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## Informing national salt reduction strategy

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### Abstract

**Background:** Excessive salt intake is associated with noncommunicable diseases, especially with hypertension, cardiovascular disease and stroke. Implementation of comprehensive and effective strategies can reduce salt intake and related disease burden. The aim of the present research was to analyse the current situation and existing evidence to inform national salt reduction strategy.

**Material and methods:** An analysis of current status of national salt reduction initiatives and hypertension prevention, as well as of scientific publications and governmental websites was done to identify the most effective interventions applicable in the Republic of Moldova.

**Results:** Four out of 10 individuals have raised blood pressure in the Republic of Moldova and the prevalence of hypertension and hypertension linked disease has tripled over the last 15 years. There is a strong link between salt consumption and hypertension. Currently, salt consumption in almost every country is too high. Three out of nine targets on noncommunicable disease prevention and control, which were internationally and nationally assumed, provide the baseline to reduce the salt intake in the Republic of Moldova. The main strategies applied in different combinations at the international level to reduce salt intake are regulations, food reformulation, food labelling, colour coding based on salt content, taxation and education campaigns.

**Conclusions:** The biggest reduction in salt consumption can be achieved by comprehensive multicomponent strategy involving legal measures, mandatory reformulation, nutritional labelling, efficient enforcement and a good leadership.

**Key words:** cardiovascular diseases, hypertension, health policy, salt reduction strategy.

### Introduction

Worldwide, cardiovascular disease (CVD) is the main cause of death. Hypertension is one of the main risk factor for CVD and stroke, and other noncommunicable diseases (NCDs) [1]. Prevalence of hypertension continues to go up, the growth being more pronounced in low and middle-income countries compared to high income countries. A "diet high in sodium" is the second most important dietary risk factor for health loss identified in the Global Burden of Disease Study 2013 [2]. Salt consumption is strongly linked with high blood pressure and the reduction in salt intake can reduce the level of blood pressure and total cardiovascular risk [3, 4, 5]. Currently, salt consumption in almost every country is too high. It is estimated that suboptimal systolic blood pressure (>115 mmHg) contributes to the development of 49% of total cardiovascular ischemic heart disease and 62% of stroke [6]. Reduction of salt consumption from the actual 9-12 grams per day, the actual worldwide mean consumption to a 5 gram per day, the World Health Organization (WHO) recommended level, is estimated to contribute to a 23% reduction in stroke and 17% in CVD, preventing annually 4 million of deaths at the global level [7, 8]. The disease burden associated with hypertension increased substantially at the global level during 1990-2015. The number of disability adjusted life years (DALY) associated with systolic blood pressure  $\geq 140$  mmHg increased during this period from 5.2 million to 7.8 million. Most of the systolic blood pressure related deaths are due to ischemic heart di-

sease (4.9 mil., 54.5%), haemorrhagic stroke (2.0 mil., 58.3%) and ischemic stroke (1.5 mil., 50.0%) [9].

Treatment of hypertension and its complications involves high health care costs, work place absenteeism and income loss, impoverishing families and contributing to poverty perpetuation. At the same time, hypertension can be prevented by modestly investing in prevention. Systematic analysis of randomized clinical trials concluded that sodium reduction interventions applied at population level contribute to the reduction in blood pressure among adults with or without hypertension [2, 10, 11].

World leaders become aware of the burden of CVD, one of the four main NCDs and committed to fight against it. WHO member-states adopted in 2013 nine voluntary targets on NCDs and their risk factors reduction to be met by 2025 [12]. A 25% relative reduction in premature death due to NCDs (CVD, cancer, diabetes and chronic obstructive pulmonary disease) is dependent on the meeting other two interrelated targets: a 30% relative reduction in sodium/salt consumption and 25% relative reduction in raised blood pressure.

WHO recommended reduction in salt consumption as well as of salt content in food. In its report on global situation of noncommunicable diseases 2010, WHO mentioned the sufficient evidence that salt reduction strategies are the best-buys, recognizing that this is the most cost-effective and feasible approach to prevent NCDs [1, 13].

World states leaders become aware of the importance of reduction of hypertension and high mortality caused by

it, implementing complex strategies to reduce salt intake. The research done supports salt reduction. Evaluation of salt reduction strategies implemented in Argentina, Great Britain, Ireland, Finland, Hungary, Japan, Turkey and other countries worldwide, showed its feasibility and contribution to the salt reduction at population level, and implicitly the reduction of mean blood pressure and of its consequences for health [14, 15, 16, 17].

