

## Special Article



# Barriers in Salt Reduction Strategies: Time to Acting for the Future

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### Conflict of Interest

The authors have no financial conflicts of interest.

## ABSTRACT

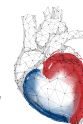
Salt reduction is important for reducing hypertension and the risk of cardiovascular events and stroke. Despite knowledge about the ill consequences, many people continue to consume high levels of salt in their diet. This paper introduces salt-reducing programs for individual, population, and country-level strategies to reduce salt intake. To effectively decrease salt intake, it is necessary to reduce the consumption of high-salt foods and replace high-salt seasonings with low-salt alternatives. Thus, healthcare professionals must effectively provide information on salt-reduction for patients with hypertension. Social strategies, such as voluntary sodium reduction targets for the food industry, are necessary to promote population strategies for salt reduction. In this paper, we examine a brief report on new salt intake values based on chronic disease risk reduction and explain the utilization of mobile health technologies to reduce salt consumption. Considering the relationship between dietary salt intake and the risk of chronic disease, ways to remove the barriers to strategies for salt reduction should be considered, as it is the most effective way for the prevention and control of hypertension and cardiovascular disease in the future.

**Keywords:** Hypertension; Mobile applications; Preventive medicine; Recommended dietary allowances; Sodium chloride

## INTRODUCTION

Elevated dietary salt intake is an established risk factor for the prevalence of non-communicable diseases (NCDs) worldwide. High salt intake has been shown to increase not only blood pressure (BP) but also the risk of stroke, left ventricular hypertrophy, and proteinuria.<sup>1)</sup> Salt reduction has been identified as the top priority intervention in response to the global NCD crisis.

Major programs, policies, and regulations to lessen salt consumption are acceptable for the following reasons: 1) Salt additives in food are common; 2) People are not aware of how much salt they eat; 3) There are widespread adverse health outcomes from high salt consumption; 4) There are very substantial cost savings in preventing premature death and disability from reducing high dietary salt.<sup>2)</sup>



The main implementation strategies for salt reduction are food reformulation, consumer education, front of pack labeling, interventions in public institution settings, and taxation.<sup>3)</sup> However, most programs are multi-faceted and there remains some uncertainty regarding the specific initiatives or strategic elements that are central to their success. In this paper, we summarize barriers to salt-reducing programs that target individuals as well as strategies to lower sodium intake in the general population and nationwide. The results will inform future guidance on the implementation of salt reduction strategies.

## STRATEGIES FOR SALT REDUCTION

### Salt-reduction strategies in individuals

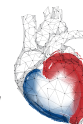
Over the years, it has been observed that dietary salt restriction facilitates reduction in BP. Accordingly, a tendency to establish a stricter target level of salt intake in nutrients, as per dietary guidelines, has been identified worldwide. The World Health Organization/Food and Agriculture Organization (WHO/FAO) report on *Diet, Nutrition and the Prevention of Chronic Diseases*, published in 2003, described that salt intake should be restricted to less than 5 g to decrease BP.<sup>4)</sup> In 2007, the European Society of Hypertension-European Society of Cardiology established a target salt intake of less than 5 g/day, although salt intake of less than 3.8 g/day was considered to be ideal.<sup>5)</sup> To effectively decrease salt intake, it is necessary to reduce the consumption of high-salt foods and replace seasonings with low-salt alternatives. Many processed foods derived from marine products and meat contain high levels of salt. Restaurant food, such as a bowl of rice with another dish on top or noodles, also contain high-level salt. Thus, dietary salt restrictions may be effectively achieved by performing dietary behaviors and techniques such as not consuming the soup of noodles and utilizing low-salt seasonings, vinegar, and spices instead of soy sauce or salt.<sup>6)</sup> In most countries, including Korea, the sodium content (mg) is labeled as a nutrient composition in most processed foods. However, this can be used as a reference when selecting low-salt foods. It is necessary to educate the nation with the correct knowledge of foods and techniques to reduce salt consumption.

