

# Industrialized food source of sodium used in the preparation of meals in commercial restaurants in the city Chapecó-SC

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## Abstract

Given the high consumption of meals outside the home and use of processed foods high in sodium in the preparation of these meals, combined with the global concern of increased blood pressure and its associated risks, this study aimed to estimate the amount of sodium and the contribution of industrial foods in the per capita quantification of this nutrient in the meals offered by commercial pay-by-weight restaurants in Chapecó-SC, Brazil. Data were collected in four commercial restaurants in March 2011. During one day in each restaurant, we verified the nutritional information of sodium in all processed food sources of this nutrient used in the lunch served by the restaurants. The average quantities of products used per week, as well as the average number of meals produced were informed by those responsible for production. The results showed that the average per capita amount of sodium found for lunch was 1.742 g in four restaurants. Of these, 52.25% (0.910 g sodium) were from industrial food sources of sodium, and 47.7% (0.805 g sodium) from total salt addition (used in the preparation and added by consumers at the dinner table). It should be noted that the intrinsic sodium in foods was not considered. It can be seen that the estimated amount of sodium contained in the meals in the four studied restaurants exceeds more than twice the amount recommended for lunch, which is only 0.700 g sodium. Given the above, it is evident that the food production units should reduce the use of these foods in the menu, so as to offer meals nutritionally adequate with respect to salt and sodium. Compulsory hiring of a professional nutritionist in these establishments would be an improvement in the quality of consumers' health.

**Keywords:** Sodium in the Diet. Food Services. Restaurants. Foods. Industrial Foods.

## Introduction

In Brazil, there is a growing tendency in the number of meals consumed outside the home. According to the Household Budget Survey (HBS), between 2008 and 2009 the Brazilian population spent on average 31% of the food budget away from home.<sup>1</sup>

Commercial Food Production Units (FPU) have become an increasingly complex and important foodservice.<sup>2</sup> Within this category, a type of “pay what you weigh” restaurant has been usually frequented by Brazilians in the past years. It is a kind of self-service, buffet-style restaurant where customers choose what they want to eat then weigh the plate to find out how much they have to pay.<sup>3</sup> In such “kilo restaurants”, the customer faces the dilemma of deciding what to eat from a much wider offer of foods than home.<sup>4</sup>

According to Veiros and Proença,<sup>5</sup> commercial FPUs aim to attract and please customers and, to this end, they seek to enhance taste to the foods. According to the *Guia alimentar para a população brasileira: promovendo a alimentação saudável*<sup>6</sup> (Food guide for the Brazilian population: promoting healthy diets), taste can be intensified especially with the addition of fats, salt and sugar. According to Cuppari,<sup>7</sup> the consumption of salt by the population comes from three major sources: 75% from processed foods, 10% from intrinsic sodium (present in the foods) and 15% from added salt. The use of salt in order to enhance taste is not restricted to kitchen salt, but also by industrial foods produced by companies specialized in the production of ready-made seasonings, canned foods, sausages, cheeses and snacks.<sup>8</sup>

According to a study of sensory analysis, food industries should develop and/or revise the recipes of their products in order to use lower concentrations of the 30-50% of the sodium added, without affecting the consumers' acceptability of the product.<sup>9</sup>

The *VI Diretrizes Brasileiras de Hipertensão*<sup>10</sup> (VI Brazilian Hypertension Guidelines) points out that overconsumption of salt is clearly the most important environmental trigger of high blood pressure. A diet rich in sodium causes an excessive release of the natriuretic hormone, which can indirectly raise blood pressure. There are scientific evidences of the beneficial effects of reducing dietary salt intake: lower prevalence of cardiovascular complications; lower blood pressure; and a reduced increase of blood pressure with aging.

Afonso, Sant'Ana and Mancini-Filho<sup>11</sup> also emphasize that cardiovascular diseases in the past decades have become the main cause of morbidity and mortality in developed countries and also in increasingly growing segments of developing countries.

