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Sodium Reduction: An Important Public Health Strategy for Heart Health

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High intake of dietary sodium is associated with elevated blood pressure, which increases the risk of heart disease and stroke.[1] Heart disease and stroke are the first and fourth leading causes of death in the United States[2]; from a public health perspective, this makes control of hypertension an important issue.

To address this, the Million Hearts initiative (led by the US Department of Health and Human Services), *Dietary Guidelines for Americans*, *Healthy People 2020*, and guidelines from numerous health organizations recommend reducing the amount of sodium consumed in the diet.[3] Most sodium consumed by Americans comes from processed and restaurant foods. Because these sources make up a large part of the American diet and because consumers have little control over the level of sodium in these foods, it is often difficult for consumers to reduce their sodium intake.[4] Many of the ingredients and food products served in schools, work sites, and group meal sites such as senior citizen centers contain high levels of sodium. Even when food purchasers and food service staff try to offer healthier food options, lower-sodium ingredients and products may not be easily available and accessible.

To increase the availability and accessibility of lower-sodium foods for consumers, the Centers for Disease Control and Prevention (CDC) launched the Sodium Reduction in Communities Program (SRCP) in 2010. This demonstration program was designed to explore the feasibility of reducing sodium consumption and whether members of the public would accept the reduction. The program supported local-level strategies to increase the availability and accessibility of lower-sodium foods and decrease sodium intake (hereafter "sodium reduction").[5] In this issue, 8 articles present insights, lessons learned, and progress updates from strategies implemented by SRCP communities in the first 2 years of their projects. Most of the articles in this supplement also describe pilot interventions and short-term outcomes of improving access to and availability of lower-sodium foods. Although the articles in this supplement do not include all the sodium-reduction work occurring across the

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country or by each SRCP community, they do provide several examples of community-based strategies for reducing sodium intake in ways that are feasible to implement and acceptable to consumers. We hope that more communities will consider implementing or adapting these strategies and that they may be inspired to develop new ways to reduce sodium intake as a public health strategy for heart disease and stroke prevention.

Excess Sodium Consumption Is a Risk Factor for High Blood Pressure

Consuming too much sodium can raise blood pressure levels and contribute to hypertension, a condition that affects nearly 67 million Americans and puts them at increased risk of heart disease and stroke.[6] When sodium intake is reduced, blood pressure begins decreasing within weeks, on average.[7]

Most adults in the United States consume sodium at levels far greater than the *2010 Dietary Guidelines for Americans* general recommendation of less than 2300 mg per day (even less for certain subpopulations).[8] An analysis of 2003–2008 National Health and Nutrition Examination Survey data of US adults found that median sodium intake was more than 3300 mg per day and that about 9 of 10 American adults consumed more than 2300 mg of sodium per day.[9]

A 2013 report from the Institute of Medicine concluded that “the available evidence on associations between sodium intake and direct health outcomes is consistent with population-based efforts to lower excessive dietary sodium intakes.”[10] On the basis of analysis of the outcomes assessed in the report, the committee found inconsistent and inconclusive evidence for amounts lower than 2300 mg of sodium per day. The CDC continues to support sodium reduction and the *2010 Dietary Guidelines for Americans*.[11]

Limiting sodium consumption is not only an effective strategy to help control hypertension but also a strategy to help prevent it. Evidence suggests that population-based strategies to reduce sodium intake can also reduce blood pressure levels,[12] and multiple studies provide economic evidence that support interventions to reduce sodium intake at a population level.[13] On the basis of modeling studies, lowering average daily intake of sodium in the US population to 2300 mg per day could prevent 11 million cases of hypertension annually.[14]

An estimated 75% of the sodium consumed in the United States comes from processed and restaurant foods.[4,15] Sodium is already present in these foods before the consumer acquires the food, and sodium cannot be removed after it is added. In addition, the sodium content of similar products can vary widely in processed and restaurant foods[16] depending on the manufacturer, product composition, and serving size. This makes it difficult for consumers who want to reduce their sodium intake to identify lower-sodium options. Furthermore, even when food or menu labels are available, lower-sodium products may not be readily available and accessible because of the pervasiveness of salt use throughout the food supply and the high average sodium density (determined by milligrams of sodium per 1000 calories) of many ingredients and prepared foods.[4] The difficulty of finding information, coupled with limited access to lower-sodium products, presents a challenge to the public health mantra to “make the healthy choice the easy choice.”