There exist pervasive misperceptions surrounding the main sources of salt in the diet of the general population (Table 1).<sup>7)</sup> Reformulation of products to lower salt levels and the availability of low-salt products remain important. Thus, interventions should initially focus on teaching individuals about what the crucial sources of salt are, which foods have a low salt content, and being more aware of their own intake levels according to dietary

**Table 1.** Common misperceptions about salt reduction

Misperceptions	Facts
When you sweat on a hot and humid day, you need more salt in the diet	A small amount of salt is lost through sweat so there is no need for extra salt even on a hot and humid day, although it is important to drink a lot of water.
Sea salt is not “better” than manufactured salt, as it is “natural”	Regardless of the source of salt, it is the sodium in salt that causes poor health outcomes.
Salt added during cooking is not the main source of salt intake	About 80% of salt in the diet comes from processed foods.
Foods high in salt taste salty	Some foods that are high in salt don't taste very salty because they are mixed with other things like sugars. It is important to read food labels to find out sodium levels.
Food has no flavor without salt	Taste buds soon become accustomed to less salt and you are more likely to enjoy food with less salt, and more flavor.
Food does not need salt to have an appealing flavor	It takes some time for a person's taste buds to adjust, but once they get used to less salt, one is more likely to notice a broader range of flavors.
Reducing salt could be “bad for my health”	It's very difficult to eat too little salt since there are so many everyday foods containing salt.

Modified from ‘Fact sheet on salt reduction: key facts, overview, recommendations, actions, and World Health Organization response’.<sup>7)</sup>



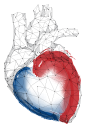
recommendations. Interventions such as encouraging tasting before the addition of salt could help in the quick achievement of salt reduction.

In the Guidelines for the Management of Hypertension, it is defined that guidance for lifestyle modification to decrease BP is vital for all patients with hypertension and that pre-hypertension patients without risk factors should be encouraged to modify their lifestyles before they go on medication. When supporting dietary modification, behavioral scientific procedures to achieve behavioral changes in daily living are necessary.<sup>8)</sup> Behavior change efforts must deal with barriers. For people to be motivated, understanding potential barriers to a lower salt lifestyle, including issues concerning food sources; physiologic and behavioral abnormalities; and social, historical, cognitive, perceptual, and emotional factors will contribute to more effective planning. Furthermore, individual goal setting can be facilitated by conducting a survey regarding the present diet salt status before the start of guidance and clarifying dietary problems. Detailed monitoring of diet or objective salt-intake assessment using urine is useful for guidance. Currently, the primary methods of monitoring salt intake include 24-hour urine collection, spot urine collection, and dietary surveys.<sup>9)</sup> However, these methods have several shortcomings. Although 24-hour urine collection is reliable for evaluating salt intake, potential barriers include the laborious collection, detection of urine samples, and the lack of an appropriate method for correctly identifying incomplete samples. Spot urine sampling is a convenient and affordable alternative to estimate 24-hour urinary sodium excretion but is limited by the difficulties faced in time selection for spot urine sampling monitoring, and non-representative and unsuitable spot urine sampling for individual assessments.<sup>10)</sup> Dietary recalls and weighed diet records are time-consuming and often underestimate actual salt intake. Therefore, an accurate and appropriate method is required to assess the salt intake of individuals.

### Population strategies for salt reduction

There are several options concerning population strategies for the primary prevention of hypertension, including salt reduction.<sup>11)</sup> The first option is education for the public. The mass media has an important role: to widely disseminate accurate, simple messages regarding the influence of salt on health using various broadcast and print media. The second method is to promote salt reduction in processed foods to food manufacturers. It is also necessary to obligate them to label the salt content of processed food and conduct legal actions/administrative guidance regarding the salt-content limit. The third method is to promote salt reduction in meals provided at school, workplaces, hospitals, and when eating out, such as at restaurants. It is necessary to achieve dietary salt reduction and allow individual persons to be able to select their meals by indicating the level of salt and creating salt-restricted menus. The fourth method is to obtain the cooperation of all healthcare professionals. In medical practice, it is necessary to educate all persons to reduce salt intake, as described for guidance regarding body weight management, physical activities, and smoking cessation.

