

## CONSUMPTION VOLUME AND SALT LEVELS CALL FOR SUBSTANTIVE REFORMULATION ACTION ON ROMANIA'S FOREMOST STAPLE FOOD: BREAD

Florin Soptica<sup>1</sup>, Alexandru I. Ciric<sup>2</sup>, Petru Niculita<sup>1</sup>, Corina A. Zugravu<sup>3\*</sup>

<sup>1</sup> University of Agronomic Sciences and Veterinary Medicine, 59 Marasti, Bucharest, Romania

<sup>2</sup> ICA Research & Development SRL, 202 Splaiul Independentei, Bucharest, Romania

<sup>3</sup> National Institute of Public Health, 1-3 Leonte Anastasievici, Bucharest, Romania

\*E-mail: corina.zugravu@insp.gov.ro

### Abstract

*Current levels of sodium intakes in Europe and Romania are twice the recommended dose, leading to an increased risk of cardiovascular incidents and renal disease due to high blood pressure. Bread products were proven to be one of the major sources of salt in the diets of people in Europe. Leavened bread was always the most prominent staple food of the Romanian population, with consumption covering almost 50% of the total energy intake. Last eight years registered a decrease in the total consumption of bread products in Romania. Nonetheless, eaten volumes are significantly higher than the European average or any other EU country, reaching 7.66 kg per month and person in 2011, according to data provided by household budget surveys, 8.84 kg per month and person as revealed by prospective dietary assessment, and 13.26 kg per month and person, according to data from analysis of food balance sheets. Food composition data reveal salt content of bread products in Romania is relatively high, with median NaCl levels ranging from 0.91 g% for pita breads to 1.79 g% for traditional potato breads. Corroborating food composition data with food consumption data reveals bread products can account for an intake of 2.5 to 5g of salt per day. Analysis of prospective nutritional surveillance data revealed bread products contribute to 30% of the total daily ingestion of salt. Given the significant contribution bread products have to the overall salt levels in the diet, immediate and considerable reformulation action is required.*

**Keywords:** food reformulation, food consumption, bread products, salt intake

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### 1. INTRODUCTION

Leavened bread and cornmeal foods have always been the major cereal derived products consumed by Romanian populations, with the former representing the most important staple food in the diet. Whole-meal wheat and rye flour and fermented dough from a previous batch were the ingredients used by peasants to prepare large loaves of bread of 5 to 10 kg, once or twice a week. To a lesser extent, wheat flour with various extraction rates and leavening yeast were used in urban areas. Nutritional surveillances carried out in the interwar and post-war period revealed bread alone to account for almost 50% of daily energy intakes in several regions of the country, with cornmeal foods representing the main staple in certain rural areas (Mincu, 1993). Nowadays, bread is the most consumed food product in the country. Official food

consumption surveys for year 2011 reveal bread is eaten daily by 93.2% of the population, and estimate daily intakes of 298.9 g for men and 219.5 g for women (National Institute of Public Health, 2011).

Given their prevalence in people's diets and their salt (*i.e.* sodium chloride) content, bread and bakery products are considered one of the main sources of sodium, as several reports of health agencies in Europe and the world show (National Diet and Nutrition Survey, 2011; Penney, 2009; UK Food Standards Agency, 2003). Solid scientific evidence suggests that current levels of salt consumption in Europe – *i.e.* in most countries, more than double the 5g daily dose recommended by the World Health Organization (WHO) – are linked to an increased incidence in arterial hypertension, and consequently enhance the risk of developing cardiovascular illness and renal disease. Within the framework of the European

Union's (EU) Strategy on Nutrition, Overweight and Obesity related Health Issues a salt reduction scheme was created in mid 2008 to support and coordinate national salt reduction initiatives already in effect and to encourage Member States without such programs to follow. The Salt Reduction Framework sets out a minimum reduction in salt levels of 16 % over 4 years for all food products [6].

Although Romanian efforts towards the evaluation of salt intakes in the population commenced in 2007 with the introduction of the National Health Programs, reformulation action aimed at lowering salt intake by dropping salt levels in processed foods was undertaken solely within the EU's Salt Reduction Framework. The Romanian Ministry of Health signed in 2010 an agreement with the main federation of food business operators relying on voluntary action to reduce the salt content of processed foods (Ministry of Health and ROMALIMENTA, 2010). The baking industry association joined the agreement setting voluntary targets to be met by bread producers. However, the pledged targets are very modest, proposing a 0.5% reduction in two years time (ROMPAN, 2010) and the follow up to these measures is virtually nonexistent.

