

Self-Reported Receipt of Advice and Action Taken To Reduce Dietary Sodium Among Adults With and Without Hypertension — Nine States and Puerto Rico, 2015

Puthiery Va, DO^{1,2}; Cecily Luncheon, MD, DrPH²; Angela M. Thompson-Paul, PhD²; Jing Fang, MD²; Robert Merritt, MS²; Mary E. Cogswell, DrPH²

Hypertension is a major cardiovascular disease risk factor (1,2). Advice given by health professionals can result in lower sodium intake and lower blood pressure (3). The 2017 Hypertension Guideline released by the American College of Cardiology and the American Heart Association emphasizes nonpharmacologic approaches, including sodium reduction, as important components of hypertension prevention and treatment (4). Data from 50,576 participants in the sodium module of the 2015 Behavioral Risk Factor Surveillance System (BRFSS) in nine states and Puerto Rico were analyzed to determine the prevalence of reported sodium reduction advice and action among participants with and without self-reported hypertension. Among participants with self-reported hypertension, adjusted prevalence of receiving sodium reduction advice from a health professional was 41.9%, compared with 12.8% among participants without hypertension. Among those with hypertension, adjusted prevalence of reported action to reduce sodium intake was 80.9% among participants who received advice and 55.7% among those who did not receive advice. Among participants without hypertension, adjusted prevalence of taking action to reduce sodium intake was 72.7% among those who received advice and 46.9% among those who did not receive advice. The provision of advice on sodium reduction by health professionals is associated with respondent action to watch or reduce sodium intake. Fewer than half of patients with hypertension received this advice from their health professionals, a circumstance that represents a substantial missed opportunity to promote hypertension prevention and treatment.

BRFSS is an annual state-based, cross-sectional telephone survey of noninstitutionalized adults aged ≥18 years. In 2015, nine states (Alabama, Indiana, Iowa, Kentucky, Maine, Nebraska, North Carolina, Oregon, and Tennessee) and Puerto Rico completed the optional sodium-related behavior module. Median survey response rate for all states and territories included in this analysis was 51.3% (range = 42.6%–59.0%) (5). Among 63,955 participants from jurisdictions that implemented the sodium-related behavior module, 55,857 participants completed it. After 5,281 participants with missing information on sex, age, race/ethnicity, education, smoking status, body mass index, and reported comorbidities were excluded, data from 50,576 respondents (90.5% of all

participants) were analyzed. Prevalence of sodium reduction advice and action was estimated by self-reported hypertension status. Hypertension was defined as an affirmative response to the question “Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?” Women who answered “yes” but “only during pregnancy,” as well as those who were told that they were “borderline high or pre-hypertensive” were not included. Receiving health professional advice to reduce sodium intake was defined by an affirmative response to the question “Has a doctor or other health professional ever advised you to reduce sodium or salt intake?” Action to reduce sodium intake was defined by an affirmative response to the question “Are you currently watching or reducing your sodium or salt intake?”

Descriptive analyses were used to examine population characteristics by hypertension status. Multiple variable logistic regression was used to examine characteristics associated with advice and action and to estimate prevalence and 95% confidence intervals using predicted marginals adjusted for selected covariates (6). Covariates included sociodemographic characteristics (geographic location, sex, age/ethnicity, race, and education) and cardiovascular disease risk factors (smoking, obesity status, and reported associated comorbidities [diabetes, kidney disease, myocardial infarction, coronary heart disease, or stroke]). All estimates used sampling weights to account for the complex survey design and nonresponse. Chi-square tests were used to compare prevalence estimates. P-values <0.05 were considered statistically significant.

Participants with self-reported hypertension differed significantly from participants without hypertension for all characteristics examined ($p < 0.05$ for all characteristics) (Table 1). Among participants with hypertension compared with those without hypertension, more participants were male (51.0% versus 48.6%), aged ≥65 years (37.0% versus 11.9%), non-Hispanic black (13.9% versus 9.6%), had less than a high school education (19.3% versus 11.6%), were current or former smokers (51.0% versus 41.0%), had obesity (45.1% versus 25.0%), or reported ≥1 comorbidity (39.8% versus 8.9%).

