

## Why Excess Sodium Consumption is Detrimental to Health

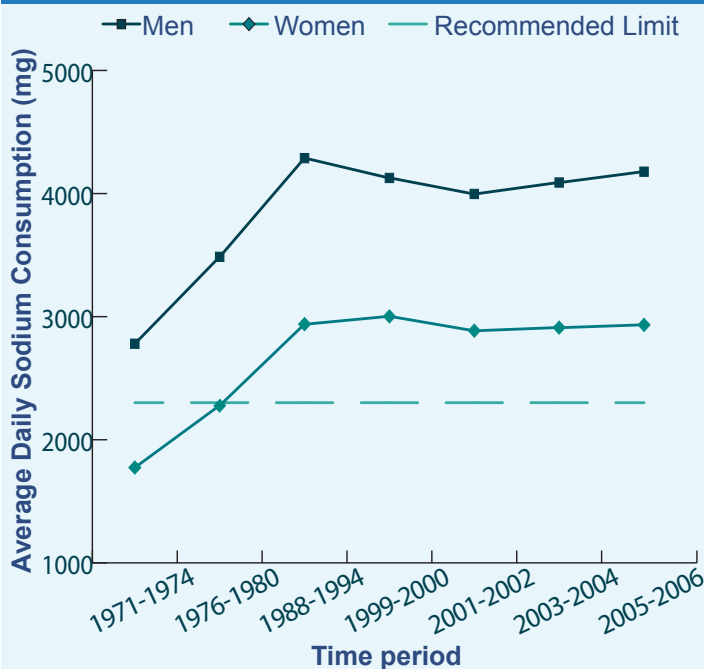
Excess dietary sodium (salt) consumption can increase blood pressure and lead to heart disease, stroke, and kidney complications.<sup>1</sup> Several clinical trials and observational studies have also linked high sodium consumption to increased risk of stomach cancer, osteoporosis, and an enlarged heart.<sup>2,3</sup>

In the U.S., individual daily sodium consumption (average > 3,400 mg) greatly exceeds limits recommended by the Dietary Guidelines for Americans (DGA).<sup>4\*</sup> In 2004, only 30% of adults were consuming less sodium than the recommended upper limit of 2,300 mg. Over the past 30 years, sodium consumption in the population has increased dramatically. Americans

consume approximately 55% more sodium today than they did a generation ago (Figure 1).<sup>5</sup>

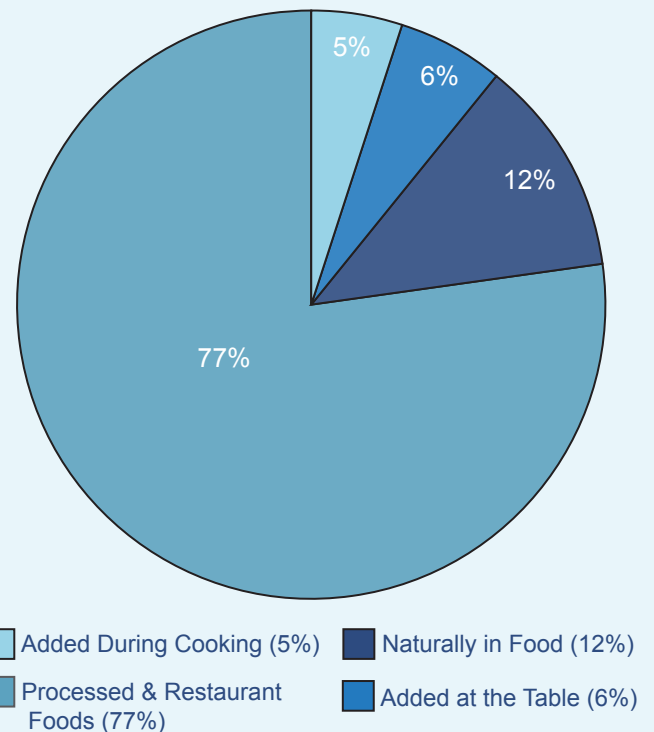
Presently, most of the sodium that Americans consume comes from processed and restaurant foods (Figure 2).<sup>6</sup> Over the past 25 years, Americans have increased the number of meals they eat away from home, making restaurant foods an important source of dietary sodium.<sup>7</sup> Frequently, consumers are not provided with information about sodium content for menu items in restaurants, and will typically underestimate the amount of sodium that is contained in a variety of restaurant foods.<sup>8</sup> Even when sodium information is provided, it may be difficult for consumers to make sense of the information as the amount of sodium that should be consumed is generally thought to be dependent on whether or not someone already has hypertension (high blood