According to the revised edition of the *American Heart Association Dietary Guide*, high blood pressure is found first in populations whose salt intake is higher than 100 mEq per day, i.e., 6 g of salt, which is equivalent to one teaspoon. But in populations where salt intake is lower than 50 mEq per day, hypertension is rare.<sup>12</sup>

According to the World Health Organization (WHO), in 2001, chronic non-communicable diseases (NCDs), such as hypertension, heart and kidney diseases accounted for 60% of the 56.5 million deaths reported worldwide. Almost half of these deaths can be attributed to cardiovascular diseases.<sup>13</sup> In Brazil, in 2007, chronic NCDs accounted for 72% of the total deaths with known cause. Between the 1930s and 1990s, the number of deaths from chronic NCDs increased more than three times. According to the Brazilian Public Health System (SUS), in the period of 2001 to 2010 there was an increase of 63% in hospitalization costs associated with hypertension.<sup>14</sup>

Based on these information, the estimated salt intake by the Brazilian population should be reduced at least by half to meet the maximum recommended consumption level, i.e., 5g of salt *per capita* per day. This amount is sufficient to meet the iodine needs.<sup>6,15</sup> Although necessary, changing dietary habits is not an easy task because salt and its relation with food reveal culturally established symbolic representations, of easy access, low cost and high seasoning power. There should also be a reduction of consumption of processed foods with high salt concentrations such as ready-made seasonings and sauces, concentrated broths, industrial snacks, chips and soups.<sup>16</sup>

As some studies have already demonstrated, it is possible to reduce the amount of sodium without interfering considerably in the taste and texture of the end product.<sup>16,17,18</sup> Based on the global concern on increased hypertension and the risks associated with it, this study had the objective of estimating the amount of sodium and the contribution of processed foods in the *per capita* quantification of this nutrient in the meals served by commercial “pay-by-weight” restaurants in downtown Chapecó-SC.

## Method

The research was conducted in Chapecó-SC, where there are 29 restaurants registered in the website of the *Sindicato dos Hotéis, Restaurantes, Bares e Similares* (Union of the Hotels, Restaurants, Bars and Similar) in the city. Of these, 15 restaurants offer self-service by weight and are located in the center of the city.<sup>19</sup> It was adopted a convenience sampling of one-third of the universe, totaling five restaurants, allowing an expressive apprehension of the object of the study. One of the restaurants chosen did not give permission to the researchers to collect data *in loco*. Due to this problem and to avoid bias in the research, this restaurant was excluded from the study, totaling a sample of four units. All restaurants have appropriate lighting, air conditioning, very good cleaning, smooth table tops and without tablecloths, upholstered chairs, uniformed employees, waiters, porcelain dinnerware, metal cutlery, and glasses. Consumers are downtown workers and families of classes A and B. Data was collect in March 2011.

Because the study is an estimate, in one day at each restaurant it was verified the sodium nutritional information of all industrially processed foods high in this nutrient served in the lunch meals, and the amount of sodium per gram of a given product was documented. For this purpose, it was requested prior authorization of the manager to visit the storage area to verify the foods used and the information contained in the labels of the products. None of the establishments used Food Preparation Specifications. After identification of the foods used and the corresponding amount of sodium, it was asked to the professional responsible for the production of the meals which was the average amount of each product source of sodium used in one week and the average number of meals produced. Thus, it was identified the *per capita* supply of sodium as well as which were the foods containing sodium most used in the restaurant. As different menus were offered every day, not all foods high in sodium were used every day. Therefore, the information collected was for a week. The amounts of salt used in the production of meals and contained in the shakers were also informed by the person responsible for the production of the meals. The list of the foods examined is shown in Table 1.

With this information, the following calculations were made:

1. Average *per capita* offer of each food (g) = average amount of the food in g per week / number of meals per week

This first calculation aimed to quantify the products containing sodium used in the production of meals.

2. Average *per capita* supply of sodium per food (mg) = *per capita* amount of sodium of each food (g) X quantity of sodium per gram of the food

This second indicator was used to determine the amount of sodium of each food served.

3. Average *per capita* amount of sodium per restaurant (g) = sum of the average supply of sodium per week at each restaurant / number of meals per week

The third indicator allowed estimating the amount of sodium and the contribution of industrial foods in the *per capita* supply of this nutrient in the meals of each restaurant.

For a 2000-kcal/day diet, an intake of 5g of sodium chloride (NaCl) is recommended, which corresponds to approximately 2g of sodium.<sup>6</sup> According to Philippi,<sup>20</sup> the daily share of the Total Energy Value (TEV) is 25% at breakfast, 5% at snack, 35% at lunch, 25% at dinner and 5% at supper. As the sodium supply was only assessed for lunch, such percentages were used to determine the optimum supply of 0.7g of sodium at lunch. This confirms the recommendations of the Worker's Food Program, in which the main meals should provide 0.72g to 0.96g of sodium *per capita* per day.<sup>21</sup>

It should be emphasized that the data found are estimated values, because there could be bias in the data provided by the person responsible for the production of the meals and because the intrinsic sodium in *in natura* foods was not considered.