In the Republic of Moldova, CVD death accounts for more than 50% of total deaths, and prevalence of hypertension is increasing [18]. The Government of the Republic of Moldova is aware of the great burden imposed by high blood pressure as the main risk factor for CVD and committed to reduce salt intake. The national food and nutrition programme and its action plan provide for the development and implementation of a salt reduction strategy in order to achieve the three interrelated NCDs targets, assumed nationally and internationally [19, 20].

We analysed the national hypertension trends and current salt reduction initiatives and reviewed the existent evidence to inform the national salt reduction strategy.

### Material and methods

Relevant publications have been identified by electronic search in databases related to medical, public health and social sciences, health policy, nutrition, WHO regional databases. Electronic search included governmental webpages belonging to the ministries of health and national public health institutions, European Commission, with the aim to identify national salt reduction policies or additional initiatives. The study includes also a documentary policy analysis. National policy documents were retrieved from official government webpages. Search has been done on the webpages, of National Register of Normative Acts, Ministry of Health, Labour and Social Protection, National Center of Public Health, National Center of Health Management and other sources.

To resume the countries and their national experience, key words have been used, such as hypertension, salt, salt reduction, salt reduction strategies, successful salt reduction strategies and others in order to collect all the articles, policy documents and other available useful documents published within country and outside.

### Results

#### Hypertension and salt consumption in the Republic of Moldova

Noncommunicable diseases are responsible for more than 80% of deaths annually and about half of them are caused by the diseases of circulatory system [18]. In 2015, the unconditional probability of death between the age of 30 and 70 years due to NCDs was 31%, being the highest in the world. Cardiovascular mortality at the working age has increased slightly (+3.3%) over the last fifteen years (2003-2016). At the same time, cardiovascular mortality increased significantly (+39.6%) in younger population group (18-39

years) and particularly among men (49.1%) and less among women (+14.3%) [21].

The incidence of hypertensive disease, ischemic heart disease with hypertensive disease and cerebrovascular disease with hypertension (hypertension and hypertension linked diseases) was 120.6 per 10 000 population (2016), accounting for about 70% of the total incidence of circulatory system disease. Over the last fifteen years, a slight decline in incidence has been reported. The prevalence of hypertension and hypertension linked diseases has steadily increased, tripling between 2004 (512.1 per 10 000 population) and 2016 (1426.4 per 10 000 population) [18].

A national survey on NCDs risk factors, STEPS, conducted in 2013 revealed that four out of ten adults had raised blood pressure ( $\geq 140/90$  mmHg) with no significant difference between the sexes. More than three quarters (76.2%) of those with hypertension did not take medication to control their blood pressure, and other 19.7% took medication but had increased blood pressure ( $\geq 140/90$  mmHg) [22]. Raised blood pressure is ranking the second within the disease burden attributable to the main risk factors and has contributed to the loss of 18.7% of the total DALY (disability adjusted life years) in 2015 [23].

Salt consumption is the main contributor to the raised blood pressure. Some of traditional food habits of the population are less healthy, and specifically consumption of salty foods, such as pickles, sheep cheese, salty spices prepared in the household and salt added at the table, before or while eating. A quarter of adult population is adding salt always or often to their meal [22]. With globalization and international trade, a broad spectrum of salty foods such as salty snacks, sauces, processed meat, fish and dairy products has been added to the traditional food consumption. A third of population (32.4%) is often consuming processed food high in salt [22]. The Republic of Moldova imports all food grade salt and estimation shows that the mean consumption in Moldovan's population is about 11-13 g of salt per day. Generally, population (nine out of 10 individuals) is aware that high salt intake can cause serious health problems, and three quarters (75.1%) consider that reduction of salt consumption is very important for health. At the same time, almost the same proportion of adult population (72.9%) think they are consuming 'just the right amount' and only 15.0% perceive they are consuming far too much or too much salt [22].

Excessive salt intake increases the hypertension levels and the risk for stroke and CVD, in conditions of low potassium intake due to low consumption of fruit and vegetables. Only a third of adult population of the Republic of Moldova is consuming adequate quantities of fruits and vegetables per day (five portions and more) in the period of the presumed highest availability, autumn season [22].