After adjusting for sociodemographic and cardiovascular risk factors, the prevalence of having received sodium reduction advice was 41.9% among participants with hypertension and 12.8% among those without hypertension (Table 2)

TABLE 1. Unadjusted prevalence* of selected characteristics of adults aged ≥18 years by hypertension† status — Behavioral Risk Factor Surveillance System, nine states and Puerto Rico, 2015

| Characteristic | Hypertension status % (95% CI) [§] | |
|-----------------------------------|--|---|
| | Self-reported hypertension (n = 22,606) | No self-reported hypertension (n = 27,970) |
| Jurisdiction | | |
| Alabama | 11.9 (11.4–12.3) | 10.0 (9.6–10.4) |
| Indiana | 12.1 (11.5–12.8) | 14.5 (13.9–15.1) |
| Iowa | 5.5 (5.3–5.8) | 7.2 (6.9–7.5) |
| Kentucky | 10.2 (9.8–10.7) | 9.1 (8.7–9.5) |
| Maine | 3.1 (2.9–3.3) | 3.4 (3.3–3.6) |
| Nebraska | 3.5 (3.3–3.7) | 4.6 (4.4–4.8) |
| North Carolina | 21.3 (20.5–22.1) | 20.9 (20.3–21.5) |
| Oregon | 7.2 (6.6–7.8) | 9.6 (9.1–10.1) |
| Tennessee | 14.7 (14.0–15.4) | 12.1 (11.6–12.7) |
| Puerto Rico | 10.6 (10.1–11.0) | 8.6 (8.2–8.9) |
| Sex | | |
| Male | 51.0 (49.9–52.0) | 48.6 (47.6–49.5) |
| Female | 49.0 (48.0–50.1) | 51.5 (50.5–52.4) |
| Age group (yrs) | | |
| 18–64 | 63.0 (62.1–63.9) | 88.1 (87.6–88.5) |
| ≥65 | 37.0 (36.1–37.9) | 11.9 (11.5–12.4) |
| Race/Ethnicity | | |
| White, non-Hispanic | 70.5 (69.6–71.5) | 72.5 (71.7–73.3) |
| Black, non-Hispanic | 13.9 (13.1–14.7) | 9.6 (9.0–10.3) |
| Other, non-Hispanic | 2.9 (2.5–3.4) | 4.1 (3.7–4.5) |
| Hispanic | 12.7 (12.1–13.3) | 13.8 (13.2–14.4) |
| Education | | |
| Less than high school | 19.3 (18.3–20.2) | 11.6 (10.9–12.4) |
| High school | 32.2 (31.2–33.1) | 29.1 (28.2–30.0) |
| Some college | 29.7 (28.8–30.7) | 33.1 (32.2–34.0) |
| College or more | 18.9 (18.2–19.6) | 26.2 (25.5–26.9) |
| Smoking status | | |
| Current and former smoker | 51.0 (50.0–52.0) | 41.0 (40.1–41.9) |
| Never smoker | 49.0 (48.0–50.0) | 59.0 (58.1–59.9) |
| Obesity status[¶] | | |
| No | 55.0 (53.9–56.0) | 75.0 (74.1–75.8) |
| Yes | 45.1 (44.0–46.1) | 25.0 (24.2–25.9) |
| Comorbidities^{**} | | |
| No | 60.2 (59.1–61.2) | 91.1 (90.6–91.5) |
| Yes | 39.8 (38.8–40.9) | 8.9 (8.5–9.4) |

Abbreviation: CI = confidence interval.

* Unadjusted prevalence estimates weighted for survey design and nonresponse.

† Hypertension was defined as an affirmative response to the question “Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?”

§ p-value <0.05 for differences (chi-square test) in percent distribution of covariates between participants with reported hypertension and without reported hypertension, accounting for complex survey design and weighted.

¶ Obesity defined as body mass index ≥30 kg/m².

