Predictors of Perceived Salt Intake and Actual Salt Intake in Romania

Implications for public policy

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Salt intake is one of the important predictors of hypertension, a widespread chronic disease among adults. Much remains to be known about its causes, especially in the Romanian context, where there is a scarcity of analyses on this particular topic. Its predictors are relevant for public policy in order to evaluate what strategy should be adopted given actual levels of salt intake and the way people think about their levels of salt intake. Our analyses focus on actual and perceived salt intake. Data for this analysis come from the SEPHAR project, gathered in 2016 (wave 3), a nationally representative sample of Romanians. After noting a major discrepancy between perceived and actual levels of salt intake, we used two regressions with actual and perceived salt intake as dependent variables and three types of factors as independent variables: socio-demographic (age, gender, region, type of locality, education), lifestyle (fat diet, alcohol consumption, active lifestyle, and smoking) and related diseases (obesity and diabetes). Results show Romanians have similar levels of salt intake perceptions independently of the characteristics considered, except fat diet and diabetes, and similar levels of actual salt intake except age and gender, even though previous research shows that there are differences between individuals across these characteristics when it comes to considering hypertension as a dependent variable. We conclude by noting policy interventions regarding salt intake based on the results of this research, especially the need to update the current Romanian TV campaign to reduce salt intake or similar campaigns from other countries.

Keywords: Salt intake perceptions, actual salt intake, public policy, SEPHAR, regression

Approximately one in six deaths a year worldwide is caused by complications from hypertension [1]. Among causes of death which can be prevented, hypertension is the leading cause [2] and salt intake holds an important role in nutrition practices for disease prevention [3]. For two conditions, i.e. ischemic heart disease and cerebrovascular disease, Romania has the highest rates in comparison with other countries worldwide, according to the World Health Organization ([1], data from 2008) which released a special report on why hypertension is a major issue and why it should be tackled by public policy. Dorobanu et al. [4] report in 2013 that about 40% of the Romanian adult population were hypertensive. The World Health Organization [5] offers statistics for gender differences in salt intake in Romania in 2013: on average the daily salt intake for women was 10.2 grams per day and 12.5 grams per day for men, even though current recommendations of salt intake underline the limit of 5-6 grams of salt per day (medical normality [5,6]).

Salt consumption is documented to be a predictor of hypertension [7,8], a widespread chronic disease among adults [9]. Much remains to be known about its causes, especially in the Romanian context, where there is a scarcity of data and analyses on this particular topic [10]. Its determinants are relevant for public policy in order to identify groups in high need of assistance. Moreover, how people perceive their own salt intake is important for public policy especially because perceptions on a topic predict behaviors with respect to it, as the theory of planned behavior argues [11] and if one perceives a situation to be real, it will become as such through its consequences [12]. If people do not think their salt intake is high but it is according to medical standards, they would not take any action about reducing their intake, which in turn will affect their health. Also, knowing and understanding that salt intake influences important diseases which cause millions of deaths each year should be leading goals for public policy.

In order to tackle the predictors of actual and perceived salt intake, it is important to consider factors also associated with hypertension, as it is the disease most related to salt intake as a risk factor. Dahl [7] found evidence for differences in salt intake among distinct cultures and regions, underlining the importance of considering the geographical aspect when analyzing this variable. Given that salt intake is connected with hypertension, we assume that predictors of salt intake are also predictors of hypertension. The World Health Organization [1] documents the following factors associated with hypertension: social factors, behavioral risk factors, metabolic risk factors and cardiovascular disease (p. 11). Among the social factors, the authors consider globalization, urbanization, population ageing, income, education, and housing [1]. The behavioral risk factors are unhealthy diet, tobacco use, physical inactivity, and harmful use of alcohol [1,13]. Further, the metabolic risk factors considered are high blood pressure, obesity, diabetes, and raised blood lipids [1]. Moreover, cardiovascular diseases, including heart attacks, strokes, heart failure and kidney disease, are other factors which influence hypertension [1]. In terms of gender, men are more likely to have raised blood pressure than women and this trend is found worldwide, but the difference is 10% at most [1].

