



## Suggested Citation

Centers for Disease Control and Prevention. *What Is the Evidence for State and Local Laws Addressing Sodium Reduction Interventions Among the US Adult Population? A Policy Evidence Assessment Report*. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2019.

## Disclaimer

The findings and conclusions of this document are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. Furthermore, this document is not intended to promote any particular legislative, regulatory, or other action.

# The Big Picture

## Background

The 2019 *Dietary Reference Intakes (DRI) for Sodium and Potassium* recommend less than 2,300 milligrams (mg) of sodium per day for adults. Reducing sodium consumption to meet these recommendations can lower blood pressure, especially among adults with hypertension.<sup>1</sup> Hypertension is a contributing factor for heart disease and stroke, which are two of the leading causes of death in the United States.<sup>2</sup> States and local communities are undertaking efforts to reduce the amount of sodium consumed by their populations through initiatives that promote access and availability of healthy foods in various settings, including restaurants, hospitals, grocery stores, government worksites, and senior centers. Some of these efforts include the Centers for Disease Control and Prevention's (CDC's) Sodium Reduction in Communities Program, the National Sodium Reduction Initiative, and the *Food Service Guidelines for Federal Facilities*.<sup>3</sup> Since about 70% of US sodium consumption is estimated to come from processed food and restaurant meals outside the home, there is a need for community-based efforts that support public education and healthy food environments that promote reduced sodium intake.<sup>4,5</sup>

Policy is a tool that can be used to help lower population sodium intake. **Policy** can be defined as "a law, regulation, procedure, administrative action, incentive, or voluntary practice of governments and other institutions."<sup>6</sup> For example, some state and local governments have enacted laws incorporating the *Food Service Guidelines for Federal Facilities* as a model to develop contracts and permits in settings of food service and vending operations (e.g., cafeterias, concession stands, vending machines) to increase the availability of and access to healthy foods, which include low sodium food options.<sup>7,8</sup> Furthermore, **policy interventions** are discrete requirements, provisions, or other elements. Public health decision makers need to know which policy interventions are feasible and most likely to achieve the desired impact. To address these needs, an early evidence assessment involves compiling and appraising all relevant, available evidence.<sup>9</sup>

From October 2018 to June 2019, CDC's Division for Heart Disease and Stroke Prevention (DHDS) assessed the best available evidence for six different policy interventions **addressed in state or local law** that aim to reduce sodium intake in the United States. Each policy addresses different types of evidence-based interventions.

## About This Report

This report assesses the **strength** and **quality** of the best available evidence for six policy interventions ([Table 1](#)) to reduce sodium consumption among the adult population (aged 18 or older). Each of these policy interventions was addressed in at least one state or local US law in effect as of January 1, 2019; recommended by subject matter experts on sodium; and addressed in relevant published and grey literature.

NOTE: Sodium limits stated in this report refer to standards and thresholds defined by the studies. Sodium limits were not assessed or compared in this report.

Table 1. Descriptions of the six policy interventions

Intervention	Description
<a href="#">Daily Meal Providers Serving Low Sodium Items</a>	Meal service providers offer prepared foods, packaged snacks, and/or beverages that are consistent with nutrition guidance, along with corresponding nutrition education encouraging participants to adopt dietary patterns that promote nutritional health and reduce the risk of diet-related chronic disease.
<a href="#">Sodium Limits on Items Served in Workplaces</a>	Limiting sodium in prepared foods, packaged snacks, and beverages served in workplaces or worksites may be achieved by setting nutrition standards, increasing the availability of and access to lower sodium options in locations serving employees and potentially other patrons, and restricting the sodium content in foods or beverages served at work events or meetings.
<a href="#">Item and Menu Labeling Based on Sodium Content</a>	Manufacturers providing nutrition content on the front of packages and on menus can influence purchasing habits and sodium consumption. By displaying numeric or symbolic indicators of the sodium content in items (i.e., prepared foods, packaged snacks, and/or beverages), manufacturers are likely to reduce sodium in their items and positively affect consumer health. Labels can come in the form of traffic lights, text labels with sodium amounts, or scores based on nutrient content.
<a href="#">Items in Stores Meeting Sodium Limits</a>	Incentivizing or requiring stores to limit sodium in the prepared foods, packaged snacks, and/or beverages they are selling may reduce consumer sodium intake by increasing the availability of lower sodium products; encouraging consumers to purchase food with lower sodium content; influencing consumer ordering decisions and intentions; and supporting community programs that promote access to healthy foods and the reduction of sodium intake.
<a href="#">Items in Vending Machines Meeting Sodium Limits</a>	Packaged snacks and/or beverages in vending machines meeting sodium limits defined by the vendor including packaged foods and/or beverages.
<a href="#">Economic Incentives for Low Sodium Items</a>	Economic incentives (such as subsidies and reduced licensing fees for restaurants) that can potentially lower the cost of low sodium items such as prepared foods, packaged snacks, and beverages.

[Figure 1](#) categorizes the six sodium reduction policy interventions addressed in state or local law by their current evidence levels (“best,” “promising quality,” “promising impact,” or “emerging”).

The following policy interventions demonstrated “best” available evidence, with strong potential public health impact and high quality of evidence:

- Daily Meal Providers Serving Low Sodium Items
- Sodium Limits on Items Served in Workplaces
- Item and Menu Labeling Based on Sodium Content
- Items in Stores Meeting Sodium Limits

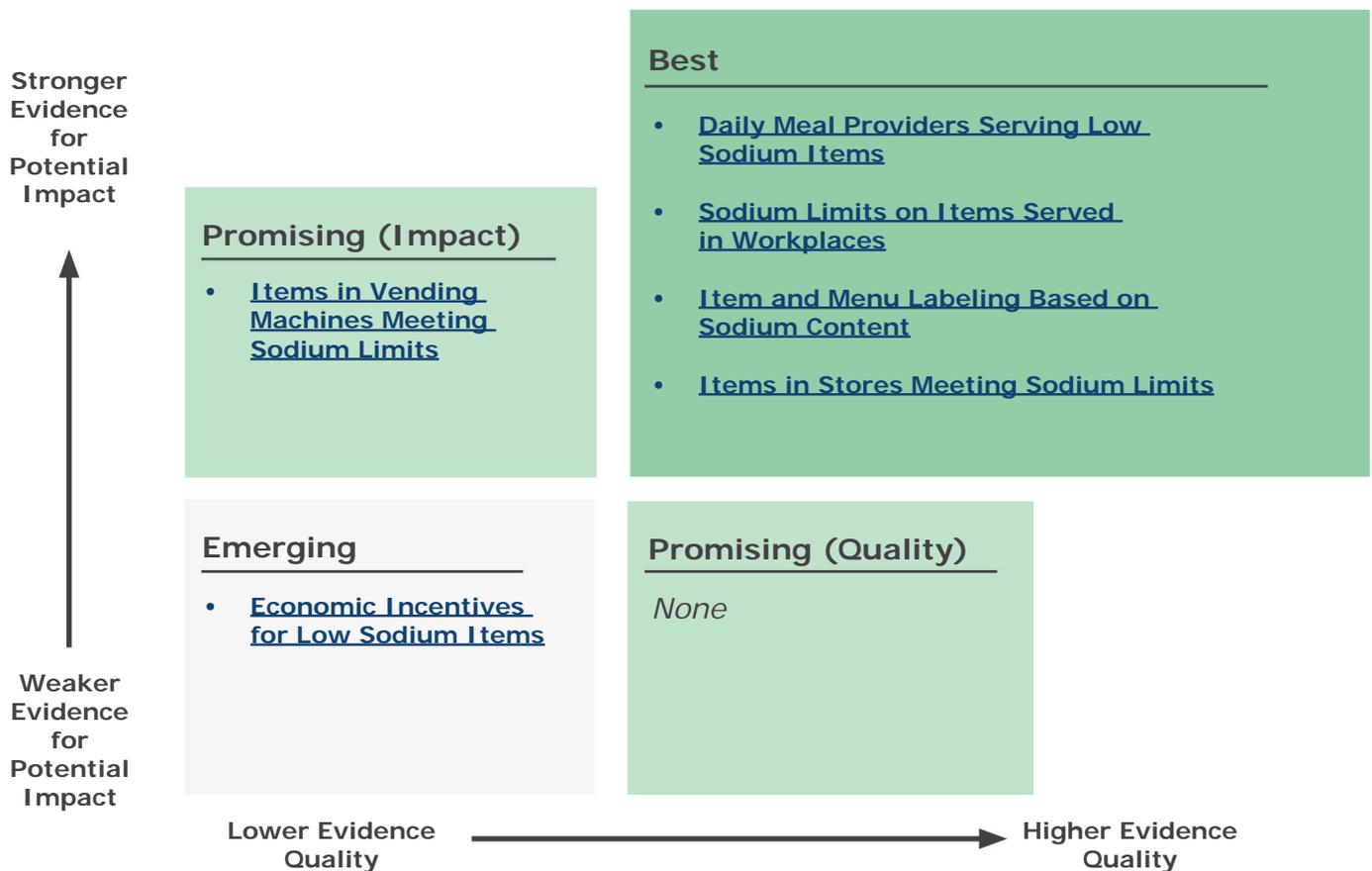
These policy interventions with “promising” or “emerging” evidence could also have positive impacts, but the quantity and quality of the evidence for public health impact is limited at this time:

- Items in Vending Machines Meeting Sodium Limits
- Economic Incentives for Low Sodium Items

See the [Appendix](#) for a more detailed description of the methodology, including the scoring for both evidence for potential public health impact and evidence quality.