** Includes self-reported diabetes, kidney disease, myocardial infarction, coronary heart disease, or stroke.

(p<0.05 for difference overall and in each subgroup). Among participants with hypertension, the adjusted prevalence of receiving advice varied significantly by geographic location, ranging from 32.3% (Oregon) to 56.7% (Puerto Rico), and by sex, race/ethnicity, obesity status, and reported presence of ≥1 comorbidity, but not by age, level of education, or smoking

status. By covariate, receipt of advice was higher, for example, among participants who were female (43.0%) versus male (40.8%); non-Hispanic black (54.1%) and Hispanic (46.1%) versus non-Hispanic white (39.1%); who had obesity (46.6%) versus those who did not have obesity (40.2%); and who had ≥1 comorbidity (53.4%) versus no comorbidity (40.0%) (Table 2). Among participants without hypertension, the prevalence of receiving advice ranged from 9.4% (Oregon) to 22.0% (Puerto Rico). Prevalence of receiving advice varied significantly by selected covariate (p<0.05), except sex. By covariate, the adjusted prevalence of advice was higher among non-Hispanic black (16.9%) and Hispanic participants (16.8%) than among non-Hispanic white participants (10.8%), among participants with a high school diploma (14.0%) or less than a high school education (14.9%) than among those with college or more (10.5%), among current or former smokers (13.9%) than among never smokers (11.9%), among those who had obesity (17.4%) versus those who did not (10.6%), and among those who reported ≥1 comorbidity (26.6%) than among those who did not (10.0%) (Table 2).

Overall, participants with hypertension who received advice had the highest adjusted prevalence of taking action to reduce sodium intake (80.9%), followed by those without hypertension who received advice (72.7%), those with hypertension who did not receive advice (55.7%), and those without hypertension who did not receive advice (46.9%) (p<0.05 for overall comparison across the four groups) (Table 3).

Discussion

In 2015, fewer than half (42%) of BRFSS participants with self-reported hypertension from nine states and Puerto Rico (range = 32% [Oregon] to 57% [Puerto Rico]) reported receiving sodium reduction advice from a health professional independent of sociodemographic characteristics and cardiovascular disease risk factors. Among respondents without hypertension, 13% reported receiving advice to reduce sodium intake (range = 9% [Oregon] to 22% [Puerto Rico]). Yet, among participants with hypertension who received advice, 81% reported taking action to reduce sodium, compared with 56% of those with hypertension who did not receive advice. Similarly, among participants without hypertension 73% of those who received advice to reduce sodium intake reported taking action to reduce sodium, compared with 47% of those who did not receive advice. In this analysis, among participants with and without hypertension, receiving sodium reduction advice from a health professional was associated with reported respondent action to watch or reduce sodium intake.

This study provides the most recent multistate BRFSS data on sodium reduction advice and action. Comparing these results with previously published BRFSS and other data are

TABLE 2. Adjusted* percentage of adults aged ≥18 years who reported receiving advice to reduce their sodium intake, by hypertension† status — Behavioral Risk Factor Surveillance System, nine states and Puerto Rico, 2015