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Our study is relevant for public policy in terms of initiatives for reducing salt consumption. The World Health Organization [5] documents the Romanian salt reduction initiatives in 2013. The following initiatives are fully implemented: monitoring and evaluation of salt content in food and TV Radio consumer awareness initiatives[1]. The following initiatives are partially implemented: monitoring and evaluation of industry self-reporting, salt intake and consumer awareness, food reformulation as a stakeholder approach, and labelling and brochure print as population approaches. Finally, several initiatives were found by the World Health Organization to have not been implemented at all: monitoring and evaluation of behavioral change and urinary salt excretion (24 hours), stakeholder approach of specific food category, and population approaches in terms of consumer awareness initiatives via website software, education, schools, health care initiatives, conferences and reporting [5].

Experimental part

Methods

Data

Data for this analysis come from the SEPHAR project, gathered in 2016 (wave 3), a nationally representative sample of Romanians. It contains individual level variables on salt consumption, medical and socio-demographic variables. It is large enough to conduct regression analyses (total N = 1970) and the results can be generalized through appropriate methods to the general Romanian population.

Variables

Actual salt intake is estimated using the Kawasaki formula [14] based on a sodium urinary test for analyzing the 24 h sodium in urine. The recommended threshold for salt intake per day is 6 g[15]. The variable used is coded as: code 0 for equal to or under 6 grams per day and code 1 for over 6 grams per day. Perceptions on salt intake are measured using the question *How would you rate the quantity of salt intake in your diet?, coded with 0 I eat food without salt, 1 I eat food with normal quantities of salt, and 2 I eat food with substantial amounts of salt.*

Region is included in this analysis as dummy variables, each of them coded with 1 for the current region (one at a time: North-East [NE], South-East [SE], South [S], South-West [SW], West [W], North-West [NW], and Center [C]) and 0 for all other situations, considering Bucharest-Ilfov as the reference category. One reason for choosing this particular reference category is given by the high socio-economic development of this region in comparison with all other regions [16,17]; for details on the technical strategy, see [18]).

Whether the respondent lives in an urban setting (towns or cities) was coded as 1 and 0 if they live in a rural setting. Gender is coded into 1 for females and 0 for males. Age is included in the analysis with three categories: 1 for 18 to 39 years of age, 2 for 40 to 64 years of age and 3 for 65 years of age or above. Education is coded 1 for high levels (tertiary education) and 0 for medium (secondary education), low (primary education) or without education.

Physical activity is measured ordinally using the following question: *How often are you physically active?, coded as 1 sporadic, 2 once a week, 3 two or three times a week, 4 almost every day, and 5 every day*. Smoking is included in the questionnaire using the following question: *Are you a smoker?*, coded 1 for smokers and 0 for non-smokers at the moment. With respect to fat diet, we use the following question: *What type of food do you usually eat?*, coded as 0 for a vegetarian diet, 1 for a diet with low content of fat (eating fish or chicken), and 2 for a fat diet (eating meat of animal origin). Alcohol drinking is measured with the question *What quantity of alcohol do you usually drink?,* and is coded as 0 without alcohol drinking, 1 with normal quantities of alcohol drinking (less than 300 mL of wine or 30 mL of distilled beverages per day) and 2 for higher quantities of alcohol drinking (more than 300 mL of wine or 30 mL of distilled beverages per day).

For measuring obesity, we used the definition provided by the World Health Organization which states that obesity can be considered if the Body Mass Index (computed by dividing the weight by the squared height) is equal to or greater than 30 [19]. For this situation, the variable included in the analysis is coded 1 for obesity and 0 else. With respect to diabetes, the question is *Have you ever been diagnosed with diabetes?,* coded as a dummy variable, with 1 for the presence of the characteristic and 0 for the absence.

Analyses

Considering that our dependent variables are measured differently, we used an ordinal regression for the model with perceived salt intake and a binary logistic regression for the model with actual salt intake (for more details on the methods, see [20–22]). For dealing with missing data, we replaced the missing values with the median of each variable in order to take into account the level of measurement of the variables included (ordinal or dummy) and the entire range of answers provided by responses (given the listwise method for dealing with missing data included in regressions). For our analysis, we used IBM SPSS statistical software, version 22. Our model is depicted in Figure 1.