**Figure 1. Six policy interventions influencing sodium reduction efforts addressed in existing state or local law as of January 1, 2019.**

Use the links in this figure to navigate to an evidence summary for each policy intervention.



## In-Depth Results

This report focuses on the **evidence and outcomes specific to sodium** and their relationship with the selected policy interventions. This includes 76 items of evidence—70 practice-based studies and six research-based studies. Positive outcomes reported within the evidence base included:

- Increased availability of items with reduced sodium
- Reduced sodium content in items
- Reduced sodium intake (among general, low-income, and minority populations)
- Healthy items with reduced sodium content
- Positive influence on purchasing reduced sodium items
- Improved food environment
- Improved clinical outcome
- Improved consumer knowledge of reduced sodium items
- Improved affordability of reduced sodium items
- Increased sales of reduced sodium items
- Reduced cost of reduced sodium items

The evidence base examined the US adult population (aged 18 or older), which also includes inmates, older adults, adults with mental illness, and low-income and minority populations.

Policy interventions addressing **Daily Meal Providers Serving Low Sodium Items** (34 items of evidence), **Sodium Limits on Items Served in Workplaces** (34 items), **Item and Menu Labeling Based on Sodium Content** (25 items), and **Items in Stores Meeting Sodium Limits** (16 items) had the most robust evidence base available for potential public health impact and quality.

The evidence base for **Items in Vending Machines Meeting Sodium Limits** (7 items) scored “promising evidence for potential public health impact,” which highlights the limited number of studies from research and practice. Other studies focused on overall healthy diets and were found to be supportive in the use of vending machines as an intervention. However, few studies met the narrow inclusion criteria for this specific policy intervention. Studies focusing on healthy vending machines may not mention the word “sodium” or “salt” in the abstracts or titles, highlight sodium as a main outcome, or focus on US adults or general populations. Therefore, readers are directed to broader nutrition research studies to learn more about this important topic.<sup>10</sup> Future researchers could consider focusing on sodium reduction interventions and outcomes in vending machines among adults in the United States.

The evidence base for **Economic Incentives for Low Sodium Items** (5 items) scored “Emerging” due to limited evidence on potential public health impact and quality. While there are current limitations in the evidence for this policy intervention, subject matter experts suggest continued monitoring of this area.

## Limitations of This Report

- This is not a systematic review. Systematic reviews are not possible for policies that only have early evidence. This report may include studies based in practice where rigorous designs were not possible due to real-world circumstances. Furthermore, this report includes non-empirical evidence (e.g., expert opinion and theory-building narratives) that are not included in systematic reviews.
- This report focused on interventions to reduce sodium, as opposed to interventions to improve the overall nutritional profile of healthy foods (Table 2). Studies were excluded if they did not report sodium reduction outcomes. For example, some evidence sought to change the nutritional content of products as a whole by targeting multiple nutrients (i.e., “healthier” products); however, if the independent effect of sodium on the health outcome could not be determined, these studies were excluded. This focus may have excluded potentially supportive articles of some policy interventions.
- Procurement guidelines are broad and can refer to a number of different settings (e.g., food in vending machines on government property, food served to employees, food served by city agencies). Rather than focusing on the guidelines as a whole, we analyzed these guidelines by setting to ensure the evidence base is applicable to each policy intervention.
- Key words were used to search and classify the items of evidence. This narrowed the scope and quantity of evidence.
- This report does not rate the impact of the policy interventions found within existing law, nor does it compare the policy interventions to each other.

**Table 2. Inclusion and exclusion criteria for the policy evidence assessment report**

Inclusion	Exclusion
<ul style="list-style-type: none"> <li>• Best available evidence per Quality and Impact of Component Evidence Assessment (QuIC) definition (including programmatic and policy items of evidence)</li> <li>• Evidence published between January 1, 2010, and before October 2018</li> <li>• US settings</li> <li>• Adult population (aged 18 or older)</li> <li>• Relevant to one or more identified policy intervention</li> </ul>	<ul style="list-style-type: none"> <li>• Not best available evidence per QuIC definition</li> <li>• Non-US settings</li> <li>• School-based or early care and education interventions</li> <li>• Federal level laws (e.g., nutrition facts label)</li> <li>• Broad nutrition-based studies that looked at other aspects of a healthy food diet and did not explicitly state “sodium”/“salt” in the title and/or abstract</li> </ul>

Given the nature of these **early evidence assessments**, the evidence level for each policy intervention may change as impactful, higher-quality evidence becomes available. These evidence levels provide an initial gauge of the current status of the sodium-specific literature related to the selected policy interventions.

## How to Use This Report

**Results of this assessment can be considered a decision aid tool that summarizes evidence-informed interventions supporting sodium reduction.**

State decision makers and public health organizations may consider researching the health status of their state's population. CDC offers many health facts on its website, including those related to [sodium consumption](#). Next, these stakeholders may consider presenting this report, along with facts about sodium consumption rates and existing nutrition policies and programs, to state and local public health agencies, health care providers and payers, and others interested in improving health outcomes.

Researchers and evaluators could help build stronger evidence for these “promising” and “emerging” policy interventions. They may consider reviewing this report for evidence gaps to be addressed in future studies. This assessment identified some research gaps, including the following:

- How do sodium reduction interventions affect populations living in food deserts (i.e., areas lacking in fresh fruit, vegetables, and other healthy whole foods, largely due to a lack of grocery stores, farmers' markets, and healthy food providers)?
- Which other policy interventions found within state or local laws could facilitate sodium reduction?
- How do these policy interventions affect clinical outcomes, such as hypertension?
- Which economic incentives for consumers or vendors affect sodium reduction, and to what extent?

## Evidence Summaries

The next section provides [evidence summaries](#) of six policy interventions affecting sodium consumption included in this assessment.

**How to use an evidence summary.** Evidence summaries describe the evidence used to score a policy intervention's evidence base on potential public health impact and quality. Each evidence summary includes a full reference and evidence list, an intervention description with identified settings, a list of **the positive outcomes observed** in intervention studies, and the specific states or municipalities in which these outcomes were found. If there were no studies of an actual health or economic outcome for a policy intervention, a rationale for the policy intervention, as described by experts and practitioners, is provided. See the [Appendix](#) for more on the method used to develop evidence summaries.

Each evidence summary includes a brief description of a state and local law that closely align with the policy intervention and may be listed among the states where the intervention achieved positive health outcomes (but not necessarily).

## References

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# Evidence Summaries



# Daily Meal Providers Serving Low Sodium Items

Evidence Level: **BEST**

Meal service providers offer items that are consistent with nutrition guidance, along with corresponding nutrition education encouraging participants to adopt dietary patterns that promote nutritional health and reduce the risk of diet-related chronic disease.<sup>31</sup> The available evidence mentioned sodium limits on items (i.e., prepared foods, packaged snacks, and/or beverages) delivered by daily meal providers, such as:

- No more than 720 mg of sodium per serving of combo meal items, 600 mg of sodium per serving for entrée items, 200 mg of sodium per serving for side items, and 200 mg per serving of sodium per package for snack items (Morrison's new Great Living patient menu).<sup>16</sup>
- No more than 700 mg sodium per serving (LiVe Well Plate health initiative).<sup>24</sup>

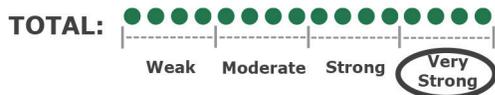
## Example of state law addressing this type of intervention

**North Carolina:** "Agencies providing congregate nutrition or home delivered meal services must comply with the following menu planning requirements: ...The sodium content shall not exceed 1,300 mg per meal." [10A N.C. ADMIN. CODE 6K.0203\(a\) \(2019\)](#).

## Example of local law addressing this type of intervention

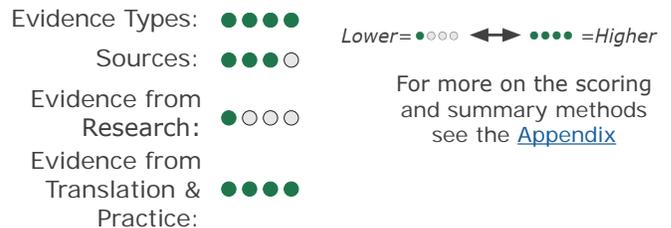
**New York City, NY:** "All City agencies shall follow the Food Standards [New York City Food Standards, [here](#), which set several limits on sodium content] for all meals that are purchased, prepared or served by the agency." [N.Y.C. EXECUTIVE ORDER NO. 122 \(Sept. 19, 2008\)](#).