## Results

With regard to the results found, it is worth noting that the restaurants that participated in the research used to respect the regional culture in the preparation of the menus as a way of attracting and keeping customers. Because none of the restaurants had the guidance of a professional nutritionist, they did not take into consideration the nutritional quality of the preparations. Although the restaurants were located in the same neighborhood and followed the same criteria in the preparation of the menus, there was no relationship between them.

Table 1 shows a list of the foods containing sodium offered in all restaurants. They were listed in a decreasing order, with the percentage of the food in the average daily supply of sodium. This table allows determining which high-sodium processed foods were most used in the meals in the restaurants in the region, and may be useful for future work interventions to reduce the offer of this nutrient.

**Table 1.** Share (%) of processed foods high in sodium used in the preparation of meals in self-service restaurants. Chapecó-SC, 2011.

Foods	Amount of sodium in 100g of food (g)*	<i>Per capita</i> average daily supply of food (g)	<i>Per capita</i> average daily supply of sodium (g)	% of the food in the daily average supply of sodium
Salt	3.9	18.750	0.7313	44.35
Soy sauce	3.9	4.036	0.1574	9.55
Ribs	1.87	5.729	0.1071	6.50
Seasoned salt	2.85	3.646	0.1039	6.30
Chicken broth	1.87	3.307	0.0618	3.75
Cheese sauce	5.421	0.938	0.0508	3.08
Meat tenderizer	2.54	1.953	0.0496	3.01
Beef broth	2.15	2.135	0.0459	2.78
Ham	1.3	2.734	0.0355	2.16
Olive	2.4	1.432	0.0344	2.08
Mozzarella cheese	1.05	2.995	0.0314	1.91
Smoked sausage	1.27	1.823	0.0232	1.40
Bacon	0.68	2.865	0.0195	1.18
Mustard	0.591	2.865	0.0169	1.03
Worcestershire sauce	2.18	0.729	0.0159	0.96
Tomato extract	0.433	3.190	0.0138	0.84
Salami	1.982	0.651	0.0129	0.78
Dried tomato	0.905	1.406	0.0127	0.77
Canned peas	0.461	2.734	0.0126	0.76
Canned palm	0.36	3.385	0.0122	0.74
Loin	1.31	0.781	0.0102	0.62
Canned corn	0.369	2.755	0.0102	0.62
Margarine	0.15	6.375	0.0096	0.58
Ketchup	0.741	0.926	0.0069	0.42

Foods	Amount of sodium in 100g of food (g)*	<i>Per capita</i> average daily supply of food (g)	<i>Per capita</i> average daily supply of sodium (g)	% of the food in the daily average supply of sodium
Mayonnaise	0.875	0.781	0.0068	0.41
Spinach cream	3.14	0.208	0.0065	0.40
Parmesan sauce	2.03	0.244	0.0049	0.30
Canned champignon	0.462	1.042	0.0048	0.29
Onion cream	0.9	0.521	0.0047	0.28
Pickled cucumber	1.64	0.260	0.0043	0.26
Grated cheese	0.74	0.521	0.0039	0.23
Straw potatoes	0.13	2.604	0.0034	0.21
Sardine	0.495	0.651	0.0032	0.20
Pickled shallots	0.5	0.521	0.0026	0.16
Rosé sauce	0.769	0.307	0.0024	0.14
Yogurt sauce	0.938	0.244	0.0023	0.14
Champignon cream	0.843	0.260	0.0022	0.13
Balsamic vinegar	0.784	0.244	0.0019	0.12
Beans seasoning	1.95	0.063	0.0012	0.07
Italian sauce	0.951	0.124	0.0012	0.07
Rice seasoning	1.8	0.063	0.0011	0.07
Bouillon cubes (beef, vegetable)	1.73	0.063	0.0011	0.07
Bouillon cubes (chicken)	1.65	0.063	0.0010	0.06
Ready-made <i>farofa</i>	0.774	0.130	0.0010	0.06
Tuna fish	0.217	0.443	0.0010	0.06
Canned asparagus	0.34	0.260	0.0009	0.05
Tomato sauce	0.977	0.061	0.0006	0.04
Sausage	1.18	0.039	0.0005	0.03

\*Source: Foods nutritional labels

It is noted that the industrial foods rich in sodium most offered to the customers, except salt, were sauces and ready-made seasonings, sausages and some canned products.