**Figure 1. Average Daily Sodium Consumption for Men and Women in the U.S., Ages 20 to 74 Years. Recommended versus Actual.**



SOURCE: The National Health and Nutrition Examination Survey (NHANES).<sup>5</sup>

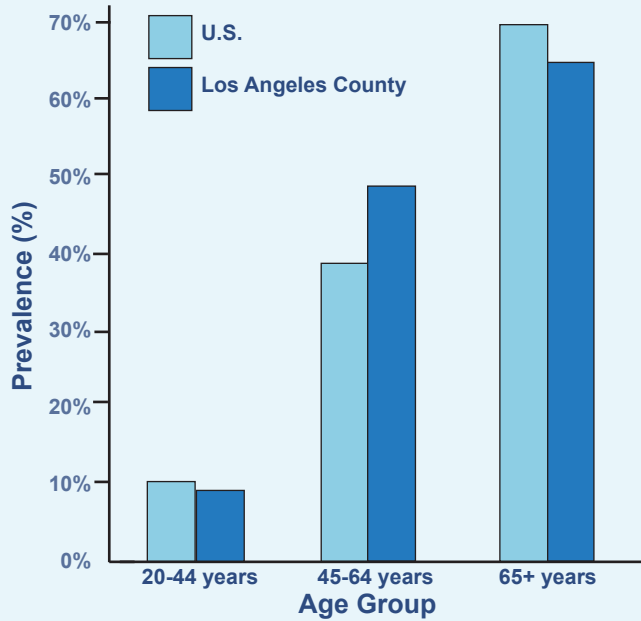
**Figure 2. Sources of Sodium in the U.S. Diet.**



SOURCE: Mattes & Donnelly, *J Am Coll Nutr* 1991.<sup>6</sup>

\* Dietary Guidelines for Americans: [www.health.gov/dietaryguidelines/dga2005/document/html/chapter8.htm](http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter8.htm)

**Figure 3. Prevalence of Hypertension by Age Group in Los Angeles County and the U.S., 2005.**



SOURCE: National Health and Nutrition Examination Survey (NHANES), 2005.<sup>5</sup>

pressure) or related chronic conditions (e.g., heart disease, heart failure, chronic kidney disease). In addition, lower calorie meals or food options can sometimes be misleading as low calorie foods, processed or at restaurants, are frequently high in sodium. Although public health messages regarding fat intake and high-energy diets are more widespread, the harmful effects of excess sodium consumption have received considerably less attention.<sup>9</sup>

## What are the Health and Economic Consequences of Excess Sodium Consumption?

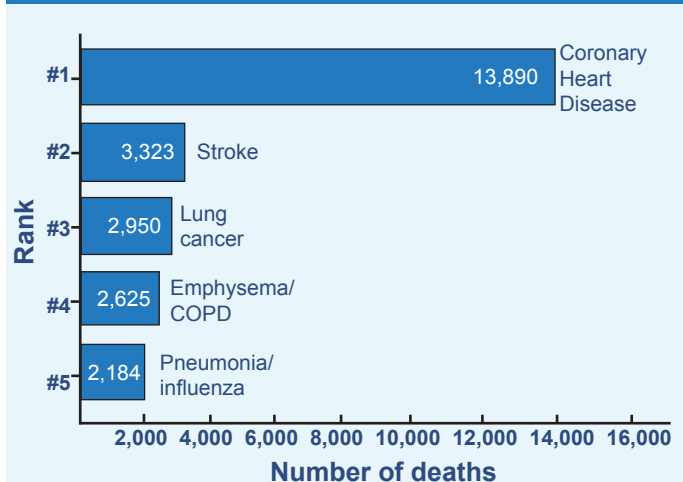
In the U.S., the burden of hypertension is considerable.<sup>10,11</sup> The residual lifetime risks of developing stage 1 ( $\geq 140/90$  mm Hg) and stage 2 ( $\geq 160/100$  mm Hg) hypertension for middle-aged adults (ages 55 to 65 years) are nearly 85% and 70%, respectively.<sup>10</sup> Additionally, the lifetime likelihood of receiving antihypertension medications for individuals ages 55 years and older is approximately 60%.<sup>10</sup> Compared with whites, African Americans experience higher rates of hypertension. In this group, the condition often begins at an earlier age and is usually more severe.<sup>12</sup> Elevated blood pressure is increasingly

becoming a problem among children. Over the past decade the average systolic blood pressure (the top number of a blood pressure reading) among children ages 8 to 17 years has increased by 1.4 mm Hg, with greater increases seen among Hispanic and African American children.<sup>13</sup>