### Evidence for Potential Public Health Impact:



**SCORE: VERY STRONG**

### Evidence Quality:



**SCORE: HIGH**

### Health-related outcomes

Daily meal providers serving low sodium items were linked to increased availability of items with reduced sodium<sup>1,4-6</sup> and reduced sodium content in items.<sup>4-12</sup> Interventions including daily meal providers serving low sodium items were linked to reduced sodium intake,<sup>2,13</sup> reduced sodium content in items,<sup>13-15</sup> and increased availability of items with reduced sodium.<sup>15,16</sup>

### Population(s) impacted

Studies reporting positive health-related outcomes examined the general population.<sup>1,2,5-16</sup> One study examined inmates,<sup>4</sup> two examined older adults,<sup>4,17</sup> and one examined those with mental illness.<sup>4</sup>



## Daily Meal Providers Serving Low Sodium Items (cont.)

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### Economic highlights

Daily meal providers serving low sodium items was linked to a decrease in prices of reduced sodium items and an increase in sales of reduced sodium items.<sup>9</sup> Interventions including daily meal providers serving low sodium items were linked to improved productivity<sup>3</sup> and improved affordability of reduced sodium items.<sup>16</sup>

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### State and local settings where interventions achieved positive health-related outcomes

Studies were set at the local level in New York City,<sup>5,15</sup> Philadelphia,<sup>11</sup> San Antonio,<sup>6,12</sup> San Diego,<sup>4,8</sup> Spokane,<sup>10</sup> Springfield (Oregon),<sup>9</sup> and Steuben County.<sup>17</sup> Studies were set at the state level in Kansas,<sup>1</sup> Maryland,<sup>2</sup> and New York.<sup>7,14</sup> There was one national study.<sup>16</sup>

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### Specific settings where interventions achieved positive health-related outcomes

Studies were set within city agencies,<sup>15</sup> congregate meal sites,<sup>7</sup> detention facilities,<sup>4</sup> government programs,<sup>6</sup> long-term care facilities,<sup>2</sup> residences,<sup>7</sup> hospital cafeterias,<sup>2,5,8,9,14,15,17</sup> non-trainee military dining facilities,<sup>13</sup> nursing homes,<sup>7,11</sup> senior nutrition programs,<sup>4,12,17</sup> universities,<sup>18</sup> and worksites.<sup>1,4,6,16</sup>

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# Daily Meal Providers Serving Low Sodium Items (cont.)

## Evidence Base

### Systematic reviews

1. Niebylski M, Lu T, Campbell N, et al. Healthy food procurement policies and their impact. *Int J Environ Res Public Health*. 2014;11(3):2608-2627. doi:10.3390/ijerph110302608

### Research-based studies

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### Practice-based studies

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## Daily Meal Providers Serving Low Sodium Items (cont.)

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## Sodium Limits on Items Served in Workplaces (cont.)

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<b>Population(s) impacted</b>	Studies reporting positive health-related outcomes examined the general population. <sup>2,3,6-10</sup> One study examined inmates, older adults, and those with mental illness. <sup>5</sup>
<b>Economic highlights</b>	Sodium limits on items served in workplaces was linked to a decrease in prices of reduced sodium items <sup>8</sup> and an increase in sales of reduced sodium items. <sup>8</sup> Interventions including sodium limits on items served in workplaces was linked to improved productivity <sup>4</sup> and improved affordability of reduced sodium items. <sup>10</sup>
<b>State and local settings where interventions achieved positive health-related outcomes</b>	Studies were set at the local level in New York City, <sup>6</sup> San Antonio, <sup>7</sup> and San Diego. <sup>5</sup> Studies were set at the state level in Kansas, <sup>2</sup> Maryland, <sup>3</sup> Oregon, <sup>8</sup> and Washington. <sup>9</sup> There was one national study. <sup>10</sup>
<b>Specific settings where interventions achieved positive health-related outcomes</b>	Studies were set within government programs, <sup>7</sup> hospital cafeterias, <sup>6,8,10</sup> long-term care facilities, <sup>3</sup> senior nutrition programs, <sup>5</sup> universities, <sup>9</sup> and worksites. <sup>2,7</sup>

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# Sodium Limits on Items Served in Workplaces (cont.)

## Evidence Base

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17. Mason M, Zaganjor H, Bozlak CT, Lammel-Harmon C, Gomez-Feliciano L, Becker AB. Working with community partners to implement and evaluate the Chicago Park District's 100% Healthier Snack Vending Initiative. *Prev Chronic Dis.* 2014;11:E135. doi:10.5888/pcd11.140141

### Narratives and commentaries

18. Appel LJ, Angell SY, Cobb LK, et al. Population-wide sodium reduction: the bumpy road from evidence to policy. *Ann Epidemiol.* 2012;22(6):417-425. doi:10.1016/j.annepidem.2012.04.003
19. Centers for Disease Control and Prevention. *Under Pressure: Strategies for Sodium Reduction in the Hospital Environment.* Atlanta, GA: Centers for Disease Control and Prevention; 2011.
20. Mozaffarian D. Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: a comprehensive review. *Circulation.* 2016;133(2):187-225. doi:10.1161/CIRCULATIONAHA.115.018585



# Item and Menu Labeling Based on Sodium Content

Evidence Level: **BEST**

Manufacturers providing nutrition content on the **front of packages** and on **menus** can influence purchasing habits and sodium consumption. When required to display numeric or symbolic indicators of the sodium content in items (i.e., prepared foods, packaged snacks, and/or beverages), manufacturers are likely to reduce sodium in their items and positively affect consumer health. Labels can come in the form of traffic lights, text labels with sodium amounts, or scores based on nutrient content.

*NOTE: Literature related to Nutrition Facts labels was excluded, as these labels are covered within federal law through The Nutrition Labeling and Education Act.*

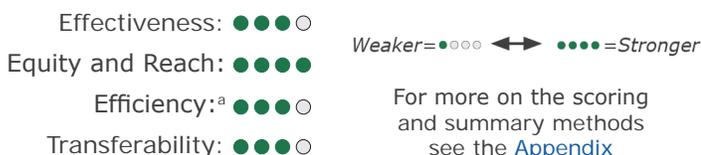
## Example of state law addressing this type of intervention

**Oregon:** "Each chain restaurant shall accurately ascertain and make available on site, and in written format, the typical nutrient values for each menu item and combination meal menu item, as the item is usually prepared and offered for sale on menus, menu boards and food tags, including condiments routinely added to a menu item as part of a standard recipe: ...Total milligrams of sodium." [OR. ADMIN. R. 333-015-0110 \(2019\)](#).

## Example of local law addressing this type of intervention

**New York City, NY:** "A covered establishment that offers for sale any food item with a high sodium content must provide the following warning: ...An icon must appear on a menu or menu board next to any food item with a high sodium content, or on a tag next to any food on display that is a food item with a high sodium content... The icon must be a black and white equilateral triangle as wide as it is tall and equal in height to the largest letter in the food item's name, as displayed on the menu, menu board, or tag next to any food on display; and [t]he following statement must be posted conspicuously at the point of purchase: 'Warning: [symbol] indicates that the sodium (salt) content of this item is higher than the total daily recommended limit (2300 mg). High sodium intake can increase blood pressure and risk of heart disease and stroke.'" [N.Y.C. HEALTH CODE § 81.49\(b\) \(2019\)](#).

### Evidence for Potential Public Health Impact:



**SCORE: VERY STRONG**

### Evidence Quality:



**SCORE: VERY HIGH**

### Health-related outcomes

Interventions including sodium labeling were linked to decreased risk for cardiometabolic syndrome,<sup>7</sup> improved consumer knowledge of reduced sodium items,<sup>3,4</sup> positive influence on purchasing reduced sodium items,<sup>8</sup> healthy items with reduced sodium content,<sup>8-11</sup> and reduced sodium intake.<sup>7,9</sup>

a. This score is based on a single study that found a one-cent reduction in the cost of items (\$0.83 to \$0.82) when comparing the first quarter of every year from 2014 to 2016.



## Item and Menu Labeling Based on Sodium Content (cont.)

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<b>Population(s) impacted</b>	Studies reporting positive health-related outcomes examined the general population. <sup>3,4,7-11</sup>
<b>Economic highlights</b>	Interventions including sodium labeling were linked to reduced cost of reduced sodium items. <sup>11</sup>
<b>State and local settings where interventions achieved positive health-related outcomes</b>	Studies were set at the local level in Indianapolis, <sup>11</sup> King County, <sup>9</sup> Philadelphia, <sup>8</sup> and Pierce County. <sup>4</sup> Studies were set at the state level in Connecticut. <sup>3</sup> There were two national studies. <sup>4,7</sup>
<b>Specific settings where interventions achieved positive health-related outcomes</b>	Studies were set within full-service restaurants, <sup>4,7,8</sup> hospital vending machines, <sup>11</sup> quick service restaurants, <sup>9</sup> and sit-down restaurants. <sup>9</sup>

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# Item and Menu Labeling Based on Sodium Content (cont.)