The results found in the present study show the average amounts of sodium served by the restaurants where data was collected. The restaurants were named “A”, “B”, “C” and “D”.

Table 2 shows the average *per capita* amounts of sodium provided by the restaurants and the origin of this nutrient, i.e., sodium contained in the kitchen salt used in the meals preparation, processed foods, and the individual amount of salt added from shakers on the buffets.

**Table 2.** Origin of *per capita* sodium (Na) contained in the meal. Chapecó-SC. 2011.

	Salt used in foods preparation		Processed foods		Individual salt addition (shaker)		Total Na <i>per capita</i> (g)
	(Na – g)	%	(Na – g)	%	(Na – g)	%	
Restaurant A	0.563	23.50	1.670	69.70	0.163	6.80	2.396
Restaurant B	1.040	54.77	0.600	31.60	0.259	13.64	1.899
Restaurant C	0.473	34.26	0.790	57.26	0.117	8.48	1.380
Restaurant D	0.533	41.25	0.580	44.89	0.179	13.85	1.292
Average	0.652±0.261	37.45	0.910±0.515	52.25	0.180±0.059	10.31	1.742±0.512

It can be noticed that the average *per capita* supply of sodium was 1.742g. Restaurant “A” had the highest supply of sodium from industrial foods, and restaurant “B” from the salt used in the foods preparation and individual addition of salt (shaker).

## Discussion

The results found in this study indicate and confirm that the average Na intake in the four restaurants studied exceeds more than twice the maximum amount recommended for a meal. Previous researches conducted on the consumption of NaCl have already shown that Brazilians consume 7g more than the amount recommended by WHO, which is 5g/day.<sup>15</sup>

Molina et al.<sup>22</sup> mentioned in their study that high Na consumption may be related to higher intake of foods prepared with ready-made seasonings, which are very accessible and practical, as well as a higher consumption of industrially processed foods. So, one can consider that the estimated Na consumed is not only due to the high intake of NaCl used in the preparation or even the NaCl added. The highest offer of Na in the present study comes from industrially processed foods, once three of the four restaurants studied confirm these assumptions.

We can observe, in restaurant "A", that 69.70% of Na comes from processed foods, while only 23.50% correspond to NaCl used in the preparations. According to Sarno et al.,<sup>23</sup> the highest portion of sodium consumed by the Brazilian population is provided by salt and ready-made seasonings based on salt, but processed foods high in sodium have been increasingly consumed. This finding can also be seen in the present study, in which five of the ten first foods listed in Table 1 are salt or salt-based seasonings.

On average, the amount of sodium found in the meals served in the restaurants was 1.742g, i.e., sodium contained both in salt and in processed foods used in the preparation of the dishes. Na of processed foods corresponds to 0.910g, i.e., 52.25%, and 0.805g, or 47.76% of NaCl come from the preparation of the foods and addition.

A study conducted in UK in 2009, which assessed sodium contents in 96 popular menus of 16 restaurant chains, found 1.179g of sodium or more in 72% of the dishes; the other 38% presented sodium concentrations above 2.359g.<sup>24</sup> In the USA, the meals served in restaurants had an average of 2.3g to 4.6g of sodium per serving.<sup>25,26</sup>

Some studies also confirm these findings in Brazil. Example is the study conducted in a FPU, which showed that the average sodium found in a meal was 2.34g, without considering addition salt.<sup>27</sup> In another study based on the Food Preparation Specifications found 1.954g of sodium only in the *per capita* values of salt, without considering the intrinsic salt contained in foods and processed foods.<sup>28</sup> Spinelli and Koga<sup>29</sup> found an intake of 2.11g of sodium only in the lunch served by a FPU.

According to Sichieri et al.,<sup>30</sup> canned and processed foods contain up to twenty times more NaCl than raw products. In this study, canned foods accounted for 6.03% of the sodium supply.

In a study conducted by Costa and Machado,<sup>31</sup> to determine whether salt intake and sodium-rich foods had influence on students' blood pressure, the consumption of canned foods had a statistical correlation with increased systolic blood pressure. Dallepiane and Bós<sup>16</sup> also found that a mild NaCl reduction (from 10g to 5g per day) causes a significant reduction of blood pressure. Among the changes that are necessary in Brazilian dietary habits, a reduced amount of salt should be considered in the meals preparation. Among such changes, removing the salt shakers from the dinner tables should be considered, as well as the restricted use of processed foods high in sodium and the use of natural seasonings and condiments, such as lemon, herbs, garlic and onion, instead of salt and processed foods, without affecting the taste of the foods.