This study aimed at assessing the contribution bread products have on daily salt intakes of the Romanian population and the pertinence of reformulation action in the sector. Findings render food reformulation by lowering the salt content of bread products to be necessary and, most importantly, potentially very effective in significantly reducing the sodium intake of the Romanian population.

## 2. MATERIALS AND METHODS

### 2.1. Food consumption data

The database of the National Institute of Statistics was searched for data on gross human apparent consumption of bread and cereal products resulted from analysis of food balance sheets (FBS). FBS measure food consumption by analyzing changes in a country's food

supply (*e.g.* production, imports, exports, industrial processing *etc.*). They do not provide information on dynamics of certain dietary parameters between different population groups, nor on seasonal variations in the food supply. FBS have been used to assess food consumption in Romania since 1950; beginning with 1990 the applied methodology is in full correspondence with the Eurostat guidelines (National Institute of Statistics, 2011). Food consumption surveys data was used to complement food consumption data resulted from FBS. Prospective dietary assessment (PDA) was performed by analyzing seven-day food diaries obtained from a nationwide nutritional surveillance study performed in 2010 within the framework of the National Health Program. Assessment of the contribution of bread products to the daily intake of salt was conducted by corroborating dietary data with food composition data included in official food composition tables and data resulted from recent food composition surveys carried out within the framework of the National Health Program (National Institute of Public Health, 2010).

### 2.2. Food purchase data

Household budget surveys (HBS) data extracted from the database of the National Institute of Statistics was used to assess purchases of bread products. HBS are highly comprehensive household surveys conducted throughout the EU. HBS have been carried out in Romania since 1948; starting with year 2001 these are performed yearly on a sample size of 37440 households in full accordance with Eurostat guidelines. Between years 1990 and 1996 such surveys were not executed causing a hiatus in continuity of HBS data (National Institute of Statistics, 2010).

### 2.3. Food composition data

Data on salt levels in bread products was extracted from the databases of two major ISO17025 accredited food testing laboratories in Bucharest which cover most of the national market for such services. The reference method, comprised by the national standard SR

91-2007, and based on the titrimetric quantitation of chloride ions in a sample using silver nitrate, is routinely employed by both consulted laboratories to assess the sodium chloride content of bread products. The database search was confined to food stuffs tested between the July 1 2011 and June 30 2012.

#### 2.4. Data analysis and plotting

Data analysis and plotting were performed using SigmaPlot version 12 from Systat Software Inc.

### 3. RESULTS AND DISCUSSION

#### 3.1. Trends in consumption of bread products in Romania

Market research commissioned by the EU shows bread consumption is relatively stable in most Member States, although varying to a great extent between countries, ranging above and below 4.8 kg of bread per month and person (*i.e.* approximately 160 g per day and person). Nonetheless, there are countries, such as Germany or UK which show long term trends of decline of 1 to 2% per year. Central European populations eat the most bread, consumption reaching 6.6 kg per month and person (*i.e.* 220 g per day and person) in Germany and Austria, while western populations eat the least, with consumptions lower than 4 kg per month and person. Market trends show increased demand for variety breads, largely whole-meal breads with seeds, rolled kernels, bran, spices and vegetables, and show increased opportunity for health value-added bread products (European Commission, 2011).