## Evidence Base

### Systematic reviews

1. Afshin A, Penalvo J, Del Gobbo L, et al. CVD prevention through policy: a review of mass media, food/menu labeling, taxation/subsidies, built environment, school procurement, worksite wellness, and marketing standards to improve diet. *Curr Card Rep*. 2015;17(11):98. doi:10.1007/s11886-015-0658-9
2. Cantu-Jungles TM, McCormack LA, Slaven JE, Slebodnik M, Eicher-Miller HA. A meta-analysis to determine the impact of restaurant menu labeling on calories and nutrients (ordered or consumed) in U.S. adults. *Nutrients*. 2017;9(10):30. doi:10.3390/nu9101088<sup>b</sup>

### Research-based studies

3. Roberto CA, Bragg MA, Seamans MJ, Mechulan RL, Novak N, Brownell KD. Evaluation of consumer understanding of different front-of-package nutrition labels, 2010–2011. *Prev Chronic Dis*. 2012;9:E149. doi:10.5888/pcd9.120015
4. Gorski Findling MT, Werth PM, Musicus AA, et al. Comparing five front-of-pack nutrition labels' influence on consumers' perceptions and purchase intentions. *Prev Med*. 2018;106:114–121. doi:10.1016/j.ypmed.2017.10.022
5. Byrd K, Almanza B, Ghiselli RF, Behnke C, Eicher-Miller HA. Adding sodium information to casual dining restaurant menus: beneficial or detrimental for consumers? *Appetite*. 2018;125:474–485. doi:10.1016/j.appet.2018.02.025<sup>c</sup>
6. Pratt NS, Ellison BD, Benjamin AS, Nakamura MT. Improvements in recall and food choices using a graphical method to deliver information of select nutrients. *Nutr Res*. 2016;36(1):44–56. doi:10.1016/j.nutres.2015.10.009

### Practice-based studies

7. Lichtenstein AH, Carson JS, Johnson RK, et al. Food intake patterns assessed by using front-of-pack labeling program criteria associated with better diet quality and lower cardiometabolic risk. *Am J Clin Nutr*. 2014;99(3):454–462. doi:10.3945/ajcn.113.071407
8. Auchincloss AH, Mallya GG, Leonberg BL, Ricchezza A, Glanz K, Schwarz DF. Customer responses to mandatory menu labeling at full-service restaurants. *Am J Prev Med*. 2013;45(6):710–719. doi:10.1016/j.amepre.2013.07.014
9. Bruemmer B, Krieger J, Saelens BE, Chan N. Energy, saturated fat, and sodium were lower in entrées at chain restaurants at 18 months compared with 6 months following the implementation of mandatory menu labeling regulation in King County, Washington. *J Acad Nutr Diet*. 2012;112(8):1169–1176. doi:10.1016/j.jand.2012.04.019
10. Pulos E, Leng K. Evaluation of a voluntary menu-labeling program in full-service restaurants. *Am J Public Health*. 2010;100(6):1035–1039. doi:10.2105/AJPH.2009.174839
11. Centers for Disease Control and Prevention. *Eskenazi Health Food and Nutrition Services, Indianapolis, Indiana: Sodium Reduction in Vending Machines*. Atlanta, GA: Centers for Disease Control and Prevention; 2016.
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13. Kaiser Permanente. *Kaiser Permanente Cafeteria Menu Labeling*. Oakland, CA: Kaiser Permanente National Nutrition Services Procurement & Supply and National Community Benefit Departments; 2013.
14. Centers for Disease Control and Prevention. *Reducing Sodium—A Johnson County Heart Health Initiative*. Atlanta, GA: Centers for Disease Control and Prevention; 2013.
15. Downs S, Bloem M, Graziose MM. Salt and the city: a preliminary examination of New York City's sodium warning labels. *FASEB J*. 2017;31(1 Suppl 1).<sup>d</sup>
16. Dunford EK, Poti JM, Xavier D, Webster JL, Taillie LS. Color-coded front-of-pack nutrition labels—an option for U.S. packaged foods? *Nutrients*. 2017;9(5):10. doi:10.3390/nu9050480
17. Lessard L, Poland M, Trotter M. Lessons learned from a healthful vending pilot program in Delaware state agency buildings, 2011–2012. *Prev Chronic Dis*. 2014;11:E143. doi:10.5888/pcd11.140188<sup>e</sup>
18. Levings JL, Gunn JP. From menu to mouth: opportunities for sodium reduction in restaurants. *Prev Chronic Dis*. 2014;11:130237. doi:10.5888/pcd11.130237
19. *Local Health Departments and HIV Prevention: Ten Ways to Connect with NACCHO*. National Association of County & City Health Officials; 2014.
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### Narratives and commentaries

21. Bellatti A, Simon M. Regulating front-of-package labeling: an exercise in futility? *J Hum Environ Nutr*. 2011;6(4):513–523. doi:10.1080/19320248.2011.625815<sup>g</sup>
22. Centers for Disease Control and Prevention. *Under Pressure: Strategies for Sodium Reduction in the Hospital Environment*. Atlanta, GA: Centers for Disease Control and Prevention; 2011.
23. Jacobson MF, Krieger J, Brownell KD. Potential policy approaches to address diet-related diseases. *JAMA*. 2018;320(4):341–342. doi:10.1001/jama.2018.7434
24. Temple NJ, Fraser J. Food labels: a critical assessment. *Nutrients*. 2014;30(3):257–260. doi:10.1016/j.nut.2013.06.012
25. Wolfson JA, Moran AJ, Jarlenski MP, Bleich SN. Trends in sodium content of menu items in large chain restaurants in the U.S. *Am J Prev Med*. 2018;54(1):28–36. doi:10.1016/j.amepre.2017.08.018

- a. No outcome—The authors noted that menu labeling did not affect sodium content of ordered foods or sodium intake.
- b. Mixed outcome—The authors found that calorie plus sodium numeric information menu labeling affected sodium in meals ordered; however, among consumers who felt that healthy food is not tasty, calorie plus sodium numeric information resulted in higher sodium content in meals.
- c. Mixed outcome—The authors noted that while the majority of restaurants included sodium warning labels on their menus, they were often difficult to interpret and rarely affected consumer purchasing decisions.
- d. Mixed outcome—The authors noted across the sites that while the amount of low sodium food and beverage items increased, it took a long time to be full compliant. They also found monthly profits at one site but losses at another in January 2012.
- e. No outcome—The authors noted a decrease in sodium between 2000 and 2013, but after 2011, sodium levels matched the expected rates based on pre-initiative trends, and more efforts are needed beyond changing the food retail environment.
- f. Mixed outcome—The authors noted that front-of-package labeling does lead to increased sales, but it may also lead consumers to purchase higher quantities of processed foods, including those with higher sodium content.



# Items in Stores Meeting Sodium Limits

Evidence Level: **BEST**

*Incentivizing or requiring stores (including chain grocery stores, convenience stores, corner stores, bodegas, gas stations, retailers, and markets) to limit sodium in the foods (i.e., prepared foods, packaged snacks, and/or beverages) they are selling may reduce consumer sodium intake by increasing the availability of lower sodium products,<sup>1</sup> encouraging consumers to purchase food with lower sodium content,<sup>2,3</sup> influencing consumer ordering decisions and intentions,<sup>4</sup> and supporting community programs that promote access to healthy foods and the reduction of sodium intake.<sup>10</sup> When available, the evidence base included sodium limits such as:*

- *No more than 2,300 mg of sodium per day (2010 Dietary Guidelines for Americans).<sup>5</sup>*

## Example of state law addressing this type of intervention

**Oklahoma:** “[A] healthy corner store shall meet the following requirements to be certified by the Department: ... (3) Actively promote healthy foods through signage and premium shelf space. (4) Stock items that include... a minimum of six (6) types of fresh produce... low-sodium or unsweetened canned fruits and vegetables...” [OKLA. ADMIN. CODE § 35:40-13-2 \(2019\)](#).

## Example of local law addressing this type of intervention

**San Francisco, CA:** “There is hereby created a Healthy Food Retailer Incentives Program for the City and County of San Francisco to be administered by the Department... The purpose of the Program shall be to increase access to healthy food; reduce unhealthy influences such as tobacco, alcohol, and processed foods high in salt, fat, and sugar in underserved parts of the City; and stimulate economic development and job creation by creating incentives for Healthy Food Retailers to open or expand in those underserved areas.” [SAN FRANCISCO ADMIN. CODE § 59.4 \(“Healthy Food Retailer Incentives Program”\) \(2018\)](#).