In addition to individuals' personal dietary choices, population-level improvements in nutrition require public education and the support of healthful environments in settings where food is available.[17] Changing the physical surroundings, the social climate, the type of information available, and organizational systems are strategies to create a healthful environment by promoting healthy behaviors. Such environmental strategies can be implemented with or without policy support.

National, State, and Local Strategies for Sodium Reduction

Although sodium-reduction activities have taken place in the United States for more than 40 years, they have recently gained greater attention and expanded emphasis.[4] At the national level, efforts are underway to educate consumers and public health professionals, to work with food manufacturers and restaurants, and to refine and expand monitoring and surveillance of sodium levels in the food supply, sodium intake, and related outcomes.[3,18]

In 2010, the Institute of Medicine report, *Strategies to Reduce Sodium Intake in the United States*, recommended that the Food and Drug Administration set national standards for sodium levels in food.[4] In addition to this primary recommendation, the Institute of Medicine also recommended several supporting strategies for sodium reduction. The recommended strategies included improving the monitoring and surveillance of sodium consumption, changes in population taste preferences, and sodium content of foods, as well as encouraging large-scale food purchasers and distributors to establish sodium specifications for food operations.

Also, in 2010, the US Department of Health and Human Services and the General Services Administration collaborated to develop the Health and Sustainability Guidelines for Federal Concessions and Vending Operations, which include sodium-related provisions[19] Recently, the US Department of Agriculture's Food and Nutrition Service issued an interim final rule that included phased targets for sodium reduction in the National School Lunch and School Breakfast programs and proposed rules for foods served in schools outside of these programs, including setting sodium limits.[20,21]

Currently, federal agencies are working to strengthen systems for tracking and reporting the sodium content of foods, consumers' sodium intake and health outcomes, and sodium-related knowledge, attitudes, and behaviors. These efforts include updating nutrient databases, assessing the usefulness of measuring the urine sodium level as a population-level measure of sodium consumption, and adding sodium-related questions to existing surveys to better understand consumers' and health care providers' opinions and practices. A complement to the work at the federal level, more than 85 health-related organizations including state and local health departments are part of the National Salt Reduction Initiative, led by the New York City Department of Health and Mental Hygiene.[22] This initiative supports sodium reduction and works with restaurants and food manufacturers to meet category-specific sodium-reduction targets.

National efforts also support state and local efforts,[3] and vice versa. Examples of state-level and local action include health departments and their partners collaborating to promote healthier eating through policy and environmental strategies such as community-wide

initiatives (eg, media campaigns) or specific venue-based approaches (eg, procurement policies in a school district, or working with grocery stores to promote the sale of lower-sodium products). Some communities have already shown that community-level approaches to improve health have the potential to reach a large number of people through systems and environmental change strategies.[23] Sodium-reduction efforts can also build on lessons learned from community-based strategies to improve other aspects of nutrition, such as *trans*-fat reduction.[24]

Highlights of the Sodium Reduction in Communities Program

Because communities can be important to supporting healthy environments, the CDC launched the SRCP in 2010 to help identify and refine community-level strategies to support sodium-reduction efforts. As more fully described by Mugavero et al,[5] the SRCP provides funding to 6 communities, with the goal of improving food environments by supporting lower-sodium intake in the population. The SRCP communities are as follows:

1. California Department of Public Health, in collaboration with Shasta County.
2. Kansas Department of Health and Environment, in collaboration with Shawnee County.
3. Los Angeles County.
4. New York City.
5. New York State Department of Health, in collaboration with Broome County.
6. New York State Department of Health, in collaboration with Schenectady County.

Prior to the initiation of the SRCP in 2010, many states and communities were already working to reduce obesity and improve nutrition in their populations. In addition, some jurisdictions were addressing the problem of overconsumption of sodium as part of their comprehensive nutrition strategies. The overarching goal of nutrition efforts continues to be promoting consumption of healthy diets, including recognizing the importance of addressing overconsumption of sodium as an important strategy to prevent heart disease and stroke at the population level.

As of spring 2013, SRCP communities were in various stages of program implementation. Some communities relatively early in the process of sodium reduction were piloting public health tools, whereas others were working on wide-reaching sodium-reduction administrative actions such as implementing procurement policies. One community surveyed adults about their knowledge and behaviors related to sodium consumption. All 6 SRCP communities were implementing policy or environmental strategies in a variety of settings to create access to more healthful food environments at the local level, many of which are described in this journal supplement. The communities were also conducting process and outcome evaluations, and they shared their perceptions of facilitators and barriers to certain strategies in the articles provided in this supplement. In addition, each community was augmenting strategies to change environments with complementary public education as well as traditional and social media outreach.