| Characteristic | Reported receiving advice | | | | | |
|---------------------------|---|-------------------------|----------------------|-------------------------------|-------------------------|----------------------|
| | Self-reported hypertension [§] | | | No self-reported hypertension | | |
| | No. | % (95% CI) | p-value [¶] | No. | % (95% CI) | p-value [¶] |
| Total | 22,606 | 41.9 (40.8–43.0) | — | 27,970 | 12.8 (12.1–13.4) | — |
| Jurisdiction | | | | | | |
| Alabama | 3,048 | 39.8 (37.3–42.4) | <0.05 | 3,159 | 12.7 (11.2–14.4) | <0.05 |
| Indiana | 2,043 | 43.1 (39.9–46.3) | | 2,613 | 11.5 (9.8–13.5) | |
| Iowa | 1,884 | 37.9 (35.1–40.9) | | 2,857 | 11.3 (9.7–13.1) | |
| Kentucky | 3,372 | 40.3 (37.5–43.2) | | 3,473 | 11.2 (9.6–13.0) | |
| Maine | 1,941 | 44.8 (41.8–47.8) | | 2,740 | 13.6 (11.8–15.7) | |
| Nebraska | 2,758 | 33.3 (30.7–36.0) | | 4,376 | 9.6 (8.1–11.3) | |
| North Carolina | 2,152 | 43.7 (41.1–46.4) | | 2,909 | 12.1 (10.7–13.7) | |
| Oregon | 744 | 32.3 (28.2–36.7) | | 1,188 | 9.4 (7.0–12.6) | |
| Tennessee | 2,210 | 40.3 (37.1–43.6) | | 2,154 | 11.7 (9.8–13.9) | |
| Puerto Rico | 2,454 | 56.7 (51.2–62.1) | | 2,501 | 22.0 (18.5–26.0) | |
| Sex | | | | | | |
| Male | 9,548 | 40.8 (39.3–42.4) | <0.05 | 11,582 | 12.9 (11.9–13.8) | 0.980 |
| Female | 13,058 | 43.0 (41.5–44.4) | | 16,388 | 12.7 (11.9–13.5) | |
| Age group (yrs) | | | | | | |
| 18–64 | 11,264 | 42.7 (41.3–44.1) | 0.582 | 21,439 | 11.4 (10.7–12.1) | <0.05 |
| ≥65 | 11,342 | 42.6 (41.1–44.1) | | 6,531 | 20.2 (18.7–21.7) | |
| Race/Ethnicity | | | | | | |
| White, non-Hispanic | 16,928 | 39.1 (37.7–40.6) | <0.05 | 22,016 | 10.8 (10.1–11.6) | <0.05 |
| Black, non-Hispanic | 2,398 | 54.1 (50.6–57.6) | | 1,769 | 16.9 (14.4–19.6) | |
| Other, non-Hispanic | 570 | 40.2 (33.9–46.9) | | 881 | 15.3 (10.8–21.3) | |
| Hispanic | 2,710 | 46.1 (41.0–51.3) | | 3,304 | 16.8 (14.2–19.7) | |
| Education | | | | | | |
| Less than high school | 2,670 | 43.0 (40.0–46.0) | 0.377 | 1,848 | 14.9 (13.0–17.0) | <0.05 |
| High school | 7,610 | 41.8 (40.1–43.6) | | 7,882 | 14.0 (12.9–15.3) | |
| Some college | 6,128 | 41.3 (39.4–43.2) | | 7,966 | 12.2 (11.1–13.4) | |
| College or more | 6,198 | 42.9 (41.0–44.8) | | 10,274 | 10.5 (9.6–11.4) | |
| Smoking status | | | | | | |
| Current and former smoker | 10,938 | 41.2 (39.7–42.8) | 0.245 | 11,358 | 13.9 (13.0–15.0) | <0.05 |
| Never smoker | 11,668 | 42.7 (41.2–44.2) | | 16,612 | 11.9 (11.1–12.8) | |
| Obesity Status** | | | | | | |
| No | 12,966 | 40.2 (38.8–41.6) | <0.05 | 21,037 | 10.6 (10.0–11.3) | <0.05 |
| Yes | 9,640 | 46.6 (44.9–48.2) | | 6,933 | 17.4 (16.1–18.8) | |
| Comorbidities†† | | | | | | |
| No | 13,231 | 40.0 (38.7–41.4) | <0.05 | 24,674 | 10.0 (9.4–10.6) | <0.05 |
| Yes | 9,375 | 53.4 (51.7–55.1) | | 3,296 | 26.6 (24.4–29.0) | |

Abbreviation: CI = confidence interval.

* Adjusted prevalence estimates were estimated from marginal predictions of separate multiple logistic regression models for each covariate with a term for the interaction between the covariate (e.g., sex) and hypertension status adjusted for all the other covariates in the table, accounting for survey design and survey weights. Significant interactions occurred between hypertension status and age, race/ethnicity, education, smoking status, obesity status, and comorbidities.