### Evidence for Potential Public Health Impact:

Effectiveness: ●●●○  
 Equity and Reach: ●●●○  
 Efficiency: ○○○○  
 Transferability: ●●●○

Weaker=●○○○ ↔ ●●●●=Stronger

For more on the scoring and summary methods see the [Appendix](#)



SCORE: **STRONG**

### Evidence Quality:

Evidence Types: ●●●○  
 Sources: ●●●○  
 Evidence from Research: ○○○○  
 Evidence from Translation & Practice: ●●●●

Lower=●○○○ ↔ ●●●●=Higher

For more on the scoring and summary methods see the [Appendix](#)



SCORE: **HIGH**

### Health-related outcomes

Interventions including items in stores meeting sodium limits were linked to increased availability of items with reduced sodium,<sup>1</sup> positive influence on purchasing reduced sodium items,<sup>2-4</sup> improved consumer knowledge of reduced sodium items,<sup>4</sup> and reduced sodium intake.<sup>10</sup>

### Population(s) impacted

Studies reporting positive health-related outcomes examined the general population,<sup>10</sup> low-income,<sup>1,2</sup> and minority populations.<sup>1,2</sup> Two studies mentioned expanding the reach of the intervention to additional local communities.<sup>1,4</sup>

### Economic highlights

No economic highlights from January 1, 2010, to October 1, 2018.



## Items in Stores Meeting Sodium Limits (cont.)

### State and local settings where intervention achieved positive health-related outcomes

Studies were set at the local level in Baltimore,<sup>1</sup> Johnson County,<sup>4</sup> and New York City.<sup>3</sup> There was one study set at the state level in Illinois.<sup>2</sup> There was one national study.<sup>10</sup>

### Specific settings where interventions achieved positive health-related outcomes

Studies were set within supermarkets,<sup>1</sup> small retailers,<sup>2</sup> corner stores,<sup>1,3</sup> bodegas,<sup>3</sup> grocery stores,<sup>4</sup> and convenience stores.<sup>10</sup>

## Evidence Base

### Research-based studies

No research-based studies January 1, 2010, to October 1, 2018

### Practice-based studies

1. Gittelsohn J, Suratkar S, Song H-J, et al. Process evaluation of Baltimore Healthy Stores: a pilot health intervention program with supermarkets and corner stores in Baltimore City. *Health Promot Pract.* 2010;11(5):723-732. doi:10.1177/1524839908329118
2. Zenk SN, Odoms-Young A, Powell LM, et al. Fruit and vegetable availability and selection: federal food package revisions, 2009. *Am J Prev Med.* 2012;43(4):423-428.
3. Dannefer R, Williams DA, Baronberg S, Silver L. Healthy bodegas: increasing and promoting healthy foods at corner stores in New York City. *Am J Public Health.* 2012;102(10):e27-e31. doi:10.2105/AJPH.2011.300615
4. Centers for Disease Control and Prevention. *Reducing Sodium—A Johnson County Heart Health Initiative.* Atlanta, GA: Centers for Disease Control and Prevention; 2013.
5. Greer S, Schieb L, Schwartz G, Onufrak S, Park S. Association of the neighborhood retail food environment with sodium and potassium intake among U.S. adults. *Prev Chronic Dis.* 2014;11:E70. doi:10.5888/pcd11.130340<sup>a</sup>
6. Taillie LS, Ng SW, Popkin BM. Gains made by Walmart's Healthier Food Initiative mirror preexisting trends. *Health Aff (Millwood).* 2015;34(11):1869-1876. doi:10.1377/hlthaff.2015.0072<sup>b</sup>
7. Gillespie C, Maalouf J, Yuan K, et al. Sodium content in major brands of U.S. packaged foods, 2009. *Am J Clin Nutr.* 2015;101(2):344-353. doi:10.3945/ajcn.113.078980
8. Stern D, Poti JM, Ng SW, Robinson WR, Gordon-Larsen P, Popkin BM. Where people shop is not associated with the nutrient quality of packaged foods for any racial-ethnic group in the United States. *Am J Clin Nutr.* 2016;103(4):1125-1134. doi:10.3945/ajcn.115.121806
9. Welsh EM, Perveen G, Clayton P, Hedberg R. Sodium reduction in communities Shawnee County survey 2011: methods and baseline key findings. *J Public Health Manag Pract.* 2014;20(1 Suppl 1):S9-S15. doi:10.1097/PHH.0b013e31829d7f63

### Narratives and commentaries

10. Aoki JR, Dawkins SA, Bishop SK. Implementing the IOM's recommendations for reducing sodium in the U.S. food supply: considerations and approaches. *Food Drug Law J.* 2014;69(1):53-85, ii.
11. Johnston YA, McFadden M, Lamphere M, Buch K, Stark B, Salton JL. Working with grocers to reduce dietary sodium: lessons learned from the Broome County Sodium Reduction in Communities pilot project. *J Public Health Manag Pract.* 2014;20(1 Suppl 1):S54-S58. doi:10.1097/PHH.0b013e3182a0b91a
12. Levings JL, Cogswell ME, Gunn JP. Are reductions in population sodium intake achievable? *Nutrients.* 2014;6(10):4354-4361. doi:10.3390/nu6104354
13. Mugavero KL, Gunn JP, Dunet DO, Bowman BA. Sodium reduction: an important public health strategy for heart health. *J Public Health Manag Pract.* 2014;20(1 Suppl 1):S1-S5. doi:10.1097/PHH.0b013e3182aa659c
14. Mugavero K, Losby JL, Gunn JP, Levings JL, Lane RI. Reducing sodium intake at the community level: the sodium reduction in communities program. *Prev Chronic Dis.* 2012;9:E168. doi:10.5888/pcd9.120081
15. Sugarman SD. Enticing business to create a healthier American diet: performance-based regulation of food and beverage retailers. *Law Pol.* 2014;36(1):91-112. doi:10.1111/lapo.12012

- a. Mixed outcome—The authors found no significant relationship between sodium intake and food environment. The presence or absence of stores selling more healthy foods does not influence levels of sodium consumption. Interventions may be more effective at the national level versus the local level.
- b. Mixed outcome—The authors found that the food retailer had major declines in energy, sodium, and sugar density, as well as declines in sugary beverages, grain-based desserts, snacks, and candy, beyond trends at similar retailers. However, post-intervention declines were similar to what we expected based on pre-intervention trends. This suggests that food retailer-based interventions alone may not be sufficient to improve the nutritional profile of food purchases.



# Items in Vending Machines Meeting Sodium Limits

Evidence Level: **PROMISING EVIDENCE FOR POTENTIAL PUBLIC HEALTH IMPACT**

Items in vending machines meeting sodium limits are part of a larger strategy to increase the availability of and access to healthy foods.<sup>1</sup> From the available evidence, sodium limits on items (i.e., packaged snacks and/or beverages) sold in vending machines included:

- No more than 200 mg of sodium per serving (Massachusetts School Nutrition Standards for Competitive Foods and Beverages<sup>2</sup> and Food Services Guidelines for Federal Facilities).<sup>7</sup>
- No more than 230 mg of sodium per serving for “green foods” and no more than 400 mg of sodium per serving for “yellow foods” in a stoplight-categorized system (Eskenazi Health, loosely modeled on the Health and Sustainability Guidelines for Federal Concessions and Vending Operations).<sup>3</sup>
- No more than 360 mg of sodium per serving (Los Angeles Healthy Vending Machine Policy).<sup>1</sup>
- No more than 400 mg of sodium per serving (Alliance for a Healthier Generation and American Heart Association).<sup>5</sup>

## Example of state law addressing this type of intervention

**Washington:** “By July 1, 2014, all state executive agencies shall adopt and begin to implement a food and beverage service policy for employees.... These policies shall ensure for the provision of healthful food and beverages in...vending machines.... These policies shall meet the standard of the [Washington State Healthy Nutrition Guidelines](#)....” [WASHINGTON EXECUTIVE ORDER NO. 13-06 \(October 30, 2013\)](#).

## Example of local law addressing this type of intervention

**Howard County, MD:** “On all County property, at least 75 percent of the packaged food and beverage options offered in vending machines shall be healthy food or beverage options...[and h]ealthy food options shall...[c]ontain no more than 200 mg of sodium per package.” [HOWARD CTY., MD., CODE §§ 12.1801\(d\)\(6\), 12.1802 \(2019\)](#).

