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Prevalence of Taking Actions to Control Blood Pressure Among Adults With Self-Reported Hypertension in 18 States and the District of Columbia, 2009

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Abstract

The authors used 2009 Behavioral Risk Factor Surveillance System data to assess the prevalence of taking actions to control hypertension among adults with self-reported hypertension. Differences by descriptive characteristics (sex, age, race/ethnicity, access to health care, medication adherence), presence of other health risk factors (overweight/obesity, smoking, heavy drinking, inadequate fruit/vegetable intake, and physical inactivity), and comorbidities (diabetes, high cholesterol, coronary heart disease, and stroke) were compared. The prevalence of hypertension was 29.6%, and 75.0% of these patients reported taking antihypertensive medications, 73.1% changed eating habits, 72.8% decreased the use of salt, 78.8% reduced alcohol consumption, and 69.9% increased their physical activity. Overall, 87.2% reported taking two or more actions to reduce blood pressure. Patients taking antihypertensive medications were more likely to take two or more actions than their counterparts (90.6% vs 79.4%, $P < .01$). Those with at least one other health risk factor were 1.85 times as likely to take two or more actions as their counterparts (95% confidence interval, 1.18–2.92 times). More than 80% of hypertensive adults reported taking two or more actions to control blood pressure. The prevalence of taking actions differed significantly by descriptive characteristics, the presence health risk factors, and comorbidities. *J Clin Hypertens (Greenwich)*. 2015;17:172–182. Published 2015. This article is a U.S. Government work and is in the public domain in the USA.

In the United States during 2011–2012, 29.1% of adults had hypertension,¹ and the estimated direct and indirect costs for hypertension in 2011 were more than \$46.4 billion.² Among adults with hypertension in 2009, about 17% were not aware that they were hypertensive.¹ Among adults with diagnosed hypertension, nearly 24% were not taking medication to lower their blood pressure (BP).¹ Awareness and treatment of hypertension

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AUTHOR CONTRIBUTIONS

CA provided study concept and design, analyzed and interpreted data, wrote and reviewed/edited the manuscript, and supervised the study. JF provided study concept and design, analyzed and interpreted data, and wrote and reviewed/edited the manuscript. KY acquired, analyzed, and interpreted the data and reviewed/edited the manuscript.

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did not change from 2009–2010 to 2011–2012, and only half of adults with hypertension had their BP under control during both survey periods.^{1–6}

Treatment guidelines recommend lifestyle modifications to lower BP as the initial step for adults with a consistent elevated BP between 140/90 mm Hg and <160/100 mm Hg, and if goal BP is not reached then antihypertensive medication is added.⁷ Patients with a BP 160/100 mm Hg, or with compelling indications, are to be initially treated with antihypertensive medication and lifestyle modifications.⁷ There are recommendations for effective BP management specifically for elderly (60 years and older), African Americans, and those with diabetes or chronic kidney disease.^{8–10} Several reports have documented that many adults initiate lifestyle modifications (eg, changing eating habits, reducing sodium intake, reducing alcohol consumption, and increasing physical activity) to treat hypertension.^{11–15} These actions target health risk factors such as heavy alcohol consumption, eating five or more servings of fruits and vegetables per day, smoking, being overweight or obese, or being physically inactive.^{16,17}

Several reports on taking action to control hypertension have used the Behavioral Risk Factor Surveillance System (BRFSS) for state-level estimates.^{18,19} The first was based on 2005 BRFSS data from 20 states¹⁹ and the second was from 2007 BRFSS data from all 50 states and the District of Columbia.²⁰ Healthy People 2020 highlights the importance of lifestyle modifications in the treatment and control of hypertension and includes several developmental objectives (heart disease and stroke 10.1–5) to increase the proportion of adults with hypertension who meet the recommended guidelines (10.1, body mass index [BMI]; 10.2, saturated fat consumption; 10.3, sodium intake; 10.4, physical activity; 10.5, alcohol consumption).^{21–23} We used the most recent BRFSS data available (2009) to assess self-reported actions to control hypertension in 18 states and the District of Columbia. We report the overall and state-specific prevalence of taking specific actions to control BP (change eating habits, reduce sodium intake, reduce alcohol consumption, and increase physical activity) and provide estimates on the proportion of people with hypertension who take antihypertensive medications.

METHODS

The BRFSS is an ongoing, state-based, random-digit-dialed telephone survey of noninstitutionalized adults aged 18 years and older. The survey has been conducted since 1984 by US state and territorial health departments with assistance from the Centers for Disease Control and Prevention (CDC). The standard BRFSS questionnaire has three parts: (1) core questions, (2) optional modules on selected topics, and (3) state-added questions. All states use the core questions but can choose whether to include the optional modules and state-added questions. In 2009, the “Actions to Control High Blood Pressure” module was included in 18 states and the District of Columbia. Details on BRFSS methodology are published elsewhere (<http://www.cdc.gov/BRFSS/>).^{16,24–26} In 2009, the median survey response rate was 57.2% (range, 39.9%–65.9%).

