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## Health Professional Advice and Adult Action to Reduce Sodium Intake

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### Abstract

**Introduction**—Excessive sodium intake is a key modifiable risk factor for hypertension and cardiovascular disease. Although 95% of U.S. adults exceed intake recommendations, knowledge is limited regarding whether doctor or health professional advice motivates patients to reduce intake. Our objectives were to describe the prevalence and determinants of taking action to reduce sodium, and to test whether receiving advice was associated with action.

**Methods**—Analyses, conducted in 2014, used data from the 2013 Behavioral Risk Factor Surveillance System, a state-based telephone survey representative of non-institutionalized adults. Respondents ( $n=173,778$ ) from 26 states, the District of Columbia, and Puerto Rico used the new optional sodium module. We estimated prevalence ratios (PRs) based on average marginal predictions, accounting for the complex survey design.

**Results**—Fifty-three percent of adults reported taking action to reduce sodium intake. Prevalence of action was highest among adults who received advice (83%), followed by adults taking antihypertensive medications, adults with diabetes, adults with kidney disease, or adults with a history of cardiovascular disease (range, 73%–75%), and lowest among adults aged 18–24 years (29%). Overall, 23% of adults reported receiving advice to reduce sodium intake. Receiving advice was associated with taking action (prevalence ratio=1.59; 95% CI=1.56, 1.61), independent of sociodemographic and health characteristics, although some disparities were observed across race/ethnicity and BMI categories.

**Conclusions**—Our results suggest that more than half of U.S. adults in 26 states and two territories are taking action to reduce sodium intake, and doctor or health professional advice is strongly associated with action.

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### Appendix

#### Supplementary data

Supplementary data cited in this article is available online at, <http://dx.doi.org/10.1016/j.amepre.2015.04.034>.

## Introduction

Cardiovascular disease (CVD) results in nearly 800,000 deaths each year in the U.S.,<sup>1</sup> and elevated blood pressure is a major risk factor for CVD.<sup>2</sup> Sodium intake reduction is a key strategy for lowering blood pressure,<sup>3</sup> with an estimated 9.5% of deaths from CVD worldwide attributable to excess sodium intake.<sup>4</sup> Given that about 95% of U.S. adults exceed sodium intake guidelines,<sup>5</sup> current recommendations encourage healthcare providers to counsel all patients with and without hypertension regarding sodium reduction.<sup>6</sup> Although data exist on health professional advice given to hypertensive patients to reduce sodium intake,<sup>5,6</sup> few studies have examined medical advice given to all patients to reduce sodium intake and the association of this advice with taking action.

One previous study reported that 24% of U.S. adults received doctor or other health professional advice to cut down on dietary sodium; the likelihood of receiving advice varied by sex, age, race/ethnicity, and household income.<sup>7</sup> Of those who received medical advice, 87% reported taking action to cut down on sodium. This study was based on a consumer market panel, and did not provide data on the prevalence of taking action among the total sample or among those who did not receive advice. Thus, it is unclear whether health professional behavior influenced patient action to reduce sodium intake.

Data from the 2013 Behavioral Risk Factor Surveillance System's (BRFSS's) new Sodium or Salt-Related Behavior optional module allowed us to examine doctor or other health professional advice and self-reported action to reduce sodium intake in a multistate, representative, probability-based sample. The main objectives of these analyses were to determine the prevalence and determinants of action to reduce sodium intake among U.S. adults and to investigate the association between receiving advice and taking action.