### Evidence for Potential Public Health Impact:

Effectiveness: ●●●○  
 Equity and Reach: ●●●○  
 Efficiency: ●●●○  
 Transferability: ●●●○

Weaker=●●●○ ↔ ●●●●=Stronger

For more on the scoring and summary methods see the [Appendix](#)



SCORE: **STRONG**

### Evidence Quality:

Evidence Types: ●●●○  
 Sources: ●●●○  
 Evidence from Research: ○○○○  
 Evidence from Translation & Practice: ●●○○

Lower=●●●○ ↔ ●●●●=Higher

For more on the scoring and summary methods see the [Appendix](#)



SCORE: **MODERATE**

### Health-related outcomes

Interventions including items meeting sodium limits in vending machines were linked to healthy items meeting reduced sodium content,<sup>1,2,3</sup> improved consumer knowledge of reduced sodium item,<sup>4</sup> and increased availability of items with reduced sodium and increased availability in sodium information and reduced sodium items.<sup>7</sup>

### Population(s) impacted

Studies reporting positive health-related outcomes examined the general population,<sup>1-3,7</sup> organizations serving the homeless population,<sup>2</sup> and rural populations.<sup>4</sup>



# Items in Vending Machines Meeting Sodium Limits (cont.)

## Economic highlights

Interventions including items meeting sodium limits in vending machines were linked to increased sales of reduced sodium items<sup>5,7</sup> and reduced cost of reduced sodium items.<sup>3</sup>

## State and local settings where interventions achieved positive health-related outcomes

Studies were set at the local level in Los Angeles.<sup>1</sup> Studies were set at the state level in Massachusetts<sup>2</sup> and Illinois.<sup>3,4,7</sup>

## Specific settings where interventions achieved positive health-related outcomes

Studies were set within hospitals,<sup>2,4</sup> YMCAs, community health centers,<sup>2</sup> local and state parks,<sup>7</sup> state buildings,<sup>3,7</sup> county buildings,<sup>1,7</sup> and private worksites.<sup>7</sup>

## Evidence Base

### Research-based studies

No research-based studies January 1, 2010, to October 1, 2018

### Practice-based studies

1. Wickramasekaran RN, Robles B, Dewey G, Kuo T. Evaluating the potential health and revenue outcomes of a 100% healthy vending machine nutrition policy at a large agency in Los Angeles County, 2013–2015. *J Public Health Manag Pract.* 2018;24(3):215-224. doi:10.1097/PHH.0000000000000702<sup>a</sup>
2. Brooks CJ, Barrett J, Daly J, et al. A community-level sodium reduction intervention, Boston, 2013–2015. *Am J Public Health.* 2017;107(12):1951-1957. doi:10.2105/AJPH.2017.304070<sup>b</sup>
3. Centers for Disease Control and Prevention. *Eskenazi Health Food and Nutrition Services, Indianapolis, Indiana: Sodium Reduction in Vending Machines.* Atlanta, GA: Centers for Disease Control and Prevention; 2016.
4. Amerson N, Nelson M, Radcliffe A, Moody C, Williams L, Miles C. Adoption of sodium reduction strategies in small and rural hospitals, Illinois, 2012. *Prev Chronic Dis.* 2014;11:E42. doi:10.5888/pcd11.130261
5. Mason M, Zaganjor H, Bozlak CT, Lammel-Harmon C, Gomez-Feliciano L, Becker AB. Working with community partners to implement and evaluate the Chicago Park District's 100% Healthier Snack Vending Initiative. *Prev Chronic Dis.* 2014;11:E135. doi:10.5888/pcd11.140141<sup>c</sup>
6. Lessard L, Poland M, Trotter M. Lessons learned from a healthful vending pilot program in Delaware state agency buildings, 2011–2012. *Prev Chronic Dis.* 2014;11:E143. doi:10.5888/pcd11.140188<sup>d</sup>

### Narratives and commentaries

7. Centers for Disease Control and Prevention. *Food Services Guidelines: Case Studies from States and Communities.* Atlanta, GA: Centers for Disease Control and Prevention; 2015.

- a. Negative outcome—The authors reported a decrease in revenue related to snacks and beverages purchased in vending machines.
- b. Mixed outcome—The authors indicated that there was no overall significant change in percentage of prepackaged foods with more than 200 mg per serving of sodium across vending machines. However, there was statistically significant decrease in the percentage of products with more than 200 mg per serving of sodium in the YMCA, community health centers, and organizations serving homeless populations.
- c. Mixed outcome—The authors reported that individuals had positive remarks on the healthful snack vending items (including low sodium options), but noncompliance was an issue and may have stemmed from mislabeling of items and restocking issues within vending machines.
- d. Mixed outcome—In a pilot program of healthful vending machines in Delaware State Agency buildings, the authors reported that the proportion of items meeting “Go” or “Slow” criteria (e.g., limit of 200 mg of sodium per item) being sold increased during the pilot period but decreased by 52% by the end of the pilot program. Additionally, monthly profit fluctuated from an increase of 6% to a loss of 30%.



# Economic Incentives for Low Sodium Items

Evidence Level: **EMERGING**

*Economic incentives (such as subsidies and reduced licensing fees for restaurants) can potentially lower the cost of low sodium items such as prepared foods, packaged snacks, and beverages. The intervention is briefly mentioned in five items of evidence.<sup>1-5</sup> A health impact assessment with a mathematical simulation found that food procurement policies, including incentives, could achieve positive health and economic outcomes.<sup>2</sup> While there is limited evidence related to sodium reduction, the concept of economic incentives is considered an evidence-based strategy to improve overall population dietary habits.<sup>5</sup>*

## Example of state law addressing this type of intervention

**Illinois:** "The Department of Human Services shall establish a Healthy Local Food Incentives Program to double the purchasing power of Illinois residents with limited access to fresh fruits and vegetables...[to purchase] any variety of fresh, canned, dried, or frozen whole or cut fruits and vegetables without added sugars, fats, or oils, and salt (i.e. sodium)...." [305 ILL. COMP. STAT. ANN. 5/12-4.50 \(West 2019\)](#).

## Example of local law addressing this type of intervention

**Santa Clara County, CA:** "A Restaurant may not provide an incentive item linked to the purchase of a single food item or meal if it includes any of the following: ...More than 480 mg of sodium for a single food item, or more than 600 mg of sodium for a meal..." [SANTA CLARA CTY., CAL., CODE § A18-352 2019](#).<sup>a</sup>

### Evidence for Potential Public Health Impact:

Effectiveness: ●○○○  
 Equity and Reach: ●○○○  
 Efficiency: ●○○○  
 Transferability: ●○○○

Weaker=●○○○ ↔ ●●●●=Stronger

For more on the scoring and summary methods see the [Appendix](#)



SCORE: **WEAK**

### Evidence Quality:

Evidence Types: ●●○○○  
 Sources: ●●●○○  
 Evidence from Research: ○○○○○  
 Evidence from Translation & Practice: ●●○○○

Lower=●○○○ ↔ ●●●●=Higher

For more on the scoring and summary methods see the [Appendix](#)



SCORE: **MODERATE**

**Health-related outcomes** *No health-related outcomes from January 1, 2010, to October 1, 2018.*

**Population(s) impacted** *No health-related outcomes from January 1, 2010, to October 1, 2018.*

**Economic highlights** *No health-related outcomes from January 1, 2010, to October 1, 2018.*

a. Although the law highlighted here has often been discussed in the context of children's meals, the text of this subsection of the law appears to have a general population focus.



## Economic Incentives for Low Sodium Items (cont.)

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### State and local settings where interventions achieved positive health-related outcomes

*No health-related outcomes from January 1, 2010, to October 1, 2018.*

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### Specific settings where interventions achieved positive health-related outcomes

*No health-related outcomes from January 1, 2010, to October 1, 2018.*

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## Evidence Base

### *Research-based studies*

*No research-based studies January 1, 2010, to October 1, 2018*

### *Practice-based studies*

1. Cummings PL, Kuo T, Gase LN, Mugavero K. Integrating sodium reduction strategies in the procurement process and contracting of food venues in the County of Los Angeles government, 2010–2012. *J Public Health Manag Pract.* 2014;20(1 Suppl 1):S16-S22. doi:10.1097/PHH.0b013e31829d7f63
2. Gase LN, Kuo T, Dunet D, Schmidt SM, Simon PA, Fielding JE. Estimating the potential health impact and costs of implementing a local policy for food procurement to reduce the consumption of sodium in the county of Los Angeles. *Am J Public Health.* 2011;101(8):1501-1507. doi:10.2105/AJPH.2011.300138
3. Gase LN, Kuo T, Dunet DO, Simon PA. Facilitators and barriers to implementing a local policy to reduce sodium consumption in the County of Los Angeles government, California, 2009. *Prev Chronic Dis.* 2011;8(2):A33.
4. Levings JL, Gunn JP. From menu to mouth: opportunities for sodium reduction in restaurants. *Prev Chronic Dis.* 2014;11:130237. doi:10.5888/pcd11.130237

### *Narratives and commentaries*

5. Mozaffarian D. Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: a comprehensive review. *Circulation.* 2016;133(2):187-225. doi:10.1161/CIRCULATIONAHA.115.018585

## Appendix—Methods

### Background

This report uses an early evidence assessment approach called the Quality and Impact of Component Evidence Assessment, or QuIC. For more on the QuIC method, contact [CDC DHDSP](#).

**In a QuIC assessment, “best available evidence”** refers to the written evidence base relevant to assessing the potential public health impact of a policy intervention reflected in state law, when there are no direct experimental studies assessing the law’s impact. A QuIC evidence base includes empirical and non-empirical analyses of public health policies, programs, activities, and using data or expert opinion that directly and/or indirectly link interventions of interest with actual or expected outcomes. Best available evidence can be found in journal articles, editorials, commentaries, and perspectives; policy briefs, statements, recommendations, and guidelines; evaluation and technical reports; conference papers; and white papers.

