

Sodium Reduction Is a Public Health Priority: Reflections on the Institute of Medicine's Report, *Sodium Intake in Populations: Assessment of Evidence*

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Reducing sodium intake is a critical, achievable and effective public health action to reduce blood pressure and improve cardiovascular health.^{1,2} In the United States, about 90% of the population consumes sodium in excess of recommended levels,³ at a mean intake of about 3,400 mg/day.⁴ Available evidence shows that higher sodium intake is strongly associated with higher blood pressure,^{5,6,7} which contributes to nearly 1,000 deaths per day and is a leading risk factor for heart disease and stroke, the first and fourth leading causes of death, respectively.^{8,9} Averting many of these deaths is possible with population-wide sodium reduction, which can be achieved through standards for sodium levels in prepared and packaged foods that allow Americans greater ability to choose their own salt intake.¹

Despite substantial evidence demonstrating the health benefits of reducing sodium intake, some studies have raised concerns that population-wide sodium reduction strategies may increase the risk of heart disease and stroke among specific populations and have adverse effects on some health outcomes (e.g., elevated lipids levels, insulin resistance).^{10,11} To better understand these concerns, in 2012, the Centers for Disease Control and Prevention (CDC) commissioned the Institute of Medicine (IOM) to evaluate the results, study design, and methodological approaches that have been used to assess the relationship between sodium intake and health outcomes. In their report, *Sodium Intake of Populations: Assessment of Evidence*, the IOM defined "health outcomes" as and focused their data review on cardiovascular disease events and mortality.¹² Of important note, the IOM committee did not include blood pressure in its review of potential health outcomes, although blood pressure is recognized and used as a key health outcome in much of the literature on

sodium interventions. The IOM committee determined that sodium intake impacts health outcomes through pathways in addition to the blood pressure pathway. The report included recommendations to strengthen research to understand the extent of the effect of sodium on blood pressure and then to events and mortality and for more studies addressing mechanisms. The committee limited its evaluation, and therefore conclusions, to studies published from 2003 to 2012—that is, the period since the 2005 Dietary Reference Intakes for Water, Sodium, Chloride, and Sulfate (DRI) were developed. Based on available scientific literature at the time, the 2005 DRI report established adequate intakes for sodium across all life stages and sex groups and specifically determined that the highest level of sodium intake not likely to pose a risk of adverse health effects for almost all individuals in the general population (tolerable upper intake level) is 2,300 mg/day for persons aged ≥ 14 years.⁵ (Based on the food supply, the AI for sodium (including sweat loss) was established to ensure the minimum level needed for sodium and to provide an adequate intake of other essential nutrients.)

In the 2013 report, the committee concluded that there is a positive relationship between higher levels of sodium intake and the risk of cardiovascular disease (e.g., heart disease and stroke).¹² This is consistent with prior knowledge of the adverse effects of sodium intake on blood pressure. The IOM committee also concluded that there is substantial population benefit to be gained—and no evidence of harm—from reducing sodium intake to a level of 2,300 mg/day. (As a result of how this report and its findings were misinterpreted in some media outlets, IOM President Dr Harvey Fineberg wrote a letter to the Honorable Secretary Sebelius to restate the conclusions. Additionally, 3 IOM committee members

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authored a viewpoint in *JAMA* clarifying the report's findings and conclusions.)¹³ The report supports existing population-based efforts by government, professional, and public health organizations (e.g., American Heart Association, American Medical Association, American Public Health Association, American Society of Hypertension, Institute of Medicine, World Health Organization), and the private sector to reduce excessive sodium intake. (In their position paper, the American Society of Hypertension recommends the following: "Lower sodium intake as much as possible, with a goal of no more than 2,300 mg/day in the general population and no more than 1,500 mg/day in blacks, middle- and older-aged persons, and individuals with hypertension, diabetes, or chronic kidney disease.")¹⁴ Given that the current mean intake in the United States is almost 1.5 times higher than 2,300 mg per day, and has not decreased over the past 5 decades despite recommended reductions, we have much work ahead of us to achieve even this general 2010 U.S. *Dietary Guidelines for Americans* recommendation.^{1,15,16} Such an achievement would yield substantial cardiovascular benefits and save tens of thousands of lives and billions of dollars in health care costs annually.²

When it comes to sodium intake levels <2,300 mg per day, however, for the outcomes assessed, the committee found insufficient and inconsistent evidence regarding the benefit or harm in certain population subgroups (e.g., individuals with diabetes, chronic kidney disease, or preexisting cardiovascular disease). Thus, the committee did not recommend that these population subgroups be treated differently from the general US population. However, the 2010 *Dietary Guidelines for Americans* recommends specific population subgroups limit sodium intake to no more than 1,500 mg per day, a recommendation consistent with other studies demonstrating important reductions in blood pressure after reductions in dietary sodium intake to about these levels for individuals with hypertension, as well as attenuation in the rise in blood pressure with age, with progressively greater reductions in blood pressure with lower sodium intake.¹⁷⁻¹⁹ The sample size and length of follow-up for these studies were not designed to directly assess the effects of sodium reduction to levels of $\leq 1,500$ mg/d on long-term health outcomes associated with hypertension, such as cardiovascular disease events and mortality.

Because of the substantial public health benefit that would be achieved if sodium intake were within recommended limits, and because evidence-based approaches exist to achieve population reductions, decreasing sodium intake is a key component of CDC's initiatives to control blood pressure and improve cardiovascular health. CDC's approach to sodium reduction includes collaborating with the food industry to reduce sodium in the food supply; educating the public about the sources of sodium, the impact of sodium intake on health, and the importance of preventing and controlling high blood pressure; providing technical and programmatic assistance to the public health community for work on sodium reduction; expanding the scientific literature related to sodium reduction and addressing potential gaps in the scientific literature; and working with stakeholders (e.g., state and local health departments) and collaborating with other federal agencies on sodium-related surveillance and to

monitor and evaluate ongoing sodium reduction and blood pressure control initiatives. CDC's sodium reduction and blood pressure control work is further supported by the US Department of Health and Human Services' Million Hearts initiative, a national public private effort co-led by CDC and the Centers for Medicare & Medicaid Services to prevent one million heart attacks and strokes by 2017.²⁰

Based on the available evidence, the CDC is committed to population-wide efforts to reduce sodium intake to levels commensurate with the *Dietary Guidelines for Americans* to substantially improve the cardiovascular health of the US population. Reducing the intake of sodium from the current mean of about 3,400 mg/day to the tolerable upper limit of 2,300 mg/day will substantially improve the cardiovascular health of Americans.

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DISCLOSURE

The authors declared no conflict of interest.

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