## Methods

### Study Population

We used data from the 2013 BRFSS survey, a state-based survey that uses a stratified multistage probability sampling design to produce a sample representative of the non-institutionalized population aged 18 years of each state. A subset of 26 states (Arkansas, Connecticut, Hawaii, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, North Carolina, North Dakota, Ohio, Oklahoma, Tennessee, Utah, Virginia, Washington, West Virginia, and Wisconsin), the District of Columbia, and Puerto Rico implemented a new optional sodium-related behavior module. For these areas, the median response rate, defined as the number of complete and partial interviews divided by an estimate of the number of eligible units in the sample, was 48.1%, with a range of 31.1%–60.3%.<sup>8</sup> The median cooperation rate (the number of complete and partial interviews divided by the number of contacted, eligible respondents) was 66.9%, with a range of 51.8%–75.9% (American Association of Public Opinion Research, [www.aapor.org/AAPORKentico/default.aspx](http://www.aapor.org/AAPORKentico/default.aspx)). BRFSS uses a sophisticated weighting methodology to improve representation based on sex, age, race/ethnicity, county, region, telephone service (landline, cell phone, or both), tenure (renting or owning a home), marital status, and education.<sup>9</sup>

Unlike in previous years in which sodium-related questions were asked only of BRFSS respondents with self-reported hypertension, the new 2013 sodium questions were asked of all respondents in participating states. Of 187,426 participants offered the sodium module, we excluded 13,648 with missing data (7.3%), leaving 173,778 participants.

## Measures

We examined self-reported action to reduce sodium intake (*Are you currently watching or reducing your sodium or salt intake?*) as our primary outcome of interest. In addition, we calculated duration of action to reduce sodium intake among those who reported taking action (Appendix, available online). Our primary exposure of interest was doctor or health professional advice to reduce sodium intake.<sup>10</sup> During survey development, BRFSS conducted three rounds of cognitive testing to modify and improve these questions.

Participant characteristics potentially associated with sodium-related behavior or reported advice were sex; age; race/ethnicity; education; having a healthcare provider considered a “personal doctor” (none, one, or more than one); self-reported hypertension (no hypertension, hypertension without medications, or hypertension with medications), diabetes, or kidney disease; CVD history (including heart attack, coronary artery disease or angina, or stroke); and BMI category.<sup>10</sup> Household income also is potentially associated with sodium-related behavior or medical advice, and we reported categories of household income in the descriptive results in Table 1. However, many respondents were missing income data (14%). Removing income from the regression model did not lessen the amount of variation in outcome explained by the model or affect relationships in the model (no confounding or interaction). Thus, we chose not to include household income in further analyses.

## Statistical Analysis

We examined characteristics of people taking action to reduce sodium intake and of those reporting advice. We used multiple logistic regression to examine which characteristics were significantly associated with reported action or advice to reduce sodium. We also used multiple logistic regression to assess the association between reported advice and action to reduce sodium, and assessed interactions to determine whether this association differed among subgroups. In all models, we estimated model-adjusted prevalence ratios (PRs) on average marginal predictions.<sup>11</sup> Because of the large sample size, small differences in behaviors were likely to be statistically significant. For this reason, in addition to calculating statistical significance, we set a meaningful difference level of PR <0.80 or >1.25. All analyses, conducted in 2014, used SAS, version 9.3 and SAS-callable SUDAAN, version 11, with sampling weights to account for the complex survey design.

## Results

In this population, sampled from non-institutionalized U.S. adults in 26 states, the District of Columbia, and Puerto Rico, 53% of adults reported taking action (i.e., currently watching or reducing their sodium or salt intake in 2013) (Table 1). The prevalence of taking action was highest among adults who reported receiving advice (83%), followed by adults taking

antihypertensive medications (75%), with a history of CVD (75%), with diabetes (74%), or with kidney disease (73%), and lowest among adults aged 18–24 years (29%). Among individuals who reported taking action to reduce sodium, the majority reported undertaking this behavior for at least 1 year (Table 2), and 40% reported ≥10 years. Older respondents reported a longer duration of taking action to reduce sodium, with more than half of the oldest respondents (aged ≥65 years) reporting watching or reducing sodium intake for ≥10 years. In sensitivity analyses, the association between age and duration of action remained significant after adjusting for hypertension status, diabetes, and kidney disease.