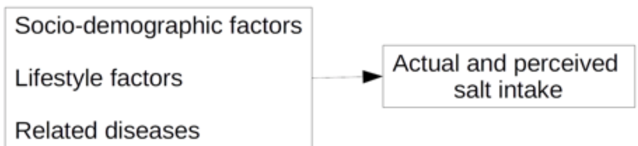

Fig. 1. Conceptual diagram

Results and discussions

Descriptive statistics

Almost all respondents show higher than recommended levels of actual estimated salt intake at their sodium urinary test. Only 3.2% show normal levels of salt intake, whereas most respondents consider that they have normal levels of salt intake: 76.5% of the total sample, while only 9.4% perceive their salt intake to be at high levels. The perception values differ from the actual objective values resulting in a high disparity between respondents' thoughts and their actual behavior.

Our sample[1] is composed of 52.5% of females and 47.5% males. 36.3% of respondents are between 18 and 39 years of age, whereas 42.7% are between 40 and 64 years of age. Concerning regional distributions, the lowest value of 9.9% is in the West and the highest value in the South, 16.2%. 34.8% of the total sample is composed of individuals with higher education attainment. In terms of lifestyle, one in six respondents consider they are active

[1] *In 2006, the National Council for Audio-Video stated that Romanian TV channels must repeat daily a message of awareness regarding high levels of salt consumption: For your health, please avoid salt, sugar and fat consumption in excess [23,28]. This awareness campaign has been implemented throughout this entire period and, currently, at the beginning of 2018, it promotes the same message.*

every day and only 8.8% think that they are active in a sporadic manner. A quarter of the sample is composed of smokers, 6.2% are vegetarians, 66.2% have a normal diet, and 27.6% a fat diet. Concerning alcohol consumption, only 4.7% report consuming high quantities, while 40.9% think they do not drink at all. 34.2% of the total sample are obese, whereas 6.9% declare having diabetes (Table 1).

Table 1

DESCRIPTIVE STATISTICS (N=1970)

	%
Salt intake consumption	
0. Normal	3.2
1. High	96.8
Salt intake perception	
0. None	14.1
1. Normal	76.5
2. High	9.4
Type of locality	
0. Rural	41.1
1. Urban	58.9
Gender	
0. Male	47.5
1. Female	52.5
Education	
0. Low levels	65.2
1. High levels	34.8
Region	
1. NE	10.7
2. SE	13.2
3. S	16.2
4. SW	11.1
5. W	9.9
6. NW	14.4
7. Center	12.8
8. Bucharest-Ilfov	11.6
Age	
1. 18-39 years	36.3
2. 40-64 years	42.7
3. 65+ years	21.0
Active lifestyle	
1. sporadic	8.8
2. once a week	3.6
3. 2/ 3 times a week11.7	
4. almost every day 10.4	
5. every day	65.5
Type of diet	
0. Vegetarian	6.2
1. Normal diet	66.2
2. Fat diet	27.6
Smoking	
0. No	75.5
1. Yes	24.5
Diabetes	
0. No	93.1
1. Yes	6.9
Obesity	
0. No	65.8
1. Yes	34.2
Alcohol consumption	
0. Without alcohol 40.9	
1. Normal quantity 54.4	
2. Raised quantity 4.7	
(N)	1970

Bivariate statistics

Considering the huge difference between actual salt intake and perceived salt intake, we take a look at their distributions across socio-demographic factors in order to see differences between regions, type of locality, age, gender and education groups (Table 2). Differences between each group are low, under 10%, independently of the characteristic considered, and the descriptive patterns stating that the majority of Romanians have normal levels of perceived salt intake, but high actual levels are kept the same across socio-demographic characteristics. Our research shows that the TV campaign [23] might not be efficient given the targeted public and, instead, another campaign focusing on what medical normality means (i.e. 5-6 grams per day) and how different it is from perceived salt intake should be considered.