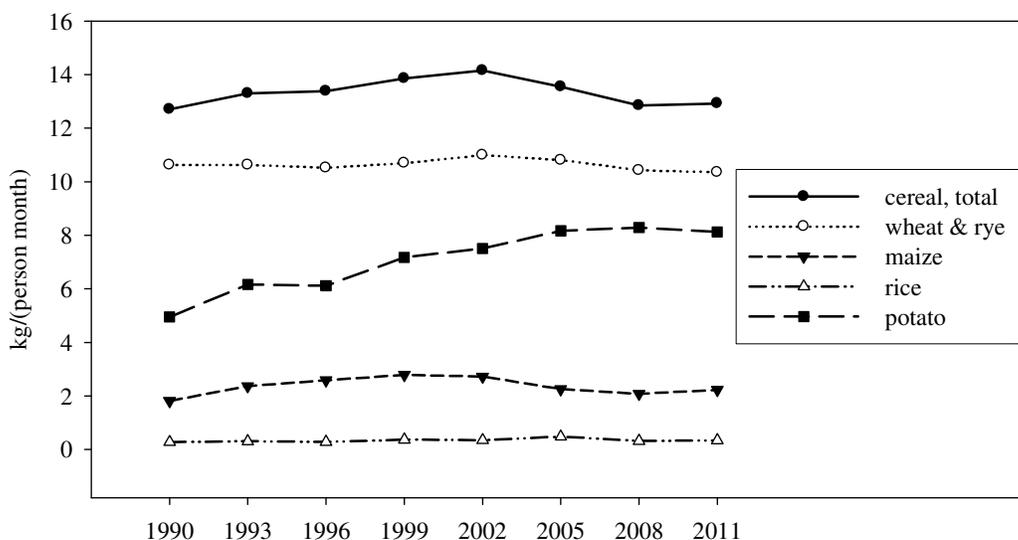
Food consumption data show the Romanian population to surpass that of any other EU country with respect to consumption of bread products. Three sets of data – produced by employing three distinct methodologies, *i.e.* FBS, HBS and PDA – were analyzed in the effort to assess intake of bread products. FBS data shows an average monthly intake of wheat and rye derived foods for year 2011 of 10.35 kg per person, expressed as flour equivalents,

or 13.26 kg per person, expressed as bread equivalents (*i.e.* 442 g per day and person). Plotting FBS data in a time series (figure 1) reveals consumption of cereal derived foods in Romania to be on a declining slope since 2002, while gross potato consumption is increasing. Due to Romania's high agricultural potential, cereal grains were always easily available commodities and cereal-derived products constituted readily accessible foods, particularly in times of economic distress. From a nutritional stand point, FBS data corresponding to year 2011 indicates cereal products – *i.e.* cornmeal, rice, pasta, pastries, and, most of all, bread – are the main source of energy in the diet, with a contribution of almost 40% to a person's daily energy intake. A wider look into a time series of data (figure 2) reveals contribution of cereal-based foods to the daily energy intake varied between 40 and 50% in the last two decades, with a declining slope in the period of economic growth (*i.e.* 1997-2009). Although this consumption rate is well within recommendations, nutritional guidelines prescribing cereal-derived foods to account for maximum 50% of the total energy intake for adults, it does have a significant influence on the overall nutritional status, particularly if the products bear high risk ingredients, such as salt or saturated fat.

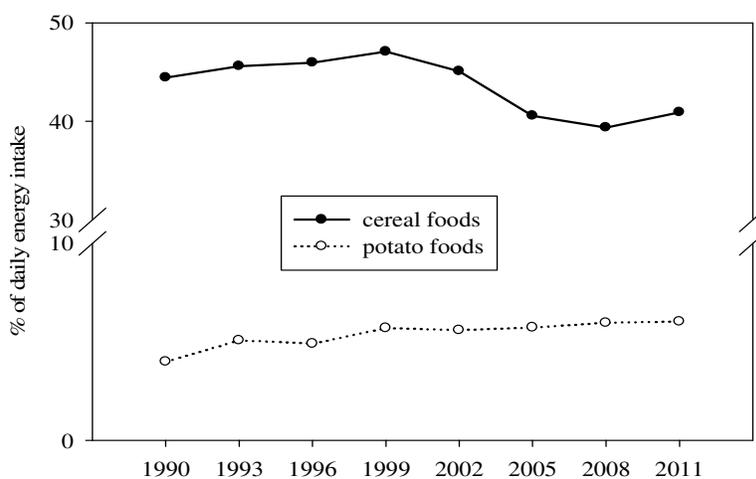
An obvious decline in bread consumption is revealed by HBS data (figure 3), in trend with most European countries, most probably due to increasingly wider selections of other bread-competitive cereal-based products on the market (*e.g.* breakfast cereals, pastries, pasta, various types of rice) and to the perception of bread as a fattening food. Bread purchases registered for year 2011 an estimated value of 7.66 kg per month and person (*i.e.* 255.3 g per day and person), the lowest value since 2004. Purchases in the urban sector decreased constantly starting with year 2003, reaching the value of 7.55 kg per month and person for year 2011, lower than the average per country. Conversely, purchases in the rural sector increased rapidly starting with 2001, overcoming those in the urban sector in 2007, and then, however, joining them in a slow and

steady decline. This consumption pattern in the rural sector is most likely explained by the increased convenience brought on by the extension of retail markets into rural areas. The general decline in bread purchases, starting with year 2008 in both rural and urban segments of the population, is most probably explained by the increasing variety of and