† Hypertension was defined as an affirmative response to the question “Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?”

§ Across all participating locations and selected covariates, a higher prevalence of advice was reported among participants with hypertension compared with those without hypertension (p-value <0.05).

¶ p-value obtained by Wald F test and p-value <0.05 were used to identify statistically significant differences in prevalence of advice among subgroups with hypertension and without hypertension.

** Obesity defined as body mass index ≥30 kg/m².

†† Includes self-reported diabetes, kidney disease, myocardial infarction, coronary heart disease, or stroke.

difficult, given differences in sample size, number of states, and analytic method. Despite these differences, results were generally consistent with previous studies that found respondents with hypertension were more likely to receive advice and take action (7) and that the prevalence of taking action was highest among those who received advice (8).

Fewer than half of adults with hypertension in most locations, and even fewer adults without hypertension, reported receiving sodium reduction advice. Geographic patterns of prevalence of receiving advice appears to correspond with the pattern of self-reported “high blood pressure” diagnosis. For example, Puerto Rico, which had a prevalence of self-reported hypertension (42.2%) substantially higher than the national

TABLE 3. Adjusted* percentage of adults aged ≥18 years who report taking action to reduce their sodium intake, by receipt of advice to reduce sodium intake and self-reported hypertension† status — Behavioral Risk Factor Surveillance System, nine states and Puerto Rico, 2015