Compared with those who did not report receiving advice, those who did were 1.59 times (95% CI=1.56, 1.61) as likely to take action to reduce sodium intake, after adjusting for sociodemographic and health characteristics (Table 3). Relative differences in the prevalence of action did not meet our criteria for meaningful differences (PR<0.80 or >1.25) for nearly all examined characteristics except for age and race/ethnicity, indicating that few characteristics were independently associated with a meaningful difference in prevalence of taking action to reduce sodium intake. Compared with adults aged 18–24 years, adults in older age groups were statistically more likely to report taking action; PR point estimates exceeded 1.25 for those aged 24–44 years (PR=1.27, 95% CI=1.21, 1.34), 45–64 years (PR=1.54, 95% CI=1.47, 1.61), and ≥65 years (PR=1.70, 95% CI=1.62, 1.78). Compared with non-Hispanic whites, adults in minority groups also were statistically more likely to report taking action to reduce sodium, with PRs exceeding 1.25 for non-Hispanic blacks (PR=1.35, 95% CI=1.31, 1.48) and Hispanics (PR=1.31, 95% CI=1.27, 1.34).

The relationship between receiving advice and taking action to reduce sodium intake was stronger among some groups compared with others (Table 4). Yet, among all subgroups, the PRs exceeded 1.25 for taking action to reduce sodium intake among those who received advice compared to those who did not. The association varied most by race/ethnicity (e.g., PR=1.27 [95% CI=1.21, 1.32] among Hispanics and PR 1.74 [95% CI=1.71, 1.78] among non-Hispanic whites).

Overall, 23% of adults reported that their doctor or another health professional had advised them to reduce sodium intake (Table 1). By contrast, more than half of adults with cardiovascular conditions reported receiving advice, including 56% of those with kidney disease, 54% of those with a history of CVD, 53% of those on antihypertensive medications, and 51% of those with diabetes. Adults aged 18–24 years were least likely (7%) to report advice to reduce sodium intake. Interestingly, some respondents (13%) who did not have a personal doctor reported receiving advice. These respondents may have received advice from a physician or other health care professional who they did not consider to be a personal doctor, or at a prior time when they did have a personal doctor.

After adjusting for sociodemographic and health characteristics (Table 3), the relative differences in the prevalence of advice to reduce sodium intake were statistically significant for most examined characteristics. The largest relative differences were for hypertensive status: compared with adults without hypertension, adults with hypertension who were not taking antihypertensive medications were 2.61 (95% CI=2.46, 2.77) times as likely to report receiving advice to reduce sodium or salt intake, and adults on antihypertensive medications

were 3.55 times as likely (95% CI=3.38, 3.67). Controlling for hypertensive status and all other examined characteristics, Hispanics (PR=1.74 versus non-Hispanic whites, 95% CI=1.67, 1.81), non-Hispanic blacks (PR=1.49 versus non-Hispanic whites, 95% CI=1.42, 1.55), those aged 45–64 years (PR=1.57 versus those aged 18–24 years, 95% CI=1.41, 1.74), and those aged ≥65 years (PR=1.54 versus those aged 18–24 years, 95% CI=1.39, 1.72) were more likely to receive advice. In relation to health characteristics, PRs for receiving advice were 1.52 among participants reporting a history of CVD, 1.46 among those reporting kidney disease, and 1.36 among those reporting being obese versus normal weight.

## Discussion

Our study is the first to provide data on sodium reduction behaviors among a general population probability sample of adults living in multiple states and territories. A little over half (53%) of surveyed adults reported watching or reducing their sodium intake in 2013. A substantial proportion of those taking action did so within the last 3 years. About one in four adults reported receiving doctor or health professional advice to reduce sodium intake, and the association between receiving advice and taking action was positive and significant across all examined subgroups. These findings suggest a greater proportion of adults might watch or reduce their sodium intake if more health professionals provided sodium reduction advice.