At the community level, it is challenging to reduce salt intake. This must be approached at the consumer and producer levels; a strategy to change the salt contents of foods will require the cooperation of the food industry. More than 80% of excess salt intake, especially in developed countries, comes from salt added to processed foods by producers and not from salt added by consumers during cooking.<sup>12)</sup> Therefore, to correct this, legal actions and administrative guidance are required.


**Table 2.** Implementation strategies by country

Country	Implementation Strategies			
	Food reformulation	Consumer education	Front-of-pack labeling	Interventions in public institutions
Korea <sup>16)</sup>	T (Vol)	Gov	% DI (Vol)/TL (M)	E/PP (Sch/Wk)
Japan <sup>17)</sup>	IM	Gov/NGO	No	No
China <sup>18)</sup>	No	Gov	% DI (Vol)	(Not aware of program)
USA <sup>19)</sup>	T (Vol)	Gov/NGO	% DI (Vol)	E/PP/VG (Sch/Wk/Hosp)
Canada <sup>20)</sup>	T (Vol)	Gov/NGO	Logo (Vol)	No
UK <sup>21)</sup>	T (Vol)	Gov	TL (Vol)/% DI (Vol)	E/PP (Sch)
France <sup>22)</sup>	T (Vol)	Gov	No	PP (Sch)

% DI = percentage daily intake labeling (or Guideline daily amount in some countries); E = education; Gov = government; Hosp = hospital settings; IM = industry meetings; M = mandatory; NGO = non-governmental organization; PP = food procurement policy with sodium standards; Sch = school settings; T = sodium content targets for foods; TL = traffic light labeling; VG = voluntary guidelines for sodium in foods; Vol = voluntary; W = high salt warning labels; Wk = workplace settings.

### National salt reduction strategies

In 2011, the United Nations (UN) held a High-Level Meeting to address the Prevention and Control of NCDs worldwide.<sup>13)</sup> The UN accepted the Political Declaration of the meeting, which committed all 193 member countries and states to the prevention and control of NCDs. At the 66th World Health Assembly, WHO Member States adopted the global target of a 30% reduction in mean population intake of salt/sodium by 2025.<sup>7,14)</sup> WHO has led its member states by identifying how best to develop, implement, and monitor salt reduction strategies. The main implementation strategies for salt reduction are food reformulation, consumer education, front-of-pack labeling, interventions in public institution settings, and taxation (Table 2).<sup>3,14-20)</sup>

#### Food reformulation

The vast majority of national salt reduction strategies include industry engagement to reduce the salt content of products. Globally, bread is the most targeted food for reformulation followed by foods such as bakery products, processed meats, dairy products, sauces, and convenience meals. Some countries have taken the next step to establish voluntary sodium content targets for foods and meals and mandated maximum sodium content limits for products.

#### Consumer education

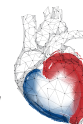
Raising consumer awareness and education about salt remains one of the primary strategies used by governments, NGOs, or industries. Consumer awareness and education activities are used in conjunction with other salt reduction intervention strategies.

#### Front of pack labelling

Some countries have voluntary or mandatory front-of-pack labeling schemes related to salt or sodium. The most frequently used front-of-pack labeling schemes are logos and symbols, followed by the percentage daily intake or guideline daily amount.

#### Interventions in public institution settings

National salt reduction strategies imply activities that target public institution settings such as schools, workplaces, public hospitals, and other public institutions. Many of these activities are education programs of nutrition guidelines for foods and meals sold and served in public settings, particularly schools and hospitals. The significant increase in the number of national salt reduction strategies and countries reporting an impact concerning one or more outcome measures represents some progress towards the global target for reduced salt intake. However, the scope of several existing salt reduction initiatives needs to expand, and



more robust monitoring is required to ensure strategies have an optimal impact. A rigorous evaluation and monitoring of these initiatives will also illuminate which elements are important to the success of programs.