#### National efforts to reduce salt intake and prevent hypertension

Ministry of Health, Labour and Social Protection has been aware of the high burden of NCDs risk factors and has decided on prevention and control measures. Some prevention measures are already provided at the individual level. Measurement of blood pressure in adult population is done

annually starting from 2008 within the primary health care institutions. Less than one in ten individuals reported in 2013 that their blood pressure had never been measured [22]. Two clinical protocols for family doctors have been developed, on global cardiovascular risk evaluation and global cardiovascular risk management, and are being implemented from 2011 onward [24, 25]. Primary health care professionals provide lifestyle advice, including for salt reduction. A total of 57.8% of adult population has been advised to reduce salt in their diet [22]. Antihypertensive medication is partially compensated within the healthcare insurance. Prevention of hypertension is part of the performance indicators, applied as criteria for bonification within the primary health care [26].

In line with the international recommendations, the Government adopted the National Strategy on Prevention and Control of Noncommunicable Diseases 2012-2020 and its Action Plan [20]. Three out of nine targets that the Government is committed to meet by 2020 are directly related to the relative reduction of salt intake, hypertension and mortality [20]. Relative reduction by 30% of salt consumption by 2020 is a component of the objective # 4 of the National Food and Nutrition Programme [19].

Food legislation was recently amended and modified, providing for the mandatory display of the salt content on the main area of the packaged food and the provisions will come into force in January 2019 [27]. Preparation, selling and distribution of unhealthy food, including high in salt was prohibited within the school and the perimeter of 100 metres starting from 2012 [28]. A general message on salt reduction has been running for several years on television channels.

It should be mentioned that iodine deficiency is also a public health problem in the Republic of Moldova and the Government decided to eliminate iodine deficiency disorders through salt iodisation, intervention that is continuously implemented since 1998.

National Public Health Agency is responsible for the surveillance of population health, including risk factors, and for the development and implementation of public health measures to reduce the disease burden. A national salt survey was conducted in 2016 to establish the baseline salt consumption based on urinary sodium excretion. The survey report will be published soon.

Salt reduction measures implemented at the individual level can contribute to the reduction in salt intake and, ir-respectively of hypertension, but the most efficient are complex measures implemented at the population level. For this reason and based on the analysis of the existing salt reduction initiatives using population-based strategy, applied in different countries, we are proposing some considerations for the national salt reduction strategy.

#### **Efficiency and effectiveness of salt reduction strategies**

The salt reduction strategy is one comprehensive involving multiple components and population-wide interventions. It can comprise, totally or partially the following types of actions: food reformulation to reduce the salt content;

limit of the salt content in food purchased for use in public institutions; nutritional labelling on the main area of the packaging and use of symbols and warnings to identify high salt foodstuffs; applying of taxes; and consumer's education.

*Food reformulation to reduce salt content.* Most of the identified strategies and interventions on salt reduction are those applied in developed countries, although during the last years the number of developing countries applying such strategies is increasing. Australia, Canada, Finland, France, Ireland, Japan, Great Britain and US have reduced the salt consumption at population level applying voluntary reformulation strategies [13, 14, 15, 29]. By reformulation we mean actions to change the composition of processed food with the goal to obtain a healthy food. Foodstuffs reformulation by limiting some unhealthy components such as salt/sodium is a public health action applicable at the population level with the aim to promote health and prevent disease [13, 30]. Process consists of gradually implemented reformulation with progressive reduction of salt/sodium content. Reformulation involves the establishment of targets that should be achieved by type or category of food, willingness and public engagement of the food industry and its participation, public health authorities working with industry to convince it to participate, as well as monitoring and evaluation [14, 15, 29]. However, the shortcoming is that a voluntary initiative cannot oblige the food industry to participate and therefore the reduction in salt can be limited to the number of participating industry as is the case of Australia or Argentina [14, 31]. Industry engagement, although publicised and monitored, is not mandatory [15, 29].

Japan initiated a comprehensive salt reduction campaign in the 1960s. This contributed to the subsequently decreasing in salt intake from 14.5 g per day in 1972 to 10.6 g per day in 2010, a fall of almost 4 g per day. Stroke mortality was predicted to fall by 80% [17].