Our finding that more than half of respondents were taking action to reduce sodium is consistent with previous reports of consumer interest in reducing sodium intake. For example, in a 2013 American Heart Association online survey, 58% of 1,000 surveyed U.S. adults reported they had tried to reduce the amount of sodium in their diets.<sup>12</sup> In a 2011 International Food Information Council web survey, 42% of U.S. adults reported currently trying to limit sodium intake.<sup>13</sup> This proportion may be lower than the 53% observed in the present study because the BRFSS question was worded as “watching or reducing” sodium intake, which may be more broadly interpreted. In another online survey, 78% of respondents reported they had taken at least one of six specified actions to limit sodium consumption,<sup>14</sup> although it may be that prompting with examples increased positive responses,<sup>15</sup> or that participants responding to an online survey about nutrition may be interested in nutrition-related issues, introducing selection bias.<sup>16</sup>

Self-reported action to watch or reduce sodium intake does not necessarily reflect achievement of sodium reduction. One analysis of hypertensive adults showed that average sodium intake was 259 mg lower among those who reported taking action to reduce sodium versus those not taking action; however, this difference was not statistically significant.<sup>17</sup> Although that study may have been underpowered, its modest findings may reflect the substantial difficulty faced by U.S. consumers attempting to reduce sodium intake, given that processed and restaurant foods account for >75% of sodium intake.<sup>18</sup> The difficulty in reducing sodium intake through individual behavioral change supports the involvement of the food industry in responding to consumer desires and facilitating efforts to reduce sodium.<sup>19</sup>

Over the past four decades, various public health campaigns have not significantly reduced U.S. sodium intake.<sup>20</sup> Evaluation of new programs requires surveillance of readiness to change sodium intake over time. Although 2013 saw the first implementation of the BRFSS sodium module, the question pertaining to duration of behavior change may offer some initial insight. New strategies to reduce sodium were issued in 2010,<sup>19</sup> and it is noteworthy that more than one third of those taking action to reduce sodium in 2013 reported initiating this behavior within the previous 3 years. However, repeated monitoring would be necessary to detect changes in behavior over time.

The proportion of adults who reported receiving advice in this study is consistent with a panel survey of healthcare providers in 2010, among whom 23% reported counseling all adults to consume less salt.<sup>21</sup> Extending this finding, our study suggests that the majority of adults with hypertension who are not treated with medication also do not receive advice to reduce sodium intake. Although previous research indicates that healthcare providers report counseling 74% of hypertensive patients and 65% of patients with chronic kidney disease to reduce sodium,<sup>21</sup> the current study suggests a smaller portion of adults with cardiovascular conditions recall receiving this advice. In the present study, PRs for diabetes, kidney disease, and history of CVD were attenuated after adjustment for hypertension, suggesting that advice to patients with these conditions is not totally independent of their hypertensive status. Healthcare professionals face many competing demands during patient encounters, and may refrain from recommending sodium reduction because of insufficient training in nutrition<sup>22</sup>; controversy surrounding ideal sodium targets<sup>23–25</sup>; pressure to reduce office visit times and lack of financial incentive for educational counseling<sup>26</sup>; or focus on other behavioral counseling strategies, such as weight reduction, exercise, or smoking cessation among high-risk patients.<sup>27</sup>

Doctors and other health professionals may doubt whether recommendations to reduce sodium will affect behavior, as patients often do not comply with provider advice regarding lifestyle changes for the prevention and management of chronic disease.<sup>28</sup> Our finding that reported advice is significantly and positively associated with action to reduce sodium is promising. In addition, our results remained robust in sensitivity analyses that excluded Puerto Rico, which had the highest hypertension prevalence of any state or territory (42%), as well as the highest prevalence of receiving advice (42%) and taking action (74%).

The weaker association between advice and action in racial/ethnic minorities and among overweight and obese participants was not examined previously. Potential explanations may be language or cultural barriers impairing the physician–patient relationship,<sup>29,30</sup> or possible stereotyping, bias, or reduced rapport in the relationships of minorities or overweight and obese people with healthcare professionals.<sup>31–35</sup> However, it is important to note that evidence of interaction by race/ethnicity and BMI category may be partly statistical because of higher baseline prevalence of action among some subgroups. Across all groups, receiving advice was associated with 18–39 percentage points greater prevalence of action and, among those reporting advice to reduce sodium, 74% of respondents took action regardless of race/ethnicity or BMI subgroup.