| Characteristic | Took action to reduce sodium intake | | | | | | | | | | | |
|-----------------------------------|-------------------------------------|-------------------------|----------------------|---------------|-------------------------|----------------------|-------------------------------|-------------------------|----------------------|---------------|-------------------------|----------------------|
| | Self-reported hypertension | | | | | | No self-reported hypertension | | | | | |
| | Advice | | | No advice | | | Advice | | | No advice | | |
| | No. | % (95% CI) | p-value [§] | No. | % (95% CI) | p-value [§] | No. | % (95% CI) | p-value [§] | No. | % (95% CI) | p-value [§] |
| Total | 10,900 | 80.9 (79.5–82.2) | — | 11,706 | 55.7 (54.2–57.2) | — | 3,346 | 72.7 (70.1–75.2) | — | 24,624 | 46.9 (45.9–47.9) | — |
| Jurisdiction | | | | | | | | | | | | |
| Alabama | 1,481 | 80.5 (77.2–83.5) | <0.05 | 1,567 | 56.5 (53.0–59.9) | <0.05 | 424 | 75.3 (68.7–80.9) | 0.330 | 2,735 | 45.2 (42.7–47.8) | <0.05 |
| Indiana | 956 | 82.8 (79.1–86.0) | | 1,087 | 51.4 (46.9–55.8) | | 302 | 71.3 (62.3–78.9) | | 2,311 | 47.9 (45.0–50.9) | |
| Iowa | 763 | 82.4 (78.3–85.8) | | 1,121 | 52.3 (48.5–56.0) | | 278 | 69.7 (61.1–77.2) | | 2,579 | 42.1 (39.6–44.7) | |
| Kentucky | 1,664 | 76.1 (71.9–79.9) | | 1,708 | 54.3 (50.4–58.3) | | 402 | 72.2 (65.2–78.3) | | 3,071 | 42.2 (39.4–45.1) | |
| Maine | 908 | 85.0 (81.6–87.8) | | 1,033 | 57.9 (54.0–61.8) | | 306 | 74.9 (67.9–80.8) | | 2,434 | 46.0 (43.2–48.7) | |
| Nebraska | 1,063 | 82.9 (79.3–85.9) | | 1,695 | 51.0 (47.1–54.8) | | 344 | 68.3 (58.4–76.7) | | 4,032 | 39.2 (36.9–41.6) | |
| North Carolina | 1,095 | 83.9 (80.6–86.8) | | 1,057 | 59.2 (55.3–62.9) | | 321 | 71.4 (64.6–77.3) | | 2,588 | 49.5 (47.2–51.8) | |
| Oregon | 268 | 83.8 (77.3–88.7) | | 476 | 49.7 (43.4–55.9) | | 82 | 71.6 (55.0–83.9) | | 1,106 | 37.2 (33.4–41.1) | |
| Tennessee | 1,024 | 78.9 (74.4–82.7) | | 1,186 | 56.8 (52.5–61.1) | | 238 | 81.1 (72.4–87.6) | | 1,916 | 51.4 (48.0–54.7) | |
| Puerto Rico | 1,678 | 81.3 (77.4–84.8) | | 776 | 62.2 (56.0–68.1) | | 649 | 74.7 (68.9–79.8) | | 1,852 | 56.7 (51.8–61.4) | |
| Sex | | | | | | | | | | | | |
| Male | 4,467 | 79.3 (77.3–81.2) | <0.05 | 5,081 | 51.0 (48.7–53.2) | <0.05 | 1,419 | 70.9 (66.9–74.7) | 0.077 | 10,163 | 43.1 (41.6–44.6) | <0.05 |
| Female | 6,433 | 82.4 (80.6–84.0) | | 6,625 | 60.5 (58.6–62.4) | | 1,927 | 74.5 (71.2–77.7) | | 14,461 | 50.6 (49.2–51.9) | |
| Age group (yrs) | | | | | | | | | | | | |
| 18–64 | 5,519 | 79.5 (77.7–81.2) | <0.05 | 5,745 | 55.1 (53.1–57.1) | <0.05 | 2,230 | 69.8 (66.6–72.8) | <0.05 | 19,209 | 44.5 (43.3–45.6) | <0.05 |
| ≥65 | 5,381 | 85.9 (84.3–87.3) | | 5,961 | 61.2 (59.2–63.1) | | 1,116 | 84.1 (80.5–87.1) | | 5,415 | 56.6 (54.6–58.6) | |
| Race/Ethnicity | | | | | | | | | | | | |
| White, non-Hispanic | 7,381 | 80.3 (78.7–81.9) | <0.05 | 9,547 | 53.1 (51.3–54.9) | <0.05 | 2,177 | 73.3 (70.1–76.3) | 0.281 | 19,839 | 43.5 (42.2–44.7) | <0.05 |
| Black, non-Hispanic | 1,449 | 87.7 (84.5–90.3) | | 949 | 71.6 (66.7–76.0) | | 312 | 77.4 (69.0–84.1) | | 1,457 | 61.3 (57.6–65.0) | |
| Other, non-Hispanic | 270 | 81.2 (67.5–90.0) | | 300 | 49.5 (39.6–59.5) | | 97 | 84.0 (70.9–91.9) | | 784 | 46.3 (41.1–51.7) | |
| Hispanic | 1,800 | 79.8 (75.8–83.3) | | 910 | 57.8 (51.2–64.2) | | 760 | 70.2 (64.1–75.7) | | 2,544 | 53.4 (49.1–57.7) | |
| Education | | | | | | | | | | | | |
| Less than high school | 1,527 | 77.0 (72.9–80.5) | 0.079 | 1,143 | 55.3 (50.7–59.7) | 0.347 | 380 | 66.5 (58.5–73.6) | 0.269 | 1,468 | 46.6 (42.7–50.5) | 0.641 |
| High school | 3,684 | 80.4 (78.1–82.5) | | 3,926 | 54.9 (52.4–57.5) | | 1,088 | 74.0 (69.3–78.1) | | 6,794 | 46.3 (44.5–48.2) | |
| Some college | 2,885 | 83.7 (81.4–85.7) | | 3,243 | 57.6 (55.0–60.2) | | 916 | 72.0 (67.0–76.5) | | 7,050 | 47.5 (45.7–49.2) | |
| College or more | 2,804 | 81.0 (78.5–83.2) | | 3,394 | 53.9 (51.3–56.4) | | 962 | 76.3 (72.1–80.0) | | 9,312 | 47.1 (45.6–48.7) | |
| Smoking status | | | | | | | | | | | | |
| Current and former smoker | 5,146 | 79.9 (77.9–81.8) | <0.05 | 5,792 | 55.0 (52.8–57.1) | 0.514 | 1,454 | 72.0 (68.2–75.5) | 0.210 | 9,904 | 46.0 (44.5–47.6) | 0.172 |
| Never smoker | 5,754 | 81.8 (80.0–83.4) | | 5,914 | 56.3 (54.1–58.3) | | 1,892 | 73.4 (69.7–76.8) | | 14,720 | 47.6 (46.2–48.9) | |
| Obesity status[¶] | | | | | | | | | | | | |
| No | 5,843 | 82.5 (80.9–84.1) | <0.05 | 7,123 | 53.6 (51.7–55.6) | <0.05 | 2,160 | 73.0 (69.6–76.2) | 0.971 | 18,877 | 45.8 (44.6–46.9) | <0.05 |
| Yes | 5,057 | 79.8 (77.7–81.7) | | 4,583 | 59.3 (56.9–61.6) | | 1,186 | 72.6 (68.4–76.3) | | 5,747 | 49.4 (47.4–51.4) | |
| Comorbidities^{**} | | | | | | | | | | | | |
| No | 5,520 | 80.1 (78.3–81.8) | <0.05 | 7,711 | 55.2 (53.4–57.0) | <0.05 | 2,423 | 70.3 (67.2–73.2) | <0.05 | 22,251 | 45.1 (44.0–46.2) | <0.05 |
| Yes | 5,380 | 84.6 (82.8–86.2) | | 3,995 | 59.8 (57.2–62.3) | | 923 | 82.1 (77.8–85.8) | | 2,373 | 55.0 (51.9–58.1) | |

