




## Short Communication

# Receiving advice from a health professional and action taken to reduce dietary sodium intake among adults

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### Abstract

**Objective:** Population reductions in Na intake could prevent hypertension, and current guidelines recommend that clinicians advise patients to reduce intake. This study aimed to estimate the prevalence of taking action and receiving advice from a health professional to reduce Na intake in ten US jurisdictions, including the first-ever data in New York state and Guam.

**Design:** Weighted prevalence and 95 % CI overall and by location, demographic group, health status and receipt of provider advice using self-reported data from the 2017 Behavioral Risk Factor Surveillance System optional Na module.

**Setting:** Seven states, the District of Columbia, Puerto Rico and Guam.

**Participants:** Adults aged  $\geq 18$  years.

**Results:** Overall, 53.6 % (95 % CI 52.7, 54.5) of adults reported taking action to reduce Na intake, including 54.8 % (95 % CI 52.8, 56.7) in New York and 61.2 % (95 % CI 57.6, 64.7) in Guam. Prevalence varied by demographic and health characteristic and was higher among adults who reported having hypertension (72.5 %; 95 % CI 71.2, 73.7) *v.* those who did not report having hypertension (43.9 %; 95 % CI 42.7, 45.0). Among those who reported receiving Na reduction advice from a health professional, 82.6 % (95 % CI 81.3, 83.9) reported action *v.* 44.4 % (95 % CI 43.4, 45.5) among those who did not receive advice. However, only 24.0 % (95 % CI 23.3, 24.7) of adults reported receiving advice from a health professional to reduce Na intake.

**Conclusions:** The majority of adults report taking action to reduce Na intake. Results highlight an opportunity to increase Na reduction advice from health professionals during clinical visits to better align with existing guidelines.

### Keywords

Adults  
Behavioral Risk Factor  
Surveillance System  
Diet  
Physician–Patient relations  
Prevalence  
Sodium  
United States

In 2019, the National Academy of Medicine indicated that lowering dietary sodium (Na) intake for people who consume more than 2300 mg/d could reduce blood pressure and CVD risk<sup>(1)</sup>. However, mean intake in the USA population exceeds this level<sup>(2)</sup>. A 10-year graduated reduction in Na in the USA food supply to achieve a mean population intake of  $\leq 2300$  mg/d could prevent 252 500 CVD deaths and save \$37 billion in health care costs<sup>(3)</sup>.

Health care providers have an important role to play in educating and supporting patients to reduce dietary Na intake<sup>(4)</sup>. Current guidelines recommend that health care providers counsel their patients who have or are at risk for hypertension on lifestyle modification, including dietary

Na reduction, to reduce their CVD risk<sup>(5)</sup>. Although the extent to which receiving advice from a health care provider to reduce Na intake results in clinically meaningful reductions in actual Na intake is unknown<sup>(6)</sup>, receiving advice from a health care provider has been shown to be associated with increased likelihood of reporting taking action to reduce Na intake<sup>(7,8)</sup>, improvements in dietary behaviours linked to CVD risk (e.g. fruit and vegetable intake, dietary fibre intake and dietary fat intake)<sup>(6)</sup> and reduced blood pressure<sup>(6)</sup>. Documenting consumer action to reduce Na intake and the prevalence of receiving advice from a health professional to reduce Na intake can help inform the development and implementation of Na

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reduction interventions. However, the prevalence of consumers who report receiving advice from a health professional to reduce Na intake and the prevalence of trying to reduce Na intake have not been estimated in all US states, territories and jurisdictions.

The Behavioral Risk Factor Surveillance System (BRFSS) optional Na module allows US states, territories and other jurisdictions to monitor receiving advice and taking action to reduce Na intake. This analysis uses 2017 BRFSS data to update prevalence estimates in seven states and the District of Columbia (DC), and generate first-ever estimates in New York state and the US territory of Guam, which have both implemented several initiatives to reduce dietary Na intake<sup>(9–11)</sup>.

## Materials and methods

The Behavioral Risk Factor Surveillance System is a cross-sectional state-based telephone survey among a representative sample of non-institutionalised adults aged  $\geq 18$  years (median response rates: 45.2% landlines, 44.3% cell phones). In 2017, Iowa, Maine, New York, North Carolina, Ohio, Oregon, West Virginia, DC, Guam and Puerto Rico opted to use the two-item Na module, which assesses whether respondents are currently watching or reducing their Na or salt intake or have received advice from a doctor or other health professional to reduce Na or salt intake. All BRFSS respondents residing in these jurisdictions were asked the Na module items. Among the 49 536 module participants, 85.3% were included in this analysis. Participants were excluded if they had missing data on module items (11.8%); hypertension status or medication use (0.3%); age, sex, or race or Hispanic ethnic group (1.2%) or comorbidities (1.8%). Excluded participants differed from included participants on all measured characteristics except for total number of comorbid conditions and were more likely to be male or younger and less likely to be in the Hispanic ethnic group or report having hypertension as compared with included participants.