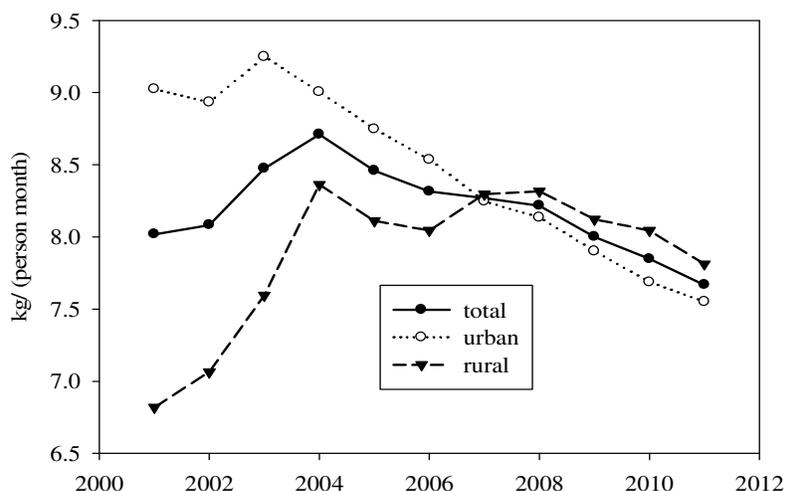
access to other cereal-based products on the market. FBS data with respect to the overall consumption of cereal-based foods (figure 2) supports this claim by showing an increase starting with year 2008, while consumption of bread alone is decreasing, as shown by both sets of data (i.e. FBS and HBS).



**Figure 1.** Time series of consumption of starchy foods in Romania expressed in kilograms per person and month, as revealed by analysis of FBS (N.B. cereal derived foods are given in flour equivalents). Last ten years registered a decrease in consumption volumes for cereal-derived foods and an increase for potato-derived foods.



**Figure 2.** Time series of consumption of starchy foods in Romania expressed in percentages of the daily energy intake, as revealed by analysis of FBS. Bread and cornmeal have always been the most important food in the diet of the Romanian population, covering 40 to 50% of the daily energy intake, particularly in times of economic hardship. Given the country's wheat production along time, Romania was never confronted with caloric malnutrition.



**Figure 3.** Time series of purchases of bread products by the Romanian population expressed in kilograms per month and person, as revealed by analysis of HBS. Food purchase data correlate with food consumption data in showing a decrease in the average consumption of bread products. Last ten years registered an increase in bread purchases in rural areas indicating rural populations no longer prepare bread in their households. An inverse trend is noticeable in the urban segment of the population, which is more prone towards healthier-perceived bread-scarce diets.

**Table 1.** Salt content of bread products on the Romanian market

Product type	Sample size	Average value	Minimum value	Maximum value	Median value	Standard deviation	1 <sup>st</sup> Quartile	3 <sup>rd</sup> Quartile
White, pavé	144	1.25	0.49	1.89	<b>1.22</b>	0.34	1.09	1.51
White, toast	51	1.29	1.03	1.47	<b>1.33</b>	0.13	1.23	1.35
White rolls	84	1.28	0.65	1.94	<b>1.25</b>	0.34	1.07	1.45
Salt free	24	0.17	0.09	0.29	<b>0.17</b>	0.07	0.1	0.2
Pretzels/ bagels	39	1.59	1.09	2	<b>1.76</b>	0.34	1.2	1.89
Pita	30	0.8	0.14	1.2	<b>0.91</b>	0.38	0.47	1.12
Whole-meal	42	1.2	0.62	1.6	<b>1.26</b>	0.25	1.06	1.35
Rye	27	1.23	0.68	1.69	<b>1.25</b>	0.34	1.17	1.5
Multi-cereal	39	1.38	0.82	1.89	<b>1.4</b>	0.31	1.22	1.54
Fiber/ bran	99	1.13	0.41	1.76	<b>1.22</b>	0.31	0.91	1.3
Seeds/ nuts	48	1.35	0.79	1.88	<b>1.26</b>	0.31	1.12	1.62
Potato	39	1.59	0.79	2.45	<b>1.79</b>	0.47	1.13	1.9
Miscellaneous	42	1.26	0.81	2	<b>1.22</b>	0.32	1.08	1.33