Abbreviation: CI = confidence interval.

* Adjusted prevalence estimates were estimated from marginal predictions of separate multiple logistic regression models for each covariate with a term for the interaction between the covariate (e.g., sex) and hypertension status adjusted for all the other covariates in the table. Significant interactions occurred between the hypertension and advice with state, age, race/ethnicity, obesity status, and comorbidities.

† Hypertension was defined as an affirmative response to the question “Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?”

§ p-value obtained by Wald F test and p<0.05 were used to identify statistically significant differences in prevalence of action among subgroups with hypertension and without hypertension by receipt of advice.

¶ Obesity defined as body mass index ≥30 kg/m².

** Includes self-reported diabetes, kidney disease, myocardial infarction, coronary heart disease, or stroke.

prevalence of 30.9% (9), had one of the highest prevalences of receiving advice and taking action. Similar to previous reports, in this study, the prevalence of receiving advice was significantly higher among persons with hypertension and obesity or other cardiovascular disease-associated comorbidity than among those with hypertension without these other

risk factors. However, among adults with an elevated risk for cardiovascular disease, but without hypertension, reported advice to reduce sodium intake was <30%. Also consistent with earlier findings, more adults who received advice from a health professional to reduce sodium intake reported watching or reducing their sodium intake, irrespective of hypertension

Summary**What is already known about this topic?**

Hypertension is a major cardiovascular disease risk factor for which sodium reduction can be beneficial. Provision of sodium reduction advice by health professionals to persons with hypertension reduces their reported sodium intake.

What is added by this report?

Among participants with self-reported hypertension, the prevalence of receiving advice to reduce sodium intake from a health professional was 42% compared with 13% among participants without hypertension. Among those with hypertension, 81% of those who received advice to reduce sodium intake reported taking action to reduce sodium intake, compared with 56% of those with hypertension who did not receive this advice.

What are the implications for public health practice?

Most patients do not receive clinical advice to reduce sodium intake. Increasing the percentage of patients who receive this advice from their health care provider might provide increased opportunities for hypertension prevention and treatment.

status or cardiovascular risk factors (7). Self-reported action to watch or reduce sodium intake might not result in achieving clinically meaningful sodium reduction (10); however, these findings suggest that a health professional's advice can significantly affect awareness.