Great Britain launched in 2003 an initiative on foodstuffs reformulation with the aim to reduce salt intake. The initiative was launched in cooperation with the food industry. Targets on salt reduction have been established for 85 types of food [29]. Concomitantly, Food Standard Agency developed a traffic light labelling system, to support consumers to make a healthy choice and launched consumers' information and awareness campaigns on health problems caused by excessive salt intake.

Monitoring and evaluation done in Great Britain have established a mean reduction in salt consumption from 9.5 g per day to about 8.1 g per day between 2001 and 2011 [30]. As a result of this change of the diet, during the above-mentioned period of time the incidence of stroke (42%) and ischemic heart disease (40%) significantly decreased [29]. Great Britain model has been mentioned as a successful government initiative, being recommended for other countries [14].

In Australia, food reformulation was decided in 2009 by the establishment of an official public-private dialogue between governmental health institutions and food industry. Subsequently, dialogue parties convened to establish food

groups that should be reformulated, targets for salt reduction, as well as the timeframe for reformulation. The industry was to report annually on the progress of engagements assumed in the frame of dialogue [14]. Although the salt content has been reduced in some foods, the overall goal to reduce the salt intake has not been met. The voluntary character of participation in the dialogue had as a consequence nonparticipation of all food production companies and the efforts of the participants to the reformulation have been significantly different. Thus, many of the foods remained outside the scope of the reformulation initiative. Unlike Great Britain, reformulation efforts have not been supported by a communication and education campaign for consumer. Among significant limits of the initiative implemented in Australia, was the lack of monitoring of change in salt content of foodstuffs, subject to reformulation by responsible governmental authorities, as well as lack of transparency and responsibility, and non-disclosure of industry reports on the progress in meeting the targets. Therefore, this public-private dialogue concerning the reduction of NCDs burden failed [32].

Modelling research on health benefit of elimination of 15-25% of sodium from processed food concluded that between 5800 and 9700 cases of myocardial infarction and between 4900 and 8200 of stroke can be prevented in Australia in a 10-year timeframe period, concomitantly preventing between 2000 and 3400 deaths [33]. Australian National Heart Foundation estimated that mandatory reformulation and reducing of sodium content in bread and other foodstuffs to established criteria can prevent 18% of disease burden associated with excessive salt intake [14].

Argentina created in 2010 the National Sodium Reduction Commission on the initiative of the Ministry of Health. Ministry of Agriculture collaborated with the Ministry of Health and led the communication activities both with food industry and general population. National Institute for Industrial Technology provided technical assistance to small and medium enterprises to set baseline sodium levels and reduction targets. National Food Authority led the design and implementation of the monitoring strategy. An agreement on reducing sodium content in foods has been signed between Ministry of Health and Ministry of Agriculture on the one hand and the Association of Food Industry on the other hand. No penalties were mentioned in the agreement [31].

Only larger company actively participated in this initiative with small and medium enterprises declining their participation. This voluntary reformulation was the first step before introducing a regulation in 2014. The regulation includes maximum levels similar to the values set in the voluntary agreement for the main food groups. The food industry saw the agreement as the first and necessary step toward legislation [31]. Health authorities in Croatia, Belgium, Austria, Check Republic, France, Israel and Italy initiated in 2009-2011 strategies to reduce salt intake through voluntary agreements with food industry [34]. Analysis of countries' experience on strategies of voluntary reformulation shows that authorities' monitoring and evaluation on meeting of

the assumed engagements as well as ensuring transparency are essential to reduce salt consumption. Auto-regulation involves an independent monitoring and evaluation of 'clearly defined, quantifiable targets, with a clear timeframe of implementation and with clearly specified start point for comparison [35]. In the absence of consequences for non-performance or non-participation, few levers exist through which enterprises can be obliged to meet voluntarily targets [29]. Strengthening performance of voluntary initiative on salt intake reduction can significantly reduce the CVD burden, as it has shown the experience of Great Britain and other countries where these programs are operational. But, voluntary strategy does not address social determinants of health, and as it is seen in Australia or Argentina and other countries, it is not sustainable.