Multivariate statistics

Except for fat diet and diabetes, for perceptions of salt intake none of the independent variables considered is statistically significant (Table 3), whereas for actual salt intake only age and gender are statistically significant (Table 4). Net of all other variables included in the first model, respondents with diabetes declare that they eat lower levels of salt than those without diabetes and those who have a fat diet are more likely to have higher levels of salt intake. In the second model, net of all other variables included, men and older persons have higher levels of salt intake in sodium urinary test than women and younger persons respectively. Fat diet and diabetes are not statistically significant in the second model. The results show that, with respect to perceived levels of salt intake, in the first model, there are no statistically significant differences between men and women or between younger and older persons. Also, in both models, there are no differences between respondents from rural and urban environments, between highly educated individuals and those with lower levels of education, between those who are physically active and others, between smokers and non-smokers, between those who report that they are overweight and others, and independently of the levels of alcohol consumption.

For the first model, pseudo R-square shows values of 0.049 (McFadden coefficient), 0.066 (Cox and Snell coefficient) and 0.088 (Nagelkerke coefficient), meaning that 8.8% at most of the variance in the dependent variable is explained by the model. For the second model, Nagelkerke R-square coefficient is 0.177 and Cox and Snell R-square coefficient is 0.044, meaning that 17.7% at most of the variance in the dependent variable is explained by the model.

Because salt consumption influences hypertension [7], our results are relevant for public policy especially in the context of promoting health behaviors. Riet, Ruiter, Smerecnik, and Vries [24] stress the importance of considering individual self-efficacy for the effectiveness of campaigns for promoting reduction of salt intake, in the sense that for individuals with high self-efficacy the salt-reducing messages will have a higher impact than for those with low self-efficacy. This concept, in line with the theory

[2]Before running the analyses, we considered the national data from the National Institute of Statistics (2017) [29], at January 1st 2015. We found differences between categories of gender and age and constructed and applied to the results presented in the paper a weight in order to adjust the sample. For individuals of 18 years of age or older, 51.7% were women, which shows a difference of 0.8 between our sample and the national one (52.5% of our respondents). With respect to age, 36.3% of Romanians (34% of our respondents) were between 18 and 39 years of age, 42.7% (43% of our respondents) were between 40 and 64 years of age and 20.9% (23% of our respondents) were 65 years of age or older. Differences between our sample and the National Institute of Statistics data tended to be small, amounted to 1-2% at most, and give us even greater reason to believe that our sample is representative of the adult population of Romania.

	Salt intake perception 0. None	1. Normal	2. High	Actual salt intake 0. Normal	1. High	Total*
Type of locality						
0. Rural	15.0%	75.2%	9.9%	2.5%	97.5%	100%
1. Urban	13.5%	77.5%	9.0%	3.7%	96.3%	100%
Gender						
0. Male	12.0%	79.9%	8.1%	1.3%	98.7%	100%
1. Female	16.0%	73.5%	10.5%	4.9%	95.1%	100%
Education						
0. Low levels	14.6%	76.2%	9.1%	3.0%	97.0%	100%
1. High levels	13.1%	77.1%	9.8%	3.6%	96.4%	100%
Region						
1. NE	9.0%	81.9%	9.0%	3.8%	96.2%	100%
2. SE	17.7%	73.5%	8.8%	6.9%	93.1%	100%
3. S	15.7%	74.6%	9.7%	2.8%	97.2%	100%
4. SW	12.4%	80.3%	7.3%	2.3%	97.7%	100%
5. W	14.3%	75.5%	10.2%	1.5%	98.5%	100%
6. NW	10.9%	77.5%	11.6%	1.4%	98.6%	100%
7. Center	13.5%	78.2%	8.3%	2.4%	97.6%	100%
8. Bucharest-Ilfov	18.3%	72.1%	9.6%	4.4%	95.6%	100%
Age						
1. 18-39 years	13.5%	76.4%	10.1%	6.0%	94.0%	100%
2. 40-64 years	12.7%	77.5%	9.8%	2.1%	97.9%	100%
3. 65+ years	17.9%	74.6%	7.5%	0.5%	99.5%	100%

Note: * This total is for both actual and perceived salt intake.

