526.0	1,089.0	715.0	-	-
Filling cookies	405.0	389.0	265.0	-	34.6
Mozzarella cheese	415.0	-	559.0	512.0	-
Curd cheese	296.0	-	587.0	541.0	-
Instant noodles	429.0	1,920.7	-	-	-
Hamburger	465.0	-	780.0	740.0	-
Nuggets	704.0	-	690.0	650.0	7.7
Savory biscuits (cream cracker)	838.0	923.0	699.0	-	16.6
Corn chips	602.0	1090.0	852.0	-	-
Bread loaf	537.0	645.0	522.0	-	2.8
Breakfast cereals	445.0	579.0	418.0	-	6.1
Small dinner rolls	429.0	531.0	430.0	-	-
Mayonnaise	8,853.0	1,283.0	1,051.0	-	88.1
Ham	1,313.0	-	1,180.0	1,160.0	11.6
Frankfurter	960.0	-	1,140.0	1,120.0	-
French fries	734.0	650.0	586.0	529.0	27.9
Sweet cookies (cornstarch)	394.0	419.0	359.0	-	8.9
Sausage	1104.0	-	1,316.7	1,223.3	-
Instant/Ready-made soup	356.0	-	330.5	322.0	9.5
Bologna	823.0	-	1,325.0	1,265.0	-
French roll	648.0	616.0	586.0	-	9.6

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- On Table 2, where the text reads:

Table 2

Impact estimates of the processed food sodium content reduction in the mean intake of sodium (mg/day), standard error (SE) and mean reduction of the proportion of sodium intake in 2017, according to sex and age group.

	2008-2009		2013		2016		2017		2017 *		Reduction (%)	
	mg/day	SE	mg/day	SE	mg/day	SE	mg/day	SE	mg/day	SE	2017	2017 *
Total	3,163	17.0	3,153	17,0	3,120	16.9	3,116	16.8	2,965	16.1	1.5	6.3
Sex												
Male												
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Adults	3,628	26.5	3,615	26.5	3,582	26.3	3,578	26.3	3,424	25.3	1.4	5.6
Aged	3,221	44.8	3,208	44.7	3,180	44.4	3,175	44.2	3,014	40.7	1.4	6.4
Female												
Adolescents	2,918	33.8	2,919	33.9	2,876	33.3	2,873	33.3	2,724	31.1	1.5	6.6
Adults	2,817	18.6	2,806	18.6	2,777	18.4	2,773	18.4	2,629	17.5	1.6	6.7
Aged	2,647	38.4	2,635	38.3	2,605	37.1	2,599	36.9	2,447	34.8	1.8	7.6

***** Aplying the 25% sodium content reduction in the food groups whose maximum sodium content agreed upon was higher than the estimated in the *National Dietary Survey* (NDS) and in those whose proportion of reduction was lower than 25%.

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	mg/day	SE	mg/day	SE	mg/day	SE	mg/day	SE	mg/day	SE	2017	2017 *
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Female												
Adolescents	2,918	33.9	2,919	33.9	2,876	33.3	2,873	33.3	2,635	30.5	1.5	9.7
Adults	2,817	18.6	2,806	18.6	2,777	18.4	2,773	18.4	2,544	17.4	1.6	9.7
Aged	2,647	38.5	2,635	38.3	2,605	37.1	2,599	36.9	2,372	34.6	1.8	10.4

* Aplying the 25% sodium content reduction in the food groups whose maximum sodium content agreed upon was higher than the estimated in the *National Dietary Survey* (NDS) and in those whose proportion of reduction was lower than 25%.