In order to reduce NCDs burden many countries have adopted a legislative approach to reduce salt intake. Most countries, especially in Europe (Belgium, Bulgaria, Greece, Hungary, Holland, Portugal, Turkey and Slovak Republic) established the maximum limits for salt or sodium content in bread. Besides the bread the salt/sodium content has been regulated in meat products, cheese and other staple foods (Bulgaria, Hungary, Turkey, Greece and Argentina) [15, 32, 35]. Modelling studies show that legislation regulating the salt content of foodstuffs is efficient and cost-effective, especially when combined with complementary strategies, such as health promotion through mass-media [17]. Mandatory reformulation could consistently achieve bigger salt reductions than voluntary reformulation; 1.6 g per day compared with 1.2 g per day; and 1.4 g per day versus 0.5 g per day. Mandatory reformulation might also achieve higher reductions in disability-adjusted life years (DALYs) and quality adjusted life years (QALYs) compared to voluntary reformulation [17].

*Regulation of salt/sodium content in foodstuffs purchased by public institutions.* Within the frame of the initiative to reduce salt intake at the level of European Region many of the member-states adopted and implemented special nutritional policies, aimed to promote a healthy environment within the settings financed by public budget. Thus, Bulgaria, Latvia, Greece, Finland and Romania have regulated the sodium/salt content in foodstuffs intended for use in kindergartens, schools and hospitals, in accordance with healthy eating regulations adopted for these settings [8, 15].

*Consumer's information by labelling.* The system of presentation of nutritional information through labelling of foodstuffs is used in many countries, like Canada, US, Israel, Great Britain, EU member-states and others. In some of these countries, like Israel, Great Britain and EU member-states, part of nutritional information, including salt content, should be displayed on the main area of the packaging. The Moldova's food labelling law that will come into force since 2019 contains similar provisions [27]. However, research done by the US Centres for Disease Control and Institute of Medicine concluded that presentation of nutritional information on the main area of packaging does not offer clear guidelines on how healthy the food is. Research-

ers proposed to evaluate foodstuffs using a scoring system that will encourage food producers to develop more healthy foods and consumers to find healthier food faster and easier, when shopping [36].

Countries like Great Britain and Australia have more experience in implementing the nutritional labelling system that uses a colour code classification system. Starting from 2006, Great Britain uses a traffic light labelling indicator system that presents the content of fat, sugar and salt and specifies the rate at which the food should be consumed. Thus, red colour (raised) indicates that food should be consumed with caution, yellow (medium) that the food should be consumed, being aware of raised health risk and green (reduced) that these nutrients do not contribute to any risks when consuming standard portions of irrespective foods [29].

France introduced recently a five colours nutritional information system on the main area of the packaging. Nutri-Score system was developed based on traffic light system, used in Great Britain and adapted to the French context. They use a nutritional profile system that classifies foods and beverages in five categories accordingly the nutritional quality, specified by a colour scale varying from green (class A) to red (class E) [37].

A legally imposed warning on food high in salt in Finland stimulated the food industry to reformulate foods. A Finish study reported a reduction by 40% of salt food intake during the last 30 years [8].

*Using price policy.* The strategy of price manipulation (through application of taxes to reduce consumption or subsidies to increase it) is one that is successfully applied to reduce the health risk factors. Tobacco and alcohol are two products for reduction of which the strategy of price increasing has proven to be the most cost-effective intervention, especially in low and middle-income countries. It has been demonstrated, that food consumption correlates with food prices and directly influences health parameters [38]. Fiji, Portugal and Hungary are currently countries that apply taxation of food high in salt [39].

'Product public health tax' is applied in Hungary since 2011 and an evaluation done after three years of its introduction reported a reduction in sales and consumption of salty snacks by 26%. Increase in price has been reported to be the main cause of consumer's behaviour change followed by the increasing of the level of awareness on negative effects of salt on health. Tax application contributed to the decreasing of salt content in many foods, in some up to 85%. Of all individuals who substituted the salty snacks, 86% have been substituted by fresh fruit and vegetables [16].

*Population education and awareness raising campaigns.* Food reformulating strategies implemented in the majority of countries have been accompanied by wide campaigns of education and awareness raising of the population.

## Discussion

Hypertension is a common risk factor for stroke, coronary heart disease, renal disease, being the main preventable risk factor for death worldwide [1]. A large number of

evidence demonstrates the strong association between salt intake and blood pressure and WHO is promoting salt intake reduction as the 'main best-buy' [1, 40]. Taking into account that both global and national action plans on prevention and control of NCDs comprise a target that will have provided for a 30% relative reduction in population mean salt intake by 2025, the need for identification of optimal strategies to reduce salt intake at population level is one intransigent [19, 20].