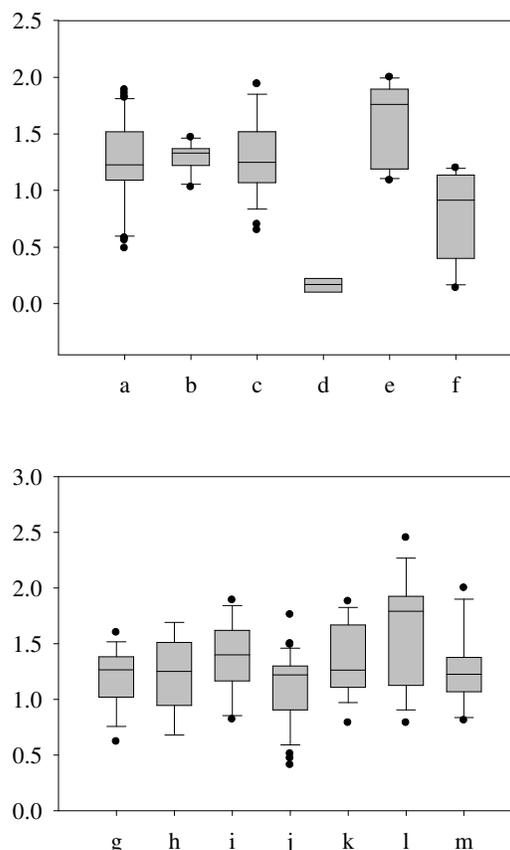
PDA data resulted from analysis of seven-day self-recorded food diaries revealed an average bread consumption of 8.4 kg per month and person (*i.e.* 280.8 g per day and person), closely resembling the values produced by analysis of HBS (*i.e.* 7.85 kg per month and person, or 261.6 g per day and person), or the

official data (*i.e.* 7.89 kg per month and person, or 263 g per day and person) of the Ministry of Health for year 2010 included in the population's nutrition status report (National Institute of Public Health, 2011). Considerable differences emerge by comparing FBS data with HBS data, given the very

different approaches the two methods have. FBS relies on national accounts, while HBS is based on individually administered questionnaires. FBS assesses bread intake by extrapolating data available on amounts of processed wheat, capturing both industrially produced bread and home used wheat flour. Conversely, HBS does not account for home-prepared bread and, moreover, is susceptible to respondent bias. However, with respect to food reformulation policies, only industrially produced bread is relevant. Nutritional surveillance data (PDA and the official data) is more consistent with HBS data, though these methods usually under-assess frequently eaten foods. The real consumption of bread is most probably higher than HBS and nutritional surveillance data show, however, not as high as suggested by FBS data, which are generally prone to gaps in accuracy. Nonetheless, all four sets of data show that bread intake in Romania is very high, higher compared to all other European countries, and that reformulation action could have a significant impact.

### 3.2. Salt content of bread products on the Romanian market

Food composition data shows bread products vary in their salt content (table 1) from 0.17 g% for salt-free bread to 1.79 g% for traditional potato bread. An important factor of variation is the origin (*i.e.* the producer) of bread. Producers with a diverse assortment of bread products have always in their portfolio breads with a lower salt content (like baguette, pita) but also traditional products with a higher content (potato bread). On the other hand, small producers (manufacturing and selling in small and usually rural communities) with a limited portfolio, sometimes consisting just of white bread (the *franzela*), have a constant and rather high level of salt in their bread. We have to take into account that the most popular bread is still white bread, especially because of its low price, so the content of salt of its many varieties has to be carefully taken into consideration.