CDC DHDSP selected six policy interventions related to sodium reduction for this evidence assessment with the content of enacted state or local law and refined with contributions from nine people with expertise in nutrition and sodium reduction initiatives and strategies.

### Evidence Collection and Classification

A combination of DHDSP priorities and avoiding overlap of existing work at other entities helped inform the inclusion and exclusion criteria ([Table 2](#)). A chimeric approach was taken for the evidence collection process: Three searches were conducted on October 11, 2018; an updated search on March 1, 2019, with input from CDC librarians; and a grey literature search on April 24, 2019. All searches only included available evidence published between January 1, 2010, and October 1, 2018, with the following search terms within the titles and abstracts:

Sodium, Dietary/ or (sodium or salt) **AND**

(vending or vend or vends or vendor or restaurant\* or diner\* or fast food or food establishment\* or menu\* or cafeteria\* or serve\* or provide\* or purchas\* or procure\* or workplace\* or worksite\* or work or hospital or hospitals or hospice or prison\* or jail\* or senior or seniors or elder\* or disab\* or resident\* or recovery or halfway or grocery or supermarket\* or store\*) **AND**

(consum\* or reduce\* or reduction or limit\* or decrease\*) **AND**

(food\* or meal\* or diet\* or nutrition\* or snack\*) **AND**

(policy or policies or program or programs or intervention\* or law or laws or regulation or regulation\* or standard\* or guideline\* or strateg\* or initiative\* or tool\* or subsid\* or tax or incentiv\* or procurement or purchasing or fund or funds or funding or grant or grants or incentive\* or tax or taxed or taxes or label\* or picture\* or pictorial or icon or icons or warning\* or menu\* or subsid\*) **AND**

exp United States/ or (America\* or “U.S.A.” or “U.S.” or USA or US or United States or Alabama or Alaska or Arizona or Arkansas or California or Colorado or Connecticut or Delaware or Florida or Georgia or Hawaii or Idaho or Illinois or Indiana or Iowa or Kansas or Kentucky or Louisiana or Maine or Maryland or Massachusetts or Michigan or Minnesota or Mississippi or Missouri or Montana or Nebraska or Nevada or New Hampshire or New Jersey or New Mexico or New York or North Carolina or North Dakota or Ohio or Oklahoma or Oregon or Pennsylvania or Rhode Island or South Carolina or South Dakota or Tennessee or Texas or Utah or Vermont or Virginia or Washington or West Virginia or Wisconsin or Wyoming or Los Angeles or Chicago or Houston or Phoenix or Philadelphia or San Antonio or San Diego or Dallas or San Jose or Cook County or Harris County or Maricopa County or San Diego County or Orange County or Miami-Dade County or Kings County or Dallas County or Riverside County)

**Evidence Collection and Classification (cont.)**

The second search was conducted as the team identified that the initial search included a “human” limiter, which may have narrowed the results. The second search removed this limiter, which resulted in identifying 183 additional articles.

Six CDC policy staff classified the sodium evidence base to the six policy interventions. The evidence base is composed of 76 items of evidence that were relevant to assessing one or more of the six policy interventions. These included 70 practice-based studies and six research-based studies that either included the policy interventions of interest or recommended the policy interventions based on study findings.

**1,029** items of evidence collected from initial search conducted on October 11, 2018;  
**183** items of evidence collected from expanded search conducted on March 1, 2019;  
**40** items of grey literature collected on April 24, 2019

**Total: 1,252 items** of evidence collected

**1,092 items** of evidence excluded for one or more of the following reasons:  
(1) Duplication; (2) Not best available evidence per QuIC definition; (3) Year: Evidence was published before January 1, 2010, or after October 2018; (4) Non-US setting; (5) Not relevant to one or more of the six sodium reduction policy interventions

**160** items of evidence assessed for potential public health impact and quality  
(84 items further excluded during assessment due to lack of relevance to one or more of the six sodium reduction policy interventions)

**76** items classified to one or more policy interventions and assessed for potential public health impact and quality

### Coding and Scoring

To refine the codebook, the team abstracted and coded a sample of evidence for each policy intervention for potential public health impact and discussed coding issues as a group. Each item of evidence assigned to each policy intervention was then independently coded by two of the six coders.<sup>a</sup> Coding pairs reconciled coding discrepancies through discussion to reach consensus on every code.<sup>b</sup>

For each policy intervention, reconciled coding results were used to complete the [QuIC Evidence Assessment Tool](#). One QuIC Tool was completed for each of the six policy interventions; six tools were completed in total. To calculate the **evidence for potential impact level** and the **evidence quality level** for each policy intervention, the four criteria scores for impact and the four criteria scores for quality from the QuIC Tool were each assigned a numeric score for the highest level reached (0-4 points), and then criteria scores were summed across impact and quality.

#### Potential Public Health Impact

- Effectiveness
- Equity and Reach
- Efficiency
- Transferability

#### Evidence Quality

- Evidence Type
- Source
- Evidence From Research
- Evidence From Translation and Practice

Evidence from research includes studies where the researcher had control over allocation of participants into the intervention and the control groups. Evidence from translation and practice includes items where the evaluator did not have control over allocation of participants into the intervention and the comparison groups.

The numeric evidence for potential impact score and quality score were each converted into ordinal evidence levels.<sup>c</sup> Then each policy intervention’s **evidence for potential impact level** and **evidence quality level** were used to categorize policy interventions as **“best,” “promising (quality),” “promising (impact),” or “emerging”** ([Table 3](#)).

**Table 3. Method for categorizing overall evidence level using evidence for potential impact and quality levels**

Evidence for Potential Public Health Impact Level	Evidence Quality Level	Evidence Level
Strong or Very Strong	High or Very High	<b>Best</b>
Weak or Moderate	High or Very High	<b>Promising Evidence Quality</b>
Strong or Very Strong	Low or Moderate	<b>Promising Evidence for Potential Public Health Impact</b>
Weak or Moderate	Low or Moderate	<b>Emerging</b>

a. Contact [CDC DHDSP](#) for the QuIC Evidence Assessment Handbook.

b. This method has been shown to achieve “very good” to “excellent” inter-rater agreement within three previous QuIC assessments: Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention. *What Could Be Addressed in an Evidence-Informed State Workplace Health Promotion Law?* Atlanta, GA: Centers for Disease Control and Prevention; 2017; Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention. *What Evidence Supports State Laws to Establish Community Health Worker Scope of Practice and Certification?* Atlanta, GA: Centers for Disease Control and Prevention; 2017; & Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention. *What Evidence Supports State Laws to Enhance Public Access Defibrillation?* Atlanta, GA: Centers for Disease Control and Prevention; 2017.

c. The evidence for potential impact level was determined using the following conversion: 1–4 points = weak, 5–8 points = moderate, 9–12 points = strong, and 13–16 points = very strong. The evidence quality level was determined using the following conversion: 1–4 points = low, 5–8 points = moderate, 9–12 points = high, and 13–16 points = very high. For example, if the Effectiveness criterion scored “very strong” and the Equity and Reach criterion scored “very strong” and the Efficiency criterion scored “strong” and the Transferability criterion scored “strong,” then 4 + 4 + 3 + 3 = 14 = “very strong” evidence for potential impact.

Table 4 describes the evidence base category and potential next steps related to the policy intervention.

**Table 4. QuIC categories and next steps for policy development and evaluation**

Category	Evidence Base Description	Next Steps for Policy
<b>Best</b>	<p>Most often, this type of evidence base includes:</p> <ul style="list-style-type: none"> <li>At least one empirical study:                             <ul style="list-style-type: none"> <li>Directly or indirectly linking the intervention to mostly positive actual outcomes relevant to health and equity, reach, and/or efficiency across two or more distinctly different regions of the United States</li> <li>Published in a credible journal</li> </ul> </li> <li>Several research- and practice-based studies, as well as a large amount of translational evidence</li> <li>Evidence from a public health authority (e.g., the National Academy of Medicine) recommending the intervention based on narrative or systematic review</li> </ul>	<p>Policy interventions with “best” evidence bases may be considered first for inclusion in a policy and future policy studies.</p>
<b>Promising (Quality)</b>	<p>Most often, this type of evidence base includes:</p> <ul style="list-style-type: none"> <li>At least one empirical research study published in a credible journal directly or indirectly projecting a positive expected outcome relevant to health</li> <li>Many narrative reviews or commentaries suggesting the intervention based on translation of research-based and practice-based studies and/or practice-based knowledge and experience</li> <li>Evidence from a public health authority suggesting the intervention based on narrative review</li> </ul>	<p>Policy interventions with “promising (quality)” evidence bases may be considered second for inclusion in a policy, especially if they are expected to facilitate the effectiveness of “best” interventions. Caution about the need for evaluation of these interventions in the PEAR.</p>
<b>Promising (Impact)</b>	<p>Most often, this type of evidence base includes at least one empirical study that directly links an intervention to a positive actual outcome relevant to health and equity, reach, and/or efficiency. This study likely took place across two or more distinctly different regions of the United States. However, its design may not have been rigorous, the report may have not come from a source with known credibility, and there may be little to no evidence from research, translation, or practice to confirm positive outcomes.</p>	<p>Like those with “promising (quality)” evidence bases, policy interventions with “promising (impact)” evidence bases may be considered second for inclusion in a policy, especially if they are expected to facilitate the effectiveness of “best” interventions. Caution about the need for evaluation of these interventions in the PEAR.</p>
<b>Emerging</b>	<p>Most often, this type of evidence base includes at least one commentary, narrative review, or predictive study directly or indirectly suggesting positive expected outcomes relevant to health, equity, reach, and/or efficiency. However, evidence on actual outcomes is still needed.</p>	<p>Policy interventions with “emerging” evidence bases need more study. Caution about the need for evaluation of these interventions in the PEAR.</p>