An important aspect of salt reduction policies, adopted by the majority of countries, is the comprehensive approach with population level interventions. Comprehensive national initiatives on salt reduction are more effective than the unidimensional. In Finland the mean reduction of salt intake by 3 g per day was achieved by reformulating processed foods, mandatory labelling of sodium and awareness increasing campaigns initiated in the yearly 90s. During the same period of time the reduction of both systolic and diastolic blood pressure (a mean measured reduction by 10 mmHg at the population level) was observed as well as a reduction by 60-80% of mortality due to stroke and CVD. Although, in Finland during this period of time there were strategies of primary prevention, reduction in blood pressure was attributed to significant reduction in salt intake [8].

Taking into account the experience of Finland, measures to prevent hypertension done actually at the level of primary health care in the Republic of Moldova should be complemented by a large spectrum of population-based interventions. Population approach on disease reduction involves an intersectoral collaboration, supported by a strong leadership of decision makers, advocacy experts and health care professionals. The pragmatic tool on evaluation and management of the global cardiovascular risk offers guidelines for cost-effective medical interventions. For developing countries, as is the case of the Republic of Moldova, individual management of a large number of patients with a reduced risk for CVD is merely unaffordable. As was elucidated by the epidemiologist Geoffrey Rose, individuals with a lower risk and not those with a higher risk face the largest proportion of the total burden of disease [41]. Prevention and management of CVD should be moved to the population level strategies that approach the main CVD risk factors, and the salt reduction strategy is a good example in this sense [34].

The European network initiative on salt actions contributed to the significant increase in the number of countries that have adopted and implemented public policies in this area [15]. WHO promoted salt reduction as the "best-buy", because it is not only a cost-effective intervention but also an affordable, feasible and culturally accepted for the implementation regardless the level of resources and making it a very convincing proposal for low-income countries [1].

Although the voluntary approach applied in Great Britain and in other developed countries has undoubtedly an impact, some experts and the existing evidence declines the sustainability of voluntary actions for the majority of countries, arguing the need for the legal regulation of ac-

tions to reduce salt intake [14, 17, 42]. The evidence shows that the results are better when actions on reformulation are imposed by law than in case of voluntary reformulation. A modelling study conducted in Australia showed that the impact from mandatory reformulation of sodium is 20 times higher than the health gain from the voluntary reformulation initiatives [14].

The introduction of legal limits for salt in food is dictated by the urgent need to approach the increasing burden of NCDs in the Republic of Moldova. Unlike developed countries where infectious diseases are well controlled, the Republic of Moldova faces the double burden of diseases, that comprise HIV/AIDS and tuberculosis on the one hand and NCDs and injuries on the other hand [18]. Bread and bakery products are among the staple foods, contributing to the highest salt intake in the Moldovan's diet. The mean bread consumption in the Republic of Moldova varied in 2006-2015 between 300 and 350 g per day per person. Establishing the maximum limits for salt content and introducing mandatory reformulation of bread and bakery products may be a start point for the mandatory reformulation [19].

WHO European Food and Nutrition Action Plan for 2015-2020 calls member-states to develop and enforce labelling systems on the main area of packaging, easy to understand and offering an additional interpretation of nutritional information to consumer. By directing consumers towards healthier choices and stimulation food business operators to reformulate their foods, labelling can contribute to the improvement of nutritional quality of the diet. The Parliament of the Republic of Moldova adopted recently the law on consumer's information [27]. Amending the legal provisions by mandatory application of a logo or a colour symbol classifying foods based on their salt content according to Great Britain's, French or Australian models or imposing a warning for the high salt foods as it is done in Finland, will help consumers to make a healthier choice at a glance and thus will contribute more and more efficiently to meet the salt reduction target and implicitly other targets associated with NCDs.