The findings in this report are subject to at least three limitations. First, BRFSS data are self-reported and subject to recall and social desirability bias, which affects prevalence estimates. Second, questions from BRFSS do not provide the extent of health professional advice or verify or detail the types of actions taken by respondents who report actively watching or reducing their sodium intake. Therefore, these questions might serve as a proxy for awareness of the need for sodium reduction rather than a measure of behavior change. Finally, responses were limited to nine states and Puerto Rico that elected to apply the sodium module during the 2015 BRFSS, and where response rates were approximately 50%; therefore, these results might not be generalizable to all U.S. adults and could be subject to response bias. Despite limitations, this report estimates sodium reduction advice and action using the latest BRFSS data and might provide a baseline for current practice as well as demonstrate opportunities for increasing the advice provided.

The findings from this analysis indicate that a higher percentage of BRFSS participants who reported receiving sodium reduction advice from a health professional reported taking action, across hypertension status and cardiovascular risk groups, underscoring the importance of health professional advice on potentially influencing sodium reduction awareness and behavior. Yet, fewer than half of respondents with

self-reported hypertension and fewer respondents without hypertension reported receiving advice. In accordance with the 2017 hypertension guidelines (4) encouraging lifestyle modification, health professionals can encourage healthy food choices and support consumer and population efforts to reduce sodium intake, highlighting a potential opportunity for hypertension prevention and treatment.

Conflict of Interest

No conflicts of interest were reported.

¹Epidemic Intelligence Service, CDC; ²Division for Heart Disease and Stroke Prevention, National Center for Chronic Disease Prevention and Health Promotion, CDC.

Corresponding author: Puthiery Va, puthieryva@cdc.gov, 404-498-1505.

References

1. Ettehad D, Emdin CA, Kiran A, et al. Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. *Lancet* 2016;387:957–67. [https://doi.org/10.1016/S0140-6736\(15\)01225-8](https://doi.org/10.1016/S0140-6736(15)01225-8)
2. US Department of Agriculture; US Department of Health and Human Services. Dietary guidelines for Americans, 2015–2020. 8th ed. Washington, DC: US Department of Agriculture; US Department of Health and Human Services; 2015. <https://health.gov/dietaryguidelines/2015/guidelines/>
3. Adler AJ, Taylor F, Martin N, Gottlieb S, Taylor RS, Ebrahim S. Reduced dietary salt for the prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2014;18:CD009217.
4. Whelton PK, Carey RM, Aronow WS, et al. ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension; 2017. <http://hyper.ahajournals.org/content/early/2017/11/10/HYP.0000000000000066>
5. CDC. Behavioral Risk Factor Surveillance System: 2015 summary data quality report. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. https://www.cdc.gov/brfss/annual_data/2015/pdf/2015-sdqr.pdf
6. Bieler GS, Brown GG, Williams RL, Brogan DJ. Estimating model-adjusted risks, risk differences, and risk ratios from complex survey data. *Am J Epidemiol* 2010;171:618–23. <https://doi.org/10.1093/aje/kwp440>
7. Jackson SL, Coleman King SM, Park S, Fang J, Odom EC, Cogswell ME. Health professional advice and adult action to reduce sodium intake. *Am J Prev Med* 2016;50:30–9. <https://doi.org/10.1016/j.amepre.2015.04.034>
8. Fang J, Cogswell ME, Park S, Jackson SL, Odom EC. Sodium intake among U.S. adults—26 states, the District of Columbia, and Puerto Rico, 2013. *MMWR Morb Mortal Wkly Rep* 2015;64:695–8.
9. CDC. BRFSS prevalence and trends data. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/brfss/brfssprevalence/>
10. Ayala C, Gillespie C, Cogswell M, Keenan NL, Merritt R. Sodium consumption among hypertensive adults advised to reduce their intake: national health and nutrition examination survey, 1999–2004. *J Clin Hypertens (Greenwich)* 2012;14:447–54. https://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=22747617&dopt=Abstract <https://doi.org/10.1111/j.1751-7176.2012.00632.x>