We estimated the weighted prevalence of receiving advice from a healthcare professional and taking action to reduce Na intake among adults overall and by jurisdiction, select demographic characteristics, hypertension status and number of CVD comorbidities linked to high blood pressure (i.e. diabetes, kidney disease, stroke, myocardial infarction and coronary heart disease) using SAS-callable SUDAAN (version 11). We also estimated the prevalence of taking action to reduce Na intake by receipt of advice from a health care professional among adults overall and by subgroup, as well as the prevalence difference (PD). Respondents were coded as having hypertension if they self-reported the condition; those who reported hypertension only during pregnancy, borderline hypertension or no hypertension were classified as not having hypertension. All prevalence estimates were weighted to account for

the complex sampling design and non-response, and  $\chi^2$  tests were used to assess the uniformity of the prevalence distribution within each subgroup using a type I error rate of 5%.

## Results

Overall, 53.6% (95% CI 52.7, 54.5) of respondents reported taking action to reduce Na intake (Table 1). The prevalence ranged from 43.0% (95% CI 41.1, 44.8) in Oregon to 69.6% (95% CI 67.6, 71.5) in Puerto Rico and was 54.8% (95% CI 52.8, 56.7) in New York and 61.2% (95% CI 57.6, 64.7) in Guam. Overall, the prevalence was highest among adults with self-reported hypertension (72.5%; 95% CI 71.2, 73.7), females (55.3%; 95% CI 54.1, 56.5), adults aged  $\geq 65$  years (69.2%; 95% CI 67.9, 70.6), non-Hispanic blacks (69.6%; 95% CI 66.7, 72.4) and those with  $\geq 2$  comorbidities (80.5%; 95% CI 77.7, 83.0). The prevalence was lowest among adults with no self-reported hypertension (43.9%; 95% CI 42.7, 45.0), males (51.8%; 95% CI 50.5, 53.1), adults aged 18–44 years (40.8%; 95% CI 39.3, 42.3), non-Hispanic whites (48.6%; 95% CI 47.5, 49.6), and those with no comorbidities (48.9%; 95% CI 47.9, 49.9). Among adults with hypertension, the prevalence of taking action was higher among those who report taking medication (76.4%; 95% CI 75.2, 77.6) as compared with those not taking medication (59.0%; 95% CI 55.7, 62.2;  $P < 0.0001$ ).

Overall, 24.0% (95% CI 23.3, 24.7) of adults reported receiving advice from a health professional to reduce Na intake (Table 1). The prevalence ranged from 14.9% (95% CI 13.6, 16.3) in Iowa to 42.7% (95% CI 40.8, 44.7) in Puerto Rico and was 21.5% (95% CI 20.1, 23.0) in New York and 33.4% (95% CI 30.1, 36.8) in Guam. Across all locations, the prevalence was highest among adults with self-reported hypertension (51.6%; 95% CI 50.2, 52.9), adults aged  $\geq 65$  years (37.5%; 95% CI 36.1, 38.9), non-Hispanic blacks (34.0%; 95% CI 31.3, 36.9) and those with  $\geq 2$  comorbidities (63%; 95% CI 59.8, 66.1). The prevalence was lowest among adults with no self-reported hypertension (9.9%; 95% CI 9.2, 10.4), adults aged 18–44 years (13.7%; 95% CI 12.8, 14.8), non-Hispanic whites (20.1%; 95% CI 19.4, 20.9) and those with no comorbidities (17.9%; 95% CI 17.2, 18.6). Among adults with hypertension, the prevalence of receiving advice was higher among those who reported taking medication (55.7%; 95% CI 54.2, 57.1) as compared with those not taking medication (37.5%; 95% CI 34.4, 40.7;  $P < 0.0001$ ).