Hypertension has significant health and economic consequences. This chronic condition greatly increases the risk of medical complications and death from cardiovascular and kidney diseases, such as heart attack, stroke, heart failure, and end-stage kidney failure.<sup>14</sup> Cardiovascular diseases are costly to society; direct and indirect costs of cardiovascular diseases in the U.S. are estimated to be approximately \$400 billion per year.<sup>15</sup>

In Los Angeles County, the prevalence of hypertension mirrors that of the general U.S. population.<sup>5,16</sup> Forty-eight percent of adults ages 45 to 64 years and 65% of adults over age 65 years have hypertension (Figure 3).<sup>5</sup> In addition, hypertension-related health conditions account for over 100,000 hospital admissions each year.<sup>17</sup> Despite advances in medical technology and treatment, heart disease and stroke remain the first and second leading causes of death, respectively, in Los Angeles County. More than 17,000 deaths and nearly 77,000 years of potential life are lost annually as a result of these two leading causes of death (Figure 4).<sup>18</sup>

**Figure 4. Leading Causes of Death in Los Angeles County, 2007.**



SOURCE: Office of Health Assessment & Epidemiology, Los Angeles County Department of Public Health.<sup>18</sup>

Past and emerging evidence suggest that even a modest, long-term reduction in sodium consumption can have a beneficial impact on blood pressure control and can lead to the reduction in preventable cardiovascular events.<sup>2</sup> Reducing sodium consumption in the population to 2,300 mg per day (DGA limit), for example, could reduce the number of hypertension cases in the U.S. by 11 million and save \$18 billion in health care costs.<sup>19</sup>

Recent estimates from a health impact analysis conducted by the Los Angeles County Department of Public Health suggest that reducing population sodium consumption, even by a modest amount, has the potential to greatly reduce the number of cases of hypertension in Los Angeles County and save millions of dollars in annual treatment costs. These estimates account for both individuals with and without hypertension. However, these estimates should be interpreted with caution as they are based on best-case assumptions and therefore represent the most optimistic impact of the presented sodium reduction scenarios (Table 1).

## What Can be Done to Reduce Population Sodium Consumption?

Reduction in sodium consumption can be accomplished with minimal impact on taste.

Research suggests that most people would adapt to or not detect a decrease in sodium content in food when done gradually over time.

Furthermore, reducing sodium consumption at the population level is possible. Many countries, including the United Kingdom and Finland, have ongoing national programs that have addressed this public health problem and have effectively reduced the sodium content in their food supply. For example, the United Kingdom has used a complementary, multi-strategy approach to:

- Increase the percentage of people who are aware of the recommended daily sodium limit.
- Increase the percentage of people trying to lower their daily sodium intake.
- Reduce the amount of sodium in most processed foods by 20% to 30%.<sup>2</sup>

In 2008, a coalition of health organizations and public agencies led by the New York City Department of Health and Mental Hygiene--the National Salt Reduction Initiative (NSRI), began exploring strategies for reducing population sodium consumption in the U.S. This has launched discussions with food industry leaders to develop a voluntary framework for substantive, gradual reductions in sodium content across a

**Table 1. Potential Decrease in Cases of Hypertension and Annual Savings in Hypertension Treatment Costs from Reducing Sodium Consumption in Los Angeles County.**

<b>Scenario: Percent Reduction in Population Sodium Consumption (decrease in sodium intake in mg)<sup>a</sup></b>	<b>Average Systolic Blood Pressure Reduction (mm Hg)<sup>b</sup></b>	<b>Percent Decrease in the Frequency of Hypertension<sup>c</sup></b>	<b>Decrease in the Number of Cases of Hypertension<sup>d</sup></b>	<b>Potential Annual Cost Savings [in 2010 dollars] (\$)<sup>e</sup></b>
10% (344 mg)	0.71	1.7%	31,953	62 million
20% (687 mg)	1.41	2.8%	52,629	102 million
30% (1,031 mg)	2.11	4.2%	78,944	153 million
40% (1,374 mg)	2.82	5.3%	99,619	193 million
50% (1,718 mg)	3.52	6.8%	127,814	247 million

Note: for key formulas used in the above analysis (columns a-e), see page 6.

range of foods.<sup>20</sup> Concurrently, several public health departments, including the Los Angeles County Department of Public Health, have expressed support for local interventions (e.g., food purchasing policies) to augment the national effort.