Table 2
BIVARIATE STATISTICS BETWEEN SOCIO-DEMOGRAPHIC FACTORS AND ACTUAL AND PERCEIVED SALT INTAKE (N=1970)

Table 3
MULTIVARIATE RESULTS OF THE MODEL FOR THE PERCEPTION ON SALT INTAKE, Sig.<0.001

	Perception on salt intake Estimate	Sig.
Threshold		
1. Without salt	-2.591	--
2. Normal salt	4.468	--
Age (reference category: 3. 65+ years)		
1. 18-39 years	.263	--
2. 40-64 years	.323	--
Region (reference category: Bucharest-Ilfov)		
NE = 0	-.361	--
SE = 0	.111	--
S = 0	-.089	--
SW = 0	-.045	--
W = 0	-.121	--
NW = 0	-.574	--
Center = 0	-.065	--
Type of locality		
0. Rural	-.016	--
Gender (reference category: 1. Female)		
0. Males	.048	--
Education (reference category: 1. High)		
0. Low	-.082	--
Active lifestyle (reference category: 5. Every day)		
1. Sporadic	-.042	--
2. 1/ week	-.082	--
3. 2/3/ week	0.120	--
4. Almost every day	-.219	--
Type of diet (reference category: 3. Fat intake)		
1. Vegetarian	-1.260	.000
2. Low fat	-.992	.000
Alcohol consumption (reference category: high quantity)		
0. None	-.291	--
1. Normal quantity	.184	--
Obesity (reference category: 1. Yes)		
0. No	.093	--
Diabetes (reference category: 1. Yes)		
0. No	.962	.000
Smoking (reference category: 1. Smoker)		
0. Non-smoker	-.057	--

of planned behavior, was also considered by Cornelio et al. [8]. Our dataset does not contain variables measuring the concept, but we think that further studies would benefit if they contained or introduced such variables.

Policy interventions should consider predictors of salt intake in their initiatives. They should take into account the patterns revealed by our analysis in order to develop cost effective interventions [1,25], such as monitoring and evaluation programs, consumer awareness campaigns and targeted projects. In Romania, we find similar levels of salt intake independently of the characteristics considered, except fat diet and diabetes for perceptions of salt intake and gender and age for actual estimated salt intake, even though previous research shows that there are differences between individuals across these characteristics when it comes to considering hypertension as a dependent variable.

Our results are key for public policy in terms of developing initiatives for salt reduction. We found that most of the respondents consider that they have normal levels of salt intake, but the actual tests show that almost all of them have higher than recommended levels of actual salt intake. This is an interesting and important result per se. Moreover, our analyses showed only small differences between types of respondents, which means that salt reduction campaigns can target widespread types of people across the country. The TV campaign [23] focusing on salt reduction may not be efficient given the characteristics of the targeted population: people with high levels of actual salt intake (medical abnormality), but who perceive themselves to have normal levels of salt intake. If people think they have normal levels of salt intake, when they hear the TV message about salt reduction they do not feel this message is addressed to them, even though it actually is. This reproduces the dictum stating that if a situation is perceived as real, it will become as such through its consequences [12], keeping high levels of salt intake. The TV message should be focused on other pieces of information than salt reduction, especially on what medical normality means, i.e. 5-6 g of salt per day at most, and what the actual salt intake looks like in Romania.

Table 4
MULTIVARIATE RESULTS OF THE MODEL FOR THE ACTUAL ESTIMATED SALT INTAKE, Sig.<0.001

	Actual estimated salt intake	
	Estimate	Sig.
Constant	2.482	--
Age	1.035	.000
Region (reference category: Bucharest-Ilfov)		
NE	-.050	--
SE	-.644	--
S	.354	--
SW	.352	--
W	.886	--
NW	1.070	--
Center	.576	--
Type of locality	-.460	--
Gender	-1.647	.000
Education	.232	--
Active lifestyle	.016	--
Type of diet	.143	--
Alcohol consumption	.256	--
Obesity	.466	--
Diabetes	1.669	--
Smoking	-.553	--

Simple messages inviting the audience to reduce salt can be found in other countries as well, for example the *Go easy on salt* campaign developed by the Stroke Foundation in New Zealand [26, 27]. The message is not accompanied by weight limits for actual salt intake, same as in the Romanian TV campaign. However, the message is not accompanied by weight limits for actual salt intake, as is true for the Romanian TV campaign.

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