Overall, the prevalence of taking action to reduce Na intake was significantly higher among those who received advice from a health professional (82.6%; 95% CI 81.3, 83.9) as compared with those who did not receive advice (44.4%; 95% CI 43.4, 45.5;  $P < 0.0001$ ; Table 2). This pattern of results was consistent across subgroups, though the magnitude of the difference in prevalence varied. The

**Table 1** Prevalence of adults aged  $\geq 18$  years who reported taking action to reduce sodium intake or receiving advice from a doctor or health professional to reduce sodium intake overall and by subgroup – Behavioral Risk Factor Surveillance System, seven states, the District of Columbia, Puerto Rico, and Guam, 2017\*

	Taking action to reduce Na intake				Receiving advice from a health professional to reduce Na intake			
	<i>n</i>	%	95% CI	<i>P</i>	<i>n</i>	%	95% CI	<i>P</i>
Total	24 583	53.6	52.7, 54.5		12 055	24.0	23.3, 24.7	
Jurisdiction				< 0.0001				< 0.0001
Iowa	1522	44.1	42.1, 46.1		553	14.9	13.6, 16.3	
Maine	3031	52.4	50.3, 54.5		1180	20.2	18.7, 21.9	
New York	2751	54.8	52.8, 56.7		1173	21.5	20.1, 23.0	
North Carolina	2266	56.5	54.4, 58.7		997	24.5	22.7, 26.3	
Ohio	4068	51.0	49.2, 52.8		2305	26.8	25.4, 28.3	
Oregon	1875	43.0	41.1, 44.8		665	15.1	13.9, 16.4	
West Virginia	2647	49.3	47.6, 51.1		1315	23.4	22.1, 24.8	
District of Columbia	2310	49.4	47.3, 51.6		1439	27.7	26.0, 29.5	
Guam	837	61.2	57.6, 64.7		445	33.4	30.1, 36.8	
Puerto Rico	3276	69.6	67.6, 71.5		1983	42.7	40.8, 44.7	
Sex				0.0001				0.96
Female	14 581	55.3	54.1, 56.5		6887	24.0	23.1, 25.0	
Male	10 002	51.8	50.5, 53.1		5168	24.0	23.0, 25.0	
Age (years)				< 0.0001				< 0.0001
18–44	4867	40.8	39.3, 42.3		1799	13.7	12.8, 14.8	
45–64	9591	60.0	58.7, 61.4		4738	28.5	27.3, 29.8	
65+	10 125	69.2	67.9, 70.6		5518	37.5	36.1, 38.9	
Race and Hispanic ethnic group				< 0.0001				< 0.0001
Black, non-Hispanic	3048	69.6	66.7, 72.4		1850	34.0	31.3, 36.9	
Hispanic	4238	64.2	62.1, 66.2		2431	33.9	32.0, 35.8	
White, non-Hispanic	15 688	48.6	47.5, 49.6		6963	20.1	19.4, 20.9	
Other, non-Hispanic	1609	50.7	46.5, 54.9		811	21.8	18.7, 25.3	
Hypertension Status				< 0.0001				< 0.0001
Hypertension	13 217	72.5	71.2, 73.7		9282	51.6	50.2, 52.9	
Taking medication	11 377	76.4	75.2, 77.6	< 0.0001	8178	55.7	54.2, 57.1	< 0.0001
Not taking medication	1840	59.0	55.7, 62.2		1104	37.5	34.4, 40.7	
No hypertension	11 366	43.9	42.7, 45.0		2773	9.8	9.2, 10.4	
Number of comorbidities†				< 0.0001				< 0.0001
0	17 049	48.9	47.9, 49.9		6769	17.9	17.2, 18.6	
1	5048	70.5	68.5, 72.4		3270	44.4	42.3, 46.5	
$\geq 2$	2486	80.5	77.7, 83.0		2016	63.0	59.8, 66.1	

\*Note. This table reports the unweighted number of respondents and weighted prevalence and 95% CI, which accounts for the complex sampling design. Wald Chi-Square tests were used to generate *P*-values testing the uniformity of the prevalence distributions within each subgroup.

†Diabetes, kidney disease, stroke, myocardial infarction, coronary heart disease.

largest difference between the prevalence of taking action among adults who reported receiving advice compared with those who did not report receiving advice was among residents of the District of Columbia (PD: 52.5%), Ohio (PD: 48.4%) and Oregon (PD: 41.3%) and non-Hispanic Whites (PD: 40.7%). The smallest prevalence differences were among residents of Guam (PD: 18.9%), adults with hypertension who were not taking medication (PD: 23.7%) and adults with  $\geq 2$  comorbidities (PD: 25.0%).