## Limitations

Self-reported data are subject to recall bias, and it may be that adults who are taking action to reduce sodium may be more likely to recall doctor or other healthcare professional advice, whereas individuals not taking action may be more likely to forget they received advice. Also, social desirability bias may have influenced our results if respondents felt social pressure to claim that they were taking action. In addition, the survey data may be subject to response bias, as the median response and cooperation rates were only 48.1% and 66.9%, respectively. Those who responded may have differed from those who did not, such as under-representation of racial/ethnic minorities.<sup>36</sup> However, sample weights were adjusted for nonresponse. Another limitation of our study is that we do not know what actions were being taken among those who reported action. Cognitive testing indicated that a positive response captured a range of behavior, from heightened awareness to selection of low-sodium products or use of less salt in cooking or at the table. Lastly, these results are representative of the 28 states and territories that opted to use the 2013 sodium module (which make up 39% of the total U.S. population), and may not be generalizable to the entire population. Examining Census estimates of the 2013 U.S. non-institutionalized adult population, our weighted results matched the U.S. sex distribution (51% female, 49% male), but minorities were slightly under-represented (74% non-Hispanic white versus 66% in the total U.S. population). Owing to the inclusion of Puerto Rico in this analysis, results for Hispanics are likely to include more Puerto Ricans than other Hispanic subgroups, compared with the general U.S. population. However, the prevalence of self-reported hypertension among BRFSS respondents in states that used the optional sodium module was comparable to the prevalence in nonparticipating states (median, 32% versus 31%, respectively).

Given sharply rising healthcare costs<sup>37</sup> and an aging population facing an unprecedented burden of CVD,<sup>38</sup> new strategies for prevention are urgently needed. Sodium reduction is one such strategy: a population-wide reduction in average sodium intake to 2,300 mg daily has been projected to reduce the U.S. prevalence of hypertension by 15% and save \$18 billion in annual healthcare spending.<sup>39</sup> Sodium reduction is a key target of the U.S. DHHS's Million Hearts initiative, which aims to prevent 1 million heart attacks and strokes by 2017.<sup>40</sup>

## Conclusions

Our data suggest that advice from doctors and other health professionals can make a positive difference in patients' efforts to reduce sodium. These professionals can recommend that patients follow a healthy dietary pattern—such as the Dietary Approaches to Stop Hypertension—as an effective strategy to reduce sodium intake.<sup>41</sup> They also can support environmental strategies such as the IOM's recommendations to set phased targets for sodium content of commercially processed foods and for food procurement guidelines.<sup>19</sup> It is remarkable that more than half of surveyed adults are currently attempting to reduce their sodium intake; health professionals, the public health community, and food industry partners should support consumer and population efforts to reduce sodium intake.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

Drs. Jackson and Park had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Dr. Jackson planned and conducted data analyses and drafted the manuscript. Drs. Cogswell and Coleman King contributed to study planning, analysis, and manuscript development. Drs. Fang and Cogswell contributed to the development of the Behavioral Risk Factor Surveillance System Sodium and Salt-Related Behavior Module. Drs. Park and Fang provided statistical expertise for analyses and edited the manuscript. Dr. Odom contributed conceptually to study planning and edited manuscript revisions.