Community-level assessments can inform strategies and monitor resulting changes. In one example described in this issue, Welsh and colleagues[25] found that, although adults in their county have extensive knowledge regarding food sources of sodium and the link between sodium intake and high blood pressure, mean sodium intake exceeds current recommendations.

The goal of this journal supplement was to share lessons learned and to contribute practice-based evidence for community approaches to sodium-reduction efforts. Key themes related to strategies, achievements, and barriers have emerged from the work of these communities. For example, a leading theme is the importance of developing partnerships between public health organizations and both traditional and nontraditional partners to achieve outcomes. Cummings and colleagues[26] describe their work with multiple county-level government agencies to implement procurement standards for foods served at work sites and institutions. Losby and colleagues[27] provide insight into working in senior dining facilities and the need to establish relationships with partners such as food service directors, suppliers, and distributors. Similarly, Schuldt and colleagues[28] describe a novel approach to engage independent restaurant owners—a nontraditional partner group—in reducing sodium levels in their menu items, underscoring the importance of including restaurant partners in sodium-reduction efforts.

Several articles in this supplement describe efforts to improve multiple components of nutrition while successfully incorporating sodium-reduction goals. Taylor and colleagues[29] describe a range of environmental strategies (eg, modifying cooking techniques) that have been applied in school districts to reduce sodium intake and improve the overall healthfulness of student meals. In another school district, Cummings and colleagues[30] report that a multistage menu-planning approach to improve the nutritional content of school meals was associated with a decrease in sodium levels that met or exceeded the 2014–2015 US Department of Agriculture sodium targets for elementary school breakfasts and secondary school breakfasts and lunches. Sodium reduction as part of a comprehensive nutrition strategy is also discussed by Lederer and colleagues,[31] who report on interviews of hospital cafeteria managers about their overall nutrition goals, including sodium-reduction strategies.

Many of the articles in this supplement demonstrate that it is possible to implement sodium-reduction strategies and that such strategies are generally acceptable to consumers, especially when the sodium level is reduced gradually. Losby and colleagues[27] note that staff members successfully reduced sodium levels each year by approximately 10% to 15% in meals prepared for seniors through product substitutions, recipe modifications, and changes in cooking practices. In another example, Johnston and colleagues[32] describe strategies that they used in a grocery store chain to inform consumers about the risks and sources of excess sodium intake, coupled with the opportunity to taste lower-sodium options —options that consumers found acceptable.

While all of the communities have demonstrated that sodium reduction is possible and generally acceptable, all have faced barriers throughout their implementation processes. Common barriers across sites and strategies included flavor profile concerns, cost concerns, limited availability of acceptable products, lack of time on the part of food service staff to

develop and implement sodium-reduction plans, and health department staff members' limited experience working with nontraditional public health partners, such as restaurants, grocery stores, and other food service establishments.

Despite barriers to sodium-reduction efforts, new opportunities are arising to further these efforts. For example, Johnston and colleagues[32] describe a successful collaboration with a corporate dietitian who represented a commercial grocery store chain. The chain subsequently applied multiple strategies in a commercial environment with complex systems and operational processes. Schuldt and colleagues[28] and Taylor and colleagues[29] describe their work with partners to establish or leverage buying cooperatives, allowing them to pool their buying power from food distributors and increase the availability of lower-sodium products at affordable prices.

Future Directions for Sodium Reduction and Public Health

Fortunately, strategies to foster healthful diets are already being implemented throughout the country, making the time ripe for including sodium reduction as part of these efforts. Because many people in the United States continue to suffer from hypertension and resulting chronic diseases such as heart disease and stroke, reducing sodium intake must be a key component of improving nutrition.

It is our hope that the experience of these communities will inspire states and communities to consider sodium-reduction efforts and will provide a starting point for continued development, refinement, and replication of sodium-reduction strategies. Continuation of national efforts and expansion of state and local efforts may increase demand for and access to lower-sodium options and lead to healthier communities.

To build on the efforts and lessons learned from the projects highlighted in this supplement, the CDC awarded new funding in September 2013 to support community-level sodium-reduction strategies. Continuation of these efforts will result in additional practice-based strategies, and evaluations will further inform ongoing efforts to give consumers the choice to reduce their sodium consumption. Changing the environments where food is consumed is a critical step toward better access to and availability of lower-sodium foods. In addition, increasing access to information about the levels of sodium in foods and related health effects is a step to provide people with the ability to control their sodium intake and improve their health and prevent chronic disease.

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