## Discussion

The majority of adults in seven US states, two territories and DC, and nearly three-quarters of adults with hypertension reported taking action to reduce Na intake. Consistent with prior results<sup>(7,8,12)</sup>, the prevalence of taking action was highest among adults who reported receiving advice from a health professional to reduce Na intake. However, only one-quarter of adults overall and one-half of adults with

hypertension reported receiving such advice in 2017. These results highlight a potential missed opportunity for health professionals to provide Na reduction advice during clinical visits, especially among adults with hypertension.

The American College of Cardiology/American Heart Association hypertension guidelines recommend that all adults with hypertension and those who are at risk of developing hypertension be counseled on lifestyle modification<sup>(5)</sup>. However, this study and others have found that not all patients with hypertension recall receiving advice to reduce Na intake<sup>(7,8)</sup>, nor do all health care providers report advising their patients with hypertension to reduce Na intake<sup>(13,14)</sup>. Barriers that health care providers report prevent them from advising patients to reduce dietary Na intake include perceptions that patients are unlikely to comply, lack of resources for patient education and insufficient scientific evidence<sup>(13,14)</sup>. Epidemiologists, health promotion specialists and public health and healthcare organisations can use data from the BRFSS optional Na module along with the strong scientific evidence

**Table 2** Prevalence of adults aged  $\geq 18$  years who reported taking action to reduce sodium intake by receipt of advice from a doctor or health professional to reduce sodium intake – Behavioral Risk Factor Surveillance System, seven states, the District of Columbia, Puerto Rico, and Guam, 2017\*

	Taking action to reduce Na intake						Prevalence difference	P
	Received advice from a health professional to reduce Na intake			Did not receive advice from a health professional to reduce Na intake				
	n	%	95% CI	n	%	95% CI		
Total	10 222	82.6	81.3, 83.9	14 361	44.4	43.4, 45.5	38.2	< 0.0001
Jurisdiction								
Iowa	453	79.9	75.5, 83.7	1069	37.8	35.7, 40.0	42.1	< 0.0001
Maine	1006	84.1	80.5, 87.1	2025	44.4	42.0, 46.7	39.7	< 0.0001
New York	974	81.0	77.8, 83.8	1777	47.6	45.4, 49.8	33.4	< 0.0001
North Carolina	834	81.6	77.9, 84.8	1432	48.4	45.9, 50.9	33.2	< 0.0001
Ohio	2025	86.4	84.0, 88.5	2043	38.0	36.1, 40.1	48.4	< 0.0001
Oregon	524	78.0	74.1, 81.4	1351	36.7	34.8, 38.7	41.3	< 0.0001
West Virginia	1032	76.1	73.1, 78.8	1615	41.2	39.2, 43.2	34.9	< 0.0001
District of Columbia	1301	87.4	84.5, 89.7	1009	34.9	32.5, 37.3	52.5	< 0.0001
Guam	340	73.8	67.9, 79.0	497	54.9	50.5, 59.2	18.9	< 0.0001
Puerto Rico	1733	84.3	82.0, 86.4	1543	58.6	55.8, 61.4	25.7	< 0.0001
Sex								
Female	5940	84.6	82.8, 86.2	8641	46.0	44.6, 47.4	38.6	< 0.0001
Male	4282	80.5	78.5, 82.4	5720	42.7	41.2, 44.3	37.8	< 0.0001
Age (years)								
18–44	1322	72.2	68.6, 75.6	3545	35.7	34.2, 37.4	36.5	< 0.0001
45–64	4038	85.3	83.4, 87.0	5553	50.0	48.4, 51.6	35.3	< 0.0001
65+	4862	87.1	85.4, 88.6	5263	58.6	56.7, 60.4	28.5	< 0.0001
Race and Hispanic ethnic group								
Black, non-Hispanic	1673	88.1	84.7, 90.9	1375	60.1	56.2, 63.8	28.0	< 0.0001
Hispanic	2096	83.1	80.5, 85.4	2142	54.5	51.8, 57.2	28.6	< 0.0001
White, non-Hispanic	5810	81.1	79.3, 82.7	9878	40.4	39.2, 41.5	40.7	< 0.0001
Other, non-Hispanic	643	80.0	72.8, 85.7	966	42.5	37.8, 47.4	37.5	< 0.0001
Hypertension status								
Hypertension	8082	85.5	84.1, 86.8	5135	58.6	56.6, 60.5	26.9	< 0.0001
Taking medication	7201	86.9	85.5, 88.2	4176	63.2	61.1, 65.2	23.7	< 0.0001
Not taking medication	881	78.2	73.5, 82.3	959	47.4	43.3, 51.5	30.8	< 0.0001
No hypertension	2140	74.8	71.7, 77.7	9226	40.5	39.3, 41.7	34.3	< 0.0001
Number of comorbidities†								
0	5571	79.2	77.4, 81.0	11 478	42.3	41.2, 43.4	36.9	< 0.0001
1	2850	86.6	84.4, 88.5	2198	57.7	54.8, 60.5	28.9	< 0.0001
$\geq 2$	1801	89.7	87.2, 91.8	685	64.7	59.1, 69.9	25.0	< 0.0001