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**Table 1**

Characteristics of Adults Taking Action or Receiving Advice to Reduce Sodium, BRFSS 2013

Characteristics	Unweighted <i>n</i>	Population, weighted % (95% CI)	Taking action, weighted % (95% CI)	Receiving advice, weighted % (95% CI)
Total	173,778	100	52.7 (52.2, 53.1)	23.0 (22.7, 23.4)
Sex				
Men	71,829	49.4 (49.0, 49.9)	50.2 (49.5, 50.8)	22.8 (22.3, 23.4)
Women	101,949	50.6 (50.1, 51.0)	55.1 (54.5, 55.7)	23.2 (22.6, 23.7)
Age (years)				
18–24	8,358	12.0 (11.6, 12.4)	28.9 (27.2, 30.6)	7.03 (6.17, 8.00)
25–44	37,188	32.0 (31.6, 32.5)	43.4 (42.5, 44.3)	14.9 (14.3, 15.5)
45–64	70,425	36.3 (35.9, 36.7)	59.4 (58.8, 60.1)	27.8 (27.2, 28.4)
65+	57,807	19.7 (19.4, 20.0)	69.8 (69.1, 70.5)	37.2 (36.5, 37.9)
Race/ethnicity				
White, non-Hispanic	137,541	74.2 (73.8, 74.6)	49.3 (48.8, 49.8)	20.5 (20.2, 20.9)
Black, non-Hispanic	14,212	10.7 (10.4, 11.0)	68.4 (66.8, 69.9)	34.5 (33.1, 36.0)
Asian, non-Hispanic	3,825	3.05 (2.85, 3.27)	48.0 (44.5, 51.6)	16.4 (14.4, 18.7)
American Indian/Alaska Native	2,155	1.10 (1.01, 1.19)	55.2 (51.0, 59.3)	24.6 (21.6, 27.8)
Hispanic	10,804	8.85 (8.59, 9.12)	62.8 (61.1, 64.4)	32.4 (30.9, 33.9)
Other race	5,241	2.17 (2.04, 2.30)	53.6 (50.5, 56.6)	22.6 (20.3, 25.0)
Education (years)				
<12	13,823	12.8 (12.5, 13.2)	58.5 (56.9, 60.0)	33.0 (31.7, 34.3)
12 or GED	50,747	29.5 (29.1, 29.9)	54.4 (53.5, 55.2)	25.5 (24.8, 26.1)
>12	109,208	57.7 (57.3, 58.2)	50.5 (48.9, 51.1)	19.6 (19.2, 20.0)
Household income (\$) <sup>a</sup>				
<25,000	44,482	29.2 (28.8, 29.6)	59.7 (58.8, 60.6)	30.9 (30.1, 31.7)
25,000 to <50,000	39,235	25.0 (24.6, 25.4)	54.3 (53.3, 55.3)	23.7 (23.0, 24.5)
50,000 to <75,000	24,017	15.7 (15.4, 16.1)	50.5 (49.3, 51.7)	20.0 (19.1, 20.9)
75,000	43,467	30.2 (29.7, 30.6)	45.9 (45.0, 46.8)	16.1 (15.5, 16.8)
Have a personal doctor?				
More than 1	14,563	7.61 (7.38, 7.84)	59.3 (57.7, 60.8)	30.6 (29.2, 32.1)
1	133,651	72.8 (72.3, 73.2)	55.1 (54.5, 55.6)	24.9 (24.5, 25.4)
None	25,564	19.6 (19.3, 20.0)	41.2 (40.1, 42.3)	13.1 (12.4, 13.8)
Self-reported HTN				
HTN with medications	61,022	27.0 (26.7, 27.4)	74.5 (73.9, 75.2)	52.5 (51.8, 53.3)
HTN without medications	11,158	7.16 (6.92, 7.41)	54.7 (53.0, 56.5)	32.0 (30.4, 33.6)
No HTN	101,598	65.8 (65.4, 66.2)	43.4 (42.9, 44.0)	9.96 (9.63, 10.3)
Diabetes				
Yes	22,384	10.2 (10.0, 10.5)	74.2 (73.1, 75.2)	51.3 (50.0, 52.5)
No	151,394	89.8 (89.6, 90.0)	50.2 (49.7, 50.7)	19.8 (19.5, 20.2)