Application of taxes to the salty foods is another component of the salt reduction strategy that can be applied in the Republic of Moldova. Accumulated money can be redirected towards the health promotion actions, including increasing the availability of fruit and vegetables that are potassium sources with a protective antihypertensive effect. A tax is acting to change the price for consumer, thus reducing the demand and changing consumption at the population level. Examples of unhealthy diets illustrate this concept. Frequent consumption of food high in energy, saturated fat, *trans* fatty acids, sugar and salt is associated with an increased risk of overweight and obesity and NCDs, including hypertension and stroke [14]. As shown by evaluation made in Hungary, the consumption of salty foods is higher among overweight and obese individuals [16]. Increasing in the number of diseases and disability associated with excessive consumption of such food leads to the increasing of medical and social care costs, additionally to the economic

productivity losses [1, 40]. As such, the costs for society of unhealthy food consumption (external costs) can be significant but it is not reflected either in the private cost of producing the product or in the price paid by the consumer. This is one example of the 'market failure or collapse' which is an economic justification for the government intervention. In such cases governments can decide to increase the product price by taxation to reduce the demand, as it did Hungary, Portugal and Fiji [16, 34].

The extensive and up-to-date analysis of evidence on salt intake reduction conducted by the academia in countries with strategies to reduce salt intake has been an important tool to stimulate political support needed to launch national strategies to reduce salt intake at population level [14, 29].

The effectiveness of salt reduction strategies is based on its potential to change the food environment. Such an approach involves engagement or imposing the food industry to reformulate foodstuffs as well the government commitment to support coordinated programmes to change the consumer's behaviour. This is also true for the Republic of Moldova, where, unlike the developed countries, a certain proportion originates from the salt added during cooking or when eating. Behaviour change programmes can include food-based guidelines, creating a healthy food environment at the workplace, in educational and other public institutions, in meal proving public and recreation facilities and should be supported by large campaigns of social marketing. Removing of salt shakers from these meals providing public premises can be an important step towards meeting the goal. An intersectoral coalition that includes Ministry of Health, Labour and Social Protection, Ministry of Education, Culture and Research, Ministry of Economy and Infrastructure, National Medical Insurance Company, Nicolae Testemitanu State University of Medicine and Pharmacy and medical colleges, food industry, non-governmental organisations jointly with mass-media, can be the most appropriate for the development and promotion of the national salt reduction strategy.

Iodine deficiency is also a public health problem in the Republic of Moldova. Continuous implementation, starting from 1997, of the salt iodization strategy contributed to the elimination of iodine deficiency disorders in 2012. There are concerns that reducing of discretionary salt intake could jeopardise success achieved through universal salt iodization programmes. World Health Organization recommends continuous surveillance of the iodine status of population, and with decreasing of salt intake the amount of iodine added as fortifier can be increased, based on needs, without risk of excess [7, 43]. Additionally, communication activities on salt intake reduction and elimination of iodine deficiency disorders should be efficiently coordinated to ensure that the potential health benefit of both programmes is maximised.

Another important element to ensure efficiency and sustainability of adopted strategy is the monitoring and evaluation of thereof and responsibility and accountability of both, government and food industry. Models of Great Britain, Ire-

land, Hungary, France, Finland, Turkey and of other countries can be taken into consideration when developing the national salt reduction strategy. Monitoring of infrastructure should allow the assessment of both, the overall impact and the differential impact on different social groups.

Ministry of Health, Labour and Social Protection should lead the process of salt reduction strategy development and implementation within a large intersectoral coalition of all interested stakeholders. National Agency for Public Health with its territorial Centers of Public Health can ensure continuous monitoring of food industry engagements and compliance, and evaluation of targets' meeting. Evaluation of urinary sodium excretion as a measure of sodium intake estimation, should become part of NCDs surveillance system, with periodic evaluations. Consumer knowledge, attitudes and practices should be also monitored.

### Conclusions

1. Salt intake is strongly linked with hypertension, one of the main risk factor for CVD and stroke. Present research exemplifies that regardless of income countries can implement efficient strategies to reduce salt intake.

2. The burden of cardiovascular disease is high in the Republic of Moldova. Reducing salt intake at the population level will substantially reduce the public burden of preventable cardiovascular disease and stroke, as well as health care costs and health disparities.

3. The biggest reduction in salt consumption can be achieved by comprehensive multicomponent strategy involving legal measures efficiently enforced, mandatory reformulation, nutritional labelling, taxation, and a good leadership.

4. Scientific community has an essential role in collecting, analysing and disseminating of evidence at the international and national levels on salt intake reduction for public health benefit and social and economic development of the country.

5. Monitoring interventions and assessing their impact is essential to meet the targets and to determine the efficiency and effectiveness of adopted decisions.

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