DC, District of Columbia; HTN, hypertension; NH, non-Hispanic.

\*This table reports the unweighted number of respondents and weighted prevalence and 95% CI, which accounts for the complex sampling design.

†Diabetes, kidney disease, stroke, myocardial infarction, coronary heart disease.

supporting scientific Na reduction<sup>(1)</sup> to document the need to train health care professionals about the benefits of Na reduction. Increasing understanding about the importance of Na reduction can augment public health strategies to reduce Na in the food supply and support patients in lowering their intake, as recommended by the National Academy of Medicine<sup>(4)</sup>. The need for clinical counseling on dietary Na reduction is likely to become increasingly important given that 52 million US adults have been newly classified as having elevated blood pressure or Stage I hypertension under the expanded blood pressure cutoffs used in the American College of Cardiology/American Heart Association hypertension guidelines released in 2017<sup>(5,15)</sup>.

According to a systematic review, although evidence suggests that receiving advice from a health care provider is associated with reductions in blood pressure

and improvements in other dietary behaviors, evidence for the association between provider advice and reduced Na intake is mixed<sup>(6)</sup>. Reducing actual Na intake may be difficult for even highly motivated consumers to achieve, given the ubiquity of added Na in the US food supply<sup>(16)</sup>. For this reason, reducing Na added to the food supply and expanding access to lower-Na food options are needed to assist consumers in lowering their Na intake<sup>(4,17)</sup>. Public health professionals and food industry partners can use data from the BRFSS optional Na module to demonstrate that the majority of adults report taking action to reduce Na intake, demonstrating potential demand for policies, interventions and products that facilitate Na reduction efforts.

Multiple Na reduction initiatives are currently being implemented throughout the USA. For example, the Centers for Disease Control and Prevention and other





federal partners support Na reduction efforts through multiple initiatives, including the Sodium Reduction in Communities Program<sup>(9)</sup>, the State Physical Activity and Nutrition Program<sup>(18)</sup> and the Million Hearts Initiative<sup>(19)</sup>. Additionally, many jurisdictions that participated in the BRFSS optional Na module have ongoing Na reduction initiatives, including New York State and Guam, which participated in the module for the first time in 2017. New York has implemented food service guidelines and offered lower-Na food options in corrections, education and healthcare settings; conducted consumer sensory testing of lower-Na products; and required chain restaurants with fifteen or more locations nationwide to post warning icons next to menu items that contain  $\geq 2300$  mg of Na to assist consumers in lowering their intake<sup>(9,10)</sup>. In Guam, Na reduction was included a component of the territorial non-communicable disease strategic plan and the Department of Health launched an initiative in collaboration with the restaurant industry to remove salt shakers from tables at local restaurants<sup>(11)</sup>. Educating health care providers about current Na reduction initiatives may increase uptake of these interventions among their patient populations.

A strength of this analysis is that it represents the first-ever prevalence estimates for New York and Guam. Limitations of this study include that responses are self-reported and median response rates of  $< 50\%$ , indicating possible recall, social desirability or response biases. Additionally, self-reported action to reduce Na intake may not necessarily equate to lower mean daily Na intake<sup>(20)</sup>. Finally, results are limited to jurisdictions that opted to participate in the Na module and may not generalise to the US adult population overall.

## Conclusions

These results document that a majority of US adults in participating jurisdictions report taking action to reduce Na intake and highlight an opportunity to increase Na reduction advice during clinical visits to encourage all adults, and especially those with hypertension, to take action to reduce sodium intake to prevent and control CVD.

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*of human subject participation:* This study was conducted according to the guidelines laid down in the Declaration of Helsinki. This is a secondary analysis of publicly available surveillance data, and human subjects review was not required.

## Supplementary material

For supplementary material accompanying this paper visit <https://doi.org/10.1017/S1368980021002019>

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