## THE FUTURE

### New category for salt based on chronic disease risk reduction

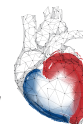
The US Dietary Guidelines and the American Heart Association Guidelines recommend that the target sodium intake should be less than 2300mg for healthy adults and less than 1,500 mg for high-risk patients (hypertensives, blacks, middle-aged to elderly) in 2005.<sup>21)</sup> A new report from the National Academies of Sciences, Engineering, and Medicine reviews current evidence and updates intake recommendations known as the Dietary Reference Intakes (DRIs) for sodium and potassium that were established in 2005.<sup>22)</sup> The report reaffirms that the sodium Adequate Intakes (AIs) for individuals aged 14–50 years, decreases the sodium AIs for children aged 1–13 years, increases the sodium AIs for adults aged 51 years and older, and decreases the potassium AIs for individuals aged 1 year and older. The report also uses guidance from a 2017 National Academies report to introduce the first DRI specific to chronic disease risk reduction.<sup>23)24)</sup>

According to this report, sodium is associated with the risk of chronic disease, particularly cardiovascular disease. Possible associations between sodium intake and other adverse health outcomes have also been suggested. The updated sodium AIs are 110 mg daily for infants 0–6 months, 370 mg daily for infants 7–12 months, 800 mg daily for children ages 1–3 years, 1,000 mg daily for ages 4–8 years, 1,200 mg daily for ages 9–13 years, and 1,500 mg daily for ages 14 years and older.

There is sufficient evidence to characterize the relationship between sodium intake and the risk of chronic disease. Therefore, the committee established a Chronic Disease Risk Reduction Intake (CDRR) for sodium using evidence of the beneficial effect of reducing sodium intake on cardiovascular disease risk, hypertension risk, systolic BP, and diastolic BP. Reductions in intake that exceed the sodium CDRR are expected to reduce chronic disease risk within the healthy population. For individuals aged 14 years and older, the CDRR recommendation is to reduce sodium intake if above 2,300 mg per day. The effect of sodium intake on BP that was used to inform the sodium tolerable upper intake level established in the 2005 DRI report is part of the evidence base that informed the CDRR. Reducing sodium intake has a greater effect on adults with hypertension than adults with normal BP. However, the benefits of reducing sodium intake toward the sodium CDRR or below apply to both groups. The report also updates adequate intake levels for potassium, which range from 2,300 to 3,400 mg daily, depending on sex, pregnancy status, and stage of life. It is now 2,600 mg and 3,400 mg daily for women and men, respectively.<sup>22)</sup> These adequate intake levels for potassium are lower than those established in 2005.

### Mobile technologies

Recently, the mobile technology sector has had significant innovation and improvement. The number of mobile phone users is estimated to have surpassed 5 billion in 2017.<sup>25)</sup> Given this potential, mobile technologies have played an increasingly significant role in the health sector. Mobile health (mHealth) is defined as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal



digital assistants, and other wireless devices.”<sup>26)</sup> There are several key functions of mHealth, including health education, data collection, electronic data systems, and clinical decision support systems.

We believe that more countries, especially those with high dietary salt consumption, can utilize mHealth as an intervention measure to reduce their population’s salt consumption for the prevention and control of hypertension and cardiovascular disease. Further, mHealth interventions that can target consumers of salt may particularly benefit countries in which the use of large quantities of salt in cooking plays a larger role in population salt intake than food processing and preservation by food industries.

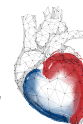
## CONCLUSION

For salt and health interaction, given the existing extensive evidence, the performance of salt reduction is suboptimal. At the global level, the target of salt reduction is being established to further lower the level. However, it is necessary to continuously endeavor to reduce salt intake not only in hypertensive patients but also throughout the country. In addition to education for the widespread use of salt reducing techniques, including behavioral approaches and mobile technologies, healthcare professionals must effectively perform salt-reduction guidance for hypertensive patients in hospitals. Urgent action is needed to speed up reaching the salt intake goal. A reduction in salt intake in the global population, even in small amounts, will substantially benefit public health and eventually eliminate the chronic disease burden.

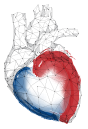
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