Taking into account that part of the customers who frequent such restaurants are workers, the Inter-ministerial Ordinance no. 66 of August 25, 2006, which changed the nutritional parameters of the Worker's Food Program (WFP) prescribes that the main meals, i.e., lunch and dinner, should have no more than 0.72g to 0.96g of sodium *per capita* per day.<sup>21</sup> The data found in this research in all restaurants are above the recommended values, either for patrons in general or the workers who are WFP's beneficiaries of the meal vouchers that they receive as a benefit.

The Ministry of Health signed an agreement with the associations that represent the processed food industries, which provides a plan to gradually reduce the amount of sodium contained in 16 food categories. The goal is to reduce the high levels of salt found in industrially processed foods.<sup>32</sup> Such agreement with the food industry represents a big step towards the attainment of WHO's maximum recommended sodium intake, since, as seen, processed foods account for most of the sodium supply.

In parallel, the Ministry of Health, in a partnership with the National Sanitary Inspection Agency (Anvisa), undertook a commitment to develop the National Plan for the Reduction of Salt Intake, monitor sodium contents in processed foods and the food consumption trends of the population and assess the impact of such reduction on the costs of SUS (the Brazilian Public Health Service) and on the incidence of chronic diseases.<sup>32</sup>

In an attempt to diminish the high consumption of salt and salt-related diseases, Anvisa and the Ministry of Health, together with the Brazilian Association of Supermarkets (Abrás), devised a Campaign for the Reduction of Salt. The campaign aims to raise the population's awareness of the benefits of reducing the use of salt and advise on healthier choices when purchasing foods. Besides encouraging the consumption of raw foods, the campaign aims to create in people the habit of reading the nutrition labels of industrial foods and choose those with lower sodium contents.<sup>15</sup>

In the recent years, both consumers and industries and government have shown interest in learning the nutritional characteristics of foods. Thus, they contribute to the development of food and nutrition government policies.<sup>33</sup> It is also important that such recommendations be followed by the restaurants since part of the population eats a large number of meals in these establishments.

Restriction of salt in diet is recommended for the population in general and can also reduce the risk of cardiovascular problems in the long term.<sup>27</sup>

As can be seen, processed foods are a convenience in modern times. They represent an increasing market share because they are practical, ready-to-eat or pre-made foods. This is due to the low cost, convenience, quickness and taste that they provide to the foods, which explain their high acceptance by adults and children. However, one of the additives incorporated to these foods is sodium. As already emphasized in this study, overconsumption of sodium can affect the regulatory mechanism of blood pressure, cause widely-known secondary disorders such as pulmonary edema, kidney diseases, stroke and other complications of the circulatory system.<sup>34,35</sup> Thus, avoiding sodium intake above the daily limit as recommended by WHO is a key factor in promoting health and, consequently, a better quality of life.<sup>6</sup>

In short, in the literature review conducted by Sarno et al.,<sup>23</sup> the studies showed beneficial effects from a moderate restriction of dietary sodium, associated or not with other nutritional changes or an increase in physical activity, both in the metabolic parameters and in blood pressure.

The results found corroborated the national campaigns on the need for a reduced salt intake. But FPU's in general should be included in these actions.

## Conclusion

It can be concluded that in the restaurants studied, in an estimated sodium content in a single meal, the average sodium intake exceeded the daily amount recommended by the Worker's Food Program and also the share (%) relating to lunch only in the total daily consumption.

Changes are needed in commercial FPU, especially in the production process, so as to use safe amounts of sodium in the meals preparation. The FPU should reduce the availability of these foods in their menus, in order to offer meals nutritionally appropriate regarding salt and sodium contents. A compulsory inclusion of a professional nutritionist to the staff of this kind of establishment would be an evolution in the consumers' quality of health.

To this end, initiatives promoted by WHO, Anvisa and other institutions to raise awareness, the application and compliance with new laws, in conjunction with companies and the population, are vital to reduce the availability of processed foods high in sodium and, as a consequence, to promote a lower intake of this nutrient by the population.

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Received: Aug. 28, 2013

Reviewed: Oct. 06, 2013

Approved: Jan. 6, 2014