Characteristics	Unweighted <i>n</i>	Population, weighted % (95% CI)	Taking action, weighted % (95% CI)	Receiving advice, weighted % (95% CI)
Kidney disease				
Yes	5,635	2.52 (2.41, 2.64)	73.1 (70.9, 75.2)	55.7 (53.3, 58.0)
No	168,143	97.5 (97.4, 97.6)	52.1 (51.7, 52.6)	22.2 (21.8, 22.6)
CVD history				
Yes	20,972	9.30 (9.07, 9.52)	74.5 (73.4, 75.5)	53.8 (52.6, 55.1)
No	152,806	90.7 (90.5, 90.9)	50.4 (49.9, 50.9)	19.9 (19.5, 20.2)
BMI (kg/m <sup>2</sup> )				
<18.5	2,925	1.83 (1.70, 1.98)	38.4 (34.9, 42.0)	13.1 (10.8, 15.8)
18.5–24.9	56,268	33.0 (32.6, 33.5)	45.0 (44.2, 45.8)	14.3 (13.7, 14.8)
25–29.9	62,505	35.5 (35.1, 36.0)	54.1 (53.3, 54.8)	22.6 (22.0, 23.2)
30	52,080	29.6 (29.2, 30.1)	60.3 (59.5, 61.1)	33.9 (33.2, 34.7)
Received advice				
Yes	45,890	23.0 (22.7, 23.4)	82.5 (81.8, 83.1)	NA
No	127,888	77.0 (76.6, 77.3)	43.7 (43.2, 44.3)	NA

<sup>a</sup> *n*=151,201 for income, due to missing data for this variable.

BRFSS, Behavioral Risk Factor Surveillance System; CVD, cardiovascular disease; GED, General Education Development test or high school equivalency credential; HTN, hypertension; NA, not applicable.

**Table 2**  
Duration of Action to Reduce Sodium Among Those Who Reported Taking Action, BRFSS 2013

Duration (years)	Total (n=94,021), <sup>a</sup> unweighted n	Aged 18–24 years, weighted % (95% CI)	Aged 25–44 years, weighted % (95% CI)	Aged 45–64 years, weighted % (95% CI)	Aged 65+ years, weighted % (95% CI)	Total, weighted % (95% CI)
<1	11,937	43.9 (40.6, 47.2)	22.7 (21.5, 23.8)	12.6 (12.0, 13.2)	8.98 (8.44, 9.56)	16.4 (15.9, 16.9)
1 to <3	16,164	27.0 (24.3, 30.0)	24.5 (23.3, 25.7)	18.2 (17.5, 18.9)	13.3 (12.7, 13.9)	19.2 (18.7, 19.7)
3 to <5	8,286	9.15 (7.58, 11.0)	11.0 (10.1, 11.9)	8.88 (8.39, 9.40)	8.05 (7.54, 8.59)	9.24 (8.89, 9.60)
5 to <10	14,845	7.31 (5.88, 9.06)	14.2 (13.3, 15.1)	16.9 (16.2, 17.6)	15.5 (14.9, 16.3)	15.2 (14.8, 15.6)
10	42,789	12.6 (10.3, 15.3)	27.7 (26.5, 29.0)	43.5 (42.6, 44.4)	54.1 (53.2, 55.1)	40.0 (39.4, 40.6)

<sup>a</sup>Of 98,664 who reported taking action to reduce sodium intake, 4.7% were missing duration information, leaving n=94,021. BRFSS, Behavioral Risk Factor Surveillance System.

**Table 3**

Multivariable Adjusted Prevalence Ratios Expressing Likelihood of Taking Action or Receiving Advice to Reduce Sodium, BRFSS 2013