**Evidence Summaries**

Each pair of coders jointly developed an evidence summary for their policy intervention. This was done by summarizing the evidence item for positive health-related outcomes observed, the populations and settings in which those specific positive health-related outcomes were observed, and any relevant economic outcomes. More general categories of outcomes, populations, and settings were created for the purposes of reporting; for example, if a study found increased availability of canned low sodium vegetables, this was reported as “increased availability and selection of low sodium food.” The list of specific outcomes and populations from this assessment could be useful to those evaluating sodium strategies—please [contact DHDSP](#) for this list.

Brief examples of state and local law in effect as of January 1, 2019, were chosen based on alignment with policy interventions. These examples were included in the evidence summaries as appropriate. A full inventory and description of sodium-related laws across the 50 states and D.C., in addition to the top 20 most populous cities and counties, will be provided in a separate [DHDSP State Law Fact Sheet](#).

## QuIC Evidence Assessment Tool

### Section 1. Evidence for Potential Public Health Impact

Criterion and What It Measures	Weak Evidence ● ○ ○ ○ ○	Moderate Evidence ● ● ○ ○ ○	Strong Evidence ● ● ● ○ ○	Very Strong Evidence ● ● ● ● ○
<b>Effectiveness</b> <i>Does it work (i.e., improve outcomes relevant to health)?</i>	Indirect evidence for a positive expected outcome relevant to health	Direct evidence for a positive expected outcome relevant to health	Indirect evidence of mostly positive actual outcomes relevant to health	Direct evidence of mostly positive actual outcomes relevant to health
<b>Equity and Reach</b> <i>Does it work for target population(s)?</i>	Indirect evidence for a positive expected outcome relevant to equity and reach	Direct evidence for a positive expected outcome relevant to equity and reach	Indirect evidence of mostly positive actual outcomes relevant to equity and reach	Direct evidence of mostly positive actual outcomes relevant to equity and reach
<b>Efficiency</b> <i>Is it a good use of resources?</i>	Indirect evidence for a positive expected outcome relevant to efficiency	Direct evidence for a positive expected outcome relevant to efficiency	Indirect evidence of mostly positive actual outcomes relevant to efficiency	Direct evidence of mostly positive actual outcomes relevant to efficiency
<b>Transferability</b> <i>Does it work across diverse settings?</i>	Indirect evidence for a positive expected outcome relevant to health in two or more regions of the United States	Direct evidence for a positive expected outcome relevant to health in two or more regions of the United States	Indirect evidence of mostly positive actual outcomes relevant to health in two or more regions of the United States	Direct evidence of mostly positive actual outcomes relevant to health in two or more regions of the United States

Note: If none of its requirements are met, a criterion is assigned a score of 0 points. ○ ○ ○ ○ ○

### Section 2. Evidence Quality

Criterion and What It Measures	Low Quality ● ○ ○ ○ ○	Moderate Quality ● ● ○ ○ ○	High Quality ● ● ● ○ ○	Very High Quality ● ● ● ● ○
<b>Evidence Types</b> <i>What is the most rigorous design?</i>	A narrative review or commentary suggests a positive outcome	A non-experimental study suggests a positive outcome	An experimental or quasi-experiment suggests a positive outcome	A systematic review suggests a positive outcome
<b>Sources</b> <i>What is the most credible source?</i>	A peer-reviewed journal or conference publication without conflict-of-interest disclosure suggests a positive outcome	A publication by a nonprofit or government organization suggests a positive outcome	A peer-reviewed journal or conference publication with conflict of interest disclosure suggests a positive outcome	A publication by a public health authority suggests a positive outcome
<b>Evidence from Research</b> <i>Relevance to controlled settings</i>	A small amount of evidence from research suggests positive outcomes	A moderate amount of evidence from research suggests positive outcomes	A large amount of evidence from research suggests positive outcomes	A very large amount of evidence from research suggests positive outcomes
<b>Evidence from Translation and Practice</b> <i>Relevance to real world</i>	A small amount of evidence from translation and practice suggests positive outcomes	A moderate amount of evidence from translation and practice suggests positive outcomes	A large amount of evidence from translation and practice suggests positive outcomes	A very large amount of evidence from translation and practice suggests positive outcomes

Note: If none of its requirements are met, a criterion is assigned a score of 0 points. ○ ○ ○ ○ ○

## Evidence Summary Template

# Policy Intervention

**Evidence Level:** *This field provides the evidence level of policy interventions related to sodium reduction, which is meant to help inform its priority during decision making: best, promising (quality), promising (impact), or emerging.*

### Intervention Description

*This section describes this policy intervention in detail, often providing supportive references.*

#### Example of state law addressing this type of intervention

This box briefly describes an example of a provision of state law addressing the policy intervention.<sup>a</sup>

#### Example of local law addressing this type of intervention

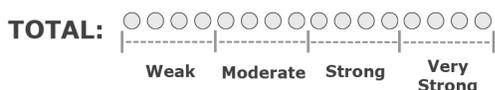
This box briefly describes an example of a provision of local law addressing the policy intervention.<sup>a</sup>

#### Evidence for Potential Public Health Impact:

Effectiveness: ○○○○  
 Equity and Reach: ○○○○  
 Efficiency: ○○○○  
 Transferability: ○○○○

Weaker=●○○○ ←→ ●●●●=Stronger

For more on the scoring and summary methods see the [Appendix](#)



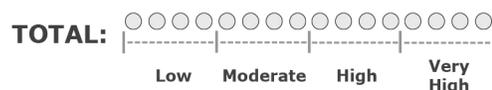
**SCORE:** Weak, Moderate, Strong, or Very Strong

#### Evidence Quality:

Evidence Types: ○○○○  
 Sources: ○○○○  
 Evidence from Research: ○○○○  
 Evidence from Translation & Practice: ○○○○

Lower=●○○○ ←→ ●●●●=Higher

For more on the scoring and summary methods see the [Appendix](#)



**SCORE:** Low, Moderate, High, or Very High

### Reported health-related outcomes

If there are studies analyzing health-related outcomes in the evidence base, this field provides the positive outcomes found and whether they were for this policy intervention and/or for sodium. Non-positive outcomes are footnoted in the "Evidence base" list below. If there were no studies observing positive outcomes, this field provides expert recommendations for the policy intervention (i.e., the rationale for positive health-related outcomes). While studies projecting positive outcomes contribute to scoring evidence for impact, they are not listed in this table.

### Groups studied

If positive health-related outcomes were found, this field provides the groups who were studied and/or cites the studies looking at general populations.

### Economic highlights

If there are studies analyzing economic outcomes—such as cost-effectiveness, return on investment, or quality of life—positive findings are provided in this field. Otherwise, absence of economic outcomes is noted.

### States and local settings where interventions achieved positive health-related outcomes

This field provides the states or localities in which the studies finding positive health-related outcomes were set and/or lists the national studies.

### Specific settings where interventions achieved positive health-related outcomes

This field provides the settings in which the studies found positive health-related outcomes were set.

a. The years used for legal citations in this document are the years when the references were last updated on the Westlaw website (states), the years the documents were last updated on a local law database (local laws), or, in the case of Executive Orders, the dates of enactment (or dates effective if more relevant). Links to laws on publicly accessible websites are provided for convenience.

## Evidence Summary Template

# Policy Intervention (cont.)

### Evidence Base

Here you will find the references supporting the description of the policy intervention.

#### *Systematic reviews*

Here you will find the studies for this policy intervention that are explicitly described as using “systematic review.” Systematic review is a design and method, often applied in public health research, for summarizing outcomes, populations, and settings across a group of high-quality studies of the same intervention.

#### *Research-based studies*

Here you will find the studies including this policy intervention that took place in a research context, in which researchers were able to allocate subjects into the intervention and the control groups.

#### *Practice-based studies*

Here you will find the studies of this policy intervention that took place under real-world circumstances. In these studies, evaluators were not able to allocate subjects into the intervention and the control groups.

#### *Narratives and commentaries*

Here you will find the evidence that provides recommendations for this policy intervention from subject matter experts and practitioners.

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