## National, State, and Local Strategies

Activities at the national, state, and local levels can play an important role in reducing the population's sodium consumption. For example, food retailers, governments, businesses, institutions, and other large-scale organizations that purchase or distribute food can establish food policies that specify sodium limits for the foods they purchase and/or the food service operations they oversee.<sup>1</sup>

### What can be done at the national level

Policymakers can work nationally to reduce the amount of sodium in the food supply. More specifically, policymakers can work to reduce the amount of sodium found in processed and restaurant foods, since over 75% of the sodium consumed by Americans is found in these sources. Policymakers should:

- Support the national collaborative effort, the NSRI, to engage food manufacturers and restaurants in voluntarily reducing the amount of sodium in their products.<sup>20</sup>
- Support the removal of sodium and other sodium-containing compounds from the Generally Regarded As Safe (GRAS) list

or restriction of sodium's GRAS status in a step-wise manner. This will allow for the Food and Drug Administration (FDA) to set limits on the amount of sodium food manufacturers can add to the food supply.<sup>1</sup>

### What can be done at the state and local levels

Several strategies can be implemented at the state and local levels to complement national sodium reduction efforts.<sup>20-22</sup> Local action can help increase consumer demand for low sodium products from food manufacturers by:

- Increasing awareness through public education about the recommended daily sodium limit and the health benefits of lowering sodium consumption.
- Implementing venue-based or venue-specific food policies that set nutrition standards, including sodium limits, on all food purchased, served, or sold by an institution or employer. These policies could help drive product reformulation, given the purchasing power of many states, counties, cities, and large businesses.<sup>23</sup>
- Taking advantage of funding to support sodium reduction efforts. For example, the CDC-supported Los Angeles County Department of Public Health initiative, RENEW Los Angeles County, provides approximately \$16 million to promote physical activity and healthy eating in the county, with specific efforts to lower sodium consumption in the population.



## Local Actions in Los Angeles County

### Renew Environments for Nutrition, Exercise, and Wellness

- RENEW Los Angeles County aims to implement evidence-based prevention strategies that increase access to safe places for physical activity and to affordable nutritious food through changes in policy, system, and/or the environment.
- Los Angeles County is one of 44 communities selected to participate in the \$372.8 million national *Communities Putting Prevention to Work* program. This program is administered by the Centers for Disease Control and Prevention (CDC) and is funded by the American Recovery and Reinvestment Act of 2009.

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## Key Formulas Used in Analysis

- a. **Formula 1:** Change in the amount of sodium consumed per day = targeted percent reduction x average daily sodium consumption in the U.S. (3,436 mg).<sup>24</sup>
- b. **Formula 2\*:** Average systolic blood pressure (SBP) reduction = decrease in SBP among proportion of population with normal blood pressure + decrease in SBP among proportion of population with hypertension = [(decrease in population sodium intake in mg / 2,300 mg) x 3.6 mm Hg x proportion of population with normal blood pressure] + [(decrease in population sodium intake in mg / 2,300 mg) x 7.2 mm Hg x proportion of population with hypertension].
- \* According to data from a meta-analysis of 31 long-running clinical trials, a 2,300 mg reduction in sodium consumption per day is associated with a 3.6 mm Hg decrease in SBP among individuals with normal blood pressure and a 7.2 mm Hg decrease in SBP among individuals with hypertension.<sup>25</sup> The proportions of the population with and without hypertension used in the calculations were based on the 1999-2004 NHANES panel for the region.<sup>5</sup>
- c. **Formula 3:†** The estimated percent decrease in the frequency of hypertension for each scenario was based on extrapolations of published data and accounts for the number of individuals who would no longer be considered hypertensive if the reduction in sodium consumption occurred at the population level beginning in 2005.
- † These extrapolations assumed that hypertensive individuals were not taking antihypertensive medications for the long-term.<sup>19</sup>
- d. **Formula 4:** Decrease in the number of cases of hypertension = percent decrease in hypertension frequency (Formula 3) x population in Los Angeles County with hypertension, based on data from the 1999-2004 NHANES panel for the region.<sup>5</sup>
- e. **Formula 5:** Annual savings in treatment costs = Formula 4 x \$1,935 per person per year (using 2010 dollars).<sup>26,\*\*</sup>

\*\* Treatment costs of hypertension were derived from published data in Trodgon et al.<sup>26</sup> In the study, the estimated treatment costs for hypertension were estimated to be \$1,598 per person per year (in 2005 dollars); for the 2010 estimate, the present analysis adjusted for inflation using the Medical Care Consumer Price Index. Hypertension treatment costs included prescription expenditures and a portion of the costs attributed to treatment of hypertension-related chronic diseases.