Characteristic	Likelihood of taking action		Likelihood of receiving advice	
	APR <sup>a</sup>	95% CI	APR <sup>a</sup>	95% CI
Received advice				
Yes	1.59	1.56, 1.62	—	—
No	1.00	ref	—	—
Sex				
Men	1.00	ref	1.00	ref
Women	1.08	1.07, 1.10	1.04	1.01, 1.07
Age (years)				
18–24	1.00	ref	1.00	ref
25–44	1.27	1.21, 1.34	1.37	1.23, 1.52
45–64	1.54	1.47, 1.61	1.57	1.41, 1.74
65+	1.70	1.62, 1.78	1.54	1.39, 1.72
Race/ethnicity				
White, non-Hispanic	1.00	ref	1.00	ref
Black, non-Hispanic	1.35	1.31, 1.38	1.49	1.42, 1.55
Asian, non-Hispanic	1.13	1.07, 1.20	1.22	1.11, 1.34
American Indian/Alaskan Native	1.13	1.05, 1.22	1.14	1.02, 1.27
Hispanic	1.31	1.27, 1.34	1.74	1.67, 1.81
Other race	1.14	1.09, 1.20	1.17	1.08, 1.26
Education (years)				
<12	0.99	0.96, 1.02	1.18	1.13, 1.24
12 or GED	1.01	0.99, 1.02	1.09	1.06, 1.13
>12	1.00	ref	1.00	ref
Personal doctor				
None	1.00	ref	1.00	ref
More than 1	1.09	1.05, 1.13	1.26	1.19, 1.35



Characteristic	Likelihood of taking action		Likelihood of receiving advice	
	APR <sup>a</sup>	95% CI	APR <sup>a</sup>	95% CI
1	1.06	1.04, 1.09	1.16	1.11, 1.22
Self-reported HTN				
No HTN	1.00	ref	1.00	ref
HTN with medications	1.18	1.15, 1.20	3.55	3.40, 3.69
HTN without medications	1.05	1.01, 1.08	2.61	2.46, 2.77
Diabetes				
No	1.00	ref	1.00	ref
Yes	1.06	1.04, 1.09	1.23	1.18, 1.28
Kidney disease				
No	1.00	ref	1.00	ref
Yes	1.05	1.00, 1.10	1.46	1.37, 1.55
CVD history				
No	1.00	ref	1.00	ref
Yes	1.08	1.05, 1.10	1.52	1.47, 1.57
BMI (kg/m <sup>2</sup> )				
18.5–24.9	1.00	ref	1.00	ref
<18.5	0.90	0.85, 0.97	0.93	0.82, 1.06
25–29.9	1.07	1.05, 1.09	1.17	1.13, 1.22
30	1.08	1.06, 1.10	1.36	1.31, 1.42

<sup>a</sup>These multiple logistic models were adjusted for all characteristics shown.

APR, adjusted prevalence ratio; CVD, cardiovascular disease; GED, General Education Development test or high school equivalency credential; HTN, hypertension.

**Table 4**  
Multivariable Adjusted Prevalence Ratios Expressing Likelihood of Taking Action to Reduce Sodium Intake, Across Subgroups, BRFSS 2013

Characteristics	Likelihood of taking action		Adjusted prevalence, % <sup>a</sup>		Risk difference, %
	APR <sup>a</sup>	95% CI	With advice	Without advice	
Sex					
Male	1.68	1.64, 1.73	77	50	27
Female	1.55	1.51, 1.58	75	44	31
Race/ethnicity					
White, non-Hispanic	1.74	1.71, 1.78	74	43	31
Black, non-Hispanic	1.33	1.28, 1.38	83	63	20
Asian, non-Hispanic	1.35	1.20, 1.53	70	52	18
American Indian/Alaskan Native	1.52	1.34, 1.73	77	50	27
Hispanic	1.27	1.21, 1.32	79	62	27
Other race	1.50	1.37, 1.64	77	51	26
BMI (kg/m <sup>2</sup> )					
<18.5	2.02	1.78, 2.30	77	38	39
18.5–24.9	1.71	1.65, 1.76	75	44	31
25–29.9	1.58	1.54, 1.62	76	48	28
30	1.53	1.49, 1.57	75	49	26

<sup>a</sup>In addition to the interaction variables shown (sex, race/ethnicity, and BMI), this multiple logistic model was adjusted for potential confounders including age, education, having a personal doctor, hypertension, diabetes, kidney disease, and cardiovascular disease history.

APR, adjusted prevalence ratio.