**Figure 4.** Salt levels in bread products on the Romanian market: *a* – white pavé bread; *b* – white toast bread; *c* – white bread rolls and baguettes; *d* – salt free bread; *e* – pretzels/bagels; *f* – pita bread; *g* – whole-meal bread; *h* – rye bread; *i* – multi-cereal bread; *j* – fiber/bran breads; *k* – breads with various seeds and nuts; *l* – potato breads; *m* – miscellaneous (breads with various add-ons, such as spices or vegetables). *N.B.* Values are given in grams of NaCl per 100 grams of bread.

### 3.3. Contribution of bread products to the daily intake of salt

Official surveys reveal the average salt intake in the Romanian population is 11.25 g per day and person, which is more than double the recommended dose (National Institute of Public Health, 2010).

Using the consumption data provided by the three employed methodologies and those included in the official report of the Ministry of Health (National Institute of Public Health, 2010), calculations of the contribution to daily salt intake were pursued (table 2). All estimated values indicate bread products are a significant contributor to dietary salt intakes. If

salt levels in bread are comparable to those in other European countries, consumption levels are significantly higher, making bread one of the most important sources of dietary salt, most likely accounting for 30% of the total ingested salt.

**Table 2.** Salt intake levels due to consumption of bread products according to four different sources of data

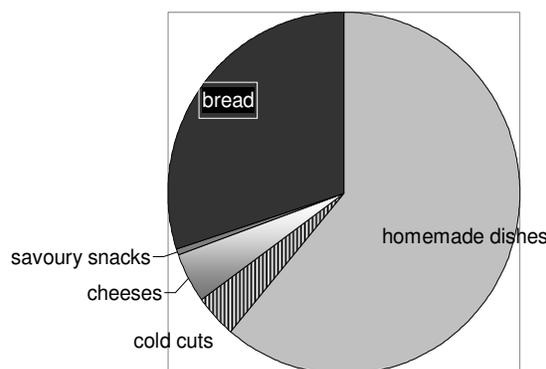
Data source	Average daily consumption of bread products (g/person)	Daily intake of salt from bread products (g/person)*	Contribution to the daily intake of salt %
FBS	442	5.3	47.1
HBS	255.3	3.06	27.2
PDA	280.8	3.37	30
Official	263	3.15	28

\*Amounts were calculated using an average salt content of 1.2 g per 100g bread product

PDA data was analyzed to compare bread to other salt contributors in the diet (figure 5). Figures show most of ingested salt comes from home-cooked meals, as the Romanian population, similarly to other countries in the SEE area, relies mostly on food prepared at home. Nonetheless, bread is revealed as the most significant contributor of all processed foods, i.e. food items bought in stores, and so reformulation by reducing salt levels in bread products constitutes a major path in normalizing the excessive salt intake levels in the population.

However, aside from its contribution to taste, which may limit consumer acceptance of reformulated products, salt plays an important technological function in dough formation and the overall quality of bread products. Large scale producers experience difficulties in reducing the salt content of bread due to elicited changes in dough properties, mostly low maneuverability, which result in high levels of waste. Salt increases the stiffness of dough and also affects its elasticity, so that a reduced level of salt leads to low dough maneuverability, as well as to a reduction in the specific volume of the baked loaf (Food Standards Agency, UK).

Given the significant positive impact a reduction of salt levels in bread products could have on public health, reformulation action in this respect is of utmost importance. However, given the technological hurdles raised by such a measure, research needs to be undertaken to overcome the difficulties. Moreover, support needs to be provided to small craft bakers who do not possess the capacity to tackle such technological issues.



**Figure 5.** Contribution of bread products to the daily intake of salt in the Romanian population as resulted from the analysis of seven-day food diaries. Bread is the largest contributor of all processed foods, with a percentage of 30%, followed by cheeses, with 4.45%, cold cuts, with 4.03%, and savory snacks, with 0.5%. However, most (61.02%) of the daily salt ingested by the Romanian population is borne by food prepared in home.

#### 4. CONCLUSION

Data show bread products represent the processed food category with the highest contribution to the daily salt intakes of the Romanian population. Given the consumption volumes of bread products and the high levels of salt in such foods, immediate and considerable reformulation action could yield noticeable and sustainable results in reducing salt intakes and tackling the high incidence of arterial hypertension.

#### 5. ACKNOWLEDGMENTS

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