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### Principal Writers and Editors

Gloria Y. Kim, MPH  
*Office of Senior Health*  
Patricia L. Cummings, MPH  
*Office of Senior Health*

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Special thanks to Lauren N. Gase, MPH, Health Scientist at the *Division for Heart Disease and Stroke Prevention in the Centers for Disease Control and Prevention*, for her technical assistance and helpful review of this report.

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### Los Angeles County Department of Public Health

Jonathan E. Fielding, MD, MPH  
*Director and Health Officer*

Jonathan E. Freedman  
*Chief Deputy Director*

Steven Teutsch, MD, MPH  
*Chief Science Officer*

Paul Simon, MD, MPH  
*Director, Division of Chronic Disease and Injury Prevention*

Tony Kuo, MD, MSHS  
*Director, Office of Senior Health*



Division of Chronic Disease and Injury Prevention  
Los Angeles County Department of Public Health  
3530 Wilshire Blvd, 8th Floor  
Los Angeles, California 90010  
<http://publichealth.lacounty.gov/chronic/>

# How Can I Reduce Sodium in My Diet?

## How much sodium is too much?

On average, Americans consume twice as much sodium (salt) as they should. The Dietary Guidelines for Americans recommend that a person should eat no more than:

- 2,300 mg of sodium (1 tsp\*) per day, or
- 1,500 mg of sodium (2/3 tsp\*) per day if the person
  - has high blood pressure (top blood pressure reading over 140 or bottom blood pressure reading over 90), or
  - is over 40 years old, or
  - is of African American descent.

Most of the sodium that a person consumes comes from pre-packaged and restaurant foods. Products labeled "low calorie" or "low fat" are frequently high in sodium.

## How can sodium consumption be reduced?

When Shopping:

- Read food labels and choose options with less sodium.
- Buy foods that are labeled as "reduced sodium," "low in sodium," "sodium free," or "no salt added."

Eat and Prepare More Fresh Foods at Home:

- Eat less fast food and restaurant food.
- Eat more fresh foods, such as fruits and vegetables.
- Eat fewer canned and pre-packaged foods, such as sausage, bologna, ham, canned soups, pickles, olives, frozen dinners, pizza, packaged mixes, and salad dressings.
- Eat fewer salty snacks, including chips and salty crackers.

When Cooking:

- Use spices, such as garlic powder, onion powder, lemon juice, and fresh and dried herbs, instead of salt.
- Use fresh poultry, fish, and lean meat, rather than the canned or processed types.
- Take the salt shaker off the table.

## How to Read Sodium Content on Nutrition Labels

### Nutrition Facts

Serving Size 8 fl oz (240 ml)	
Servings Per Container 8	
<b>Amount Per Serving</b>	
<b>Calories</b> 100	Calories from Fat 20
<b>% Daily Value*</b>	
<b>Total Fat</b> 2.5g	<b>4%</b>
Saturated Fat 1.5g	<b>8%</b>
<b>Cholesterol</b> 10mg	<b>3%</b>
<b>Sodium</b> 130mg	<b>5%</b>
<b>Total Carbohydrate</b> 12g	<b>4%</b>
Dietary Fiber 0g	<b>0%</b>
Sugars 11g	
<b>Protein</b> 8g	
Vitamin A 10%	Vitamin C 4%
Calcium 30%	Iron 0%
Vitamin D 25%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g

8 servings per container

130 mg of sodium in one serving

**In the WHOLE container:**  
130 mg x 8 servings = **1,040 mg sodium**

- Rinse canned foods, such as tuna, to remove some salt.

When Eating Out:

- Ask how much sodium is in the different menu options. Sometimes restaurants will provide sodium content information on their menus.
- Ask for food to be prepared without salt or with less salt.

## How do low sodium foods taste?

Many low sodium foods taste good. Cut back a little on the amount of sodium you eat each day. Most people will get used to eating less salt and will not notice a difference in taste if the amount of sodium consumed is reduced gradually over time.

Try low sodium recipes from [www.dashdiet.org](http://www.dashdiet.org) or <http://www.mayoclinic.com/health/low-sodium-recipes/RE00101>.

\*tsp = teaspoon

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Division of Chronic Disease and Injury Prevention  
Los Angeles County Department of Public Health  
3530 Wilshire Blvd, 8th Floor  
Los Angeles, California 90010  
<http://publichealth.lacounty.gov/chronic/>