Participants were classified as having awareness of high BP if they answered yes to the core question, “Have you been told by a doctor or other health professional that you have high BP

(not including hypertension during pregnancy)?” Only those who responded yes were asked questions from the “Actions to Control High Blood Pressure” module. In this module, if participants answered yes to the question, “Were you told on two or more different visits to a doctor or other health professional that you had hypertension?,” they were classified as having self-reported hypertension. The module also asked the following four questions about specific actions the participants were currently taking to lower their blood pressure: “Are you changing your eating habits to help lower or control your high blood pressure?,” “Are you cutting down on salt to help lower or control your high blood pressure?,” “Are you reducing alcohol use to help lower or control your high blood pressure?,” and “Are you exercising to help lower or control your high blood pressure?” Finally, participants were asked about taking antihypertensive medications: “Are you currently taking medicine for your high blood pressure?”

Descriptive characteristics analyzed were sex, age (18–44, 45–64, 65 years or older), race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic other, Hispanic), education (less than high school, high school graduate, some college, college graduate or more), household income (<\$25,000, \$25,000–\$49,999, \$50,000), employment (employed, unemployed, retired), health insurance (yes, no), primary care provider (yes, no), and medication adherence (taking or not taking antihypertensive drugs). Health risk factors included BMI calculated from self-reported weight and height (in kg/m²) and categorized into three groups:^{27,28} underweight and normal weight (<25.0), overweight (25.0–29.9), and obese (>30); fruit/vegetable intake (<5 or 5 servings per day), heavy alcohol consumption (>1 drink per day for women and >2 drinks per day for men); physical activity (inactive, <10 min/wk; insufficient, 10–149 min/wk; active, 150 min/wk of moderate-intensity equivalent physical activity);²⁹ and smoking status (current, former, none). Diabetes, high blood cholesterol, coronary heart disease, and stroke were ascertained by self-report.

Data analysis

Data were age-standardized to the 2000 US standard population (when applicable). Among those with self-reported hypertension, differences in taking actions to lower or control BP by demographic characteristics, health risk factors, comorbidities, health care access, and medication compliance using chi-square tests were assessed.

We categorized hypertensive adults as taking none or one or two or more actions and assessed differences by demographic characteristics, presence of other health risk factors, presence of comorbidities, healthcare access, and medication compliance using chi-square tests. We calculated state-specific prevalence of taking two or more actions to lower or control BP and determined quartile ranks to allow for geographic distribution.

Using multiple logistic regression models, we estimated the odds ratios and adjusted odds ratios (AORs) of taking two or more actions to control hypertension compared with taking no or one action. Stepwise regression was used with the a priori elimination of variables with a significance of $P < .20$. Model 1 was unadjusted and compared those with no health risk factors with those with one or more health risk factors. Model 2 adjusted for age, sex, race/ethnicity, education, health insurance, and primary care physician. Model 3 adjusted for

all variables in model 2 and also for taking antihypertensive medications and having diabetes.

We calculated the prevalence of taking two or more actions to lower BP for each of the 18 states and the District of Columbia that participated in the CDC-funded Heart Disease and Stroke Prevention (HDSP) state programs. We identified each state program's participation as capacity building (CB) and basic intervention (BI) and the year they first received funding and the status of the program in 2009. Additional details about HDSP state programs can be found at http://www.cdc.gov/dhdsp/programs/nhdsp_program/index.htm. We categorized the prevalence of taking two or more actions into quartiles and ranked them from lowest prevalence to highest within the quartiles. We examined for differences in CP and BI by quartiles of action prevalence.

All analyses used sampling weights to account for the complex sampling design and were performed using SAS-Callable SUDAAN (Research Triangle Institute, Research Triangle Park, NC).³⁰ All statistical tests were two-tailed, and significance was defined as $P < .05$. Any estimate with a standard error $> 30\%$ was considered to be unreliable.

RESULTS

During 2009, a total of 52,068 of 126,718 (41.2%, $\pm 0.2\%$) BRFSS respondents reported high BP and 39,469 (22.0% ± 0.2) were classified as having self-reported hypertension (ie, told on two or more occasions). Among adults with hypertension, 75.0% were currently taking antihypertensive medications (Table I) and 98.5% stated that they were taking one or more lifestyle action to control their BP: 73.1% changed eating habits, 72.8% reduced sodium intake, 78.8% reduced alcohol consumption, and 69.9% increased physical activity.

A significantly smaller proportion of older adults (65 years and older) with hypertension reported changed eating habits compared with those aged 18 to 44 years and those 45 to 64 years. However, a greater proportion of those aged 65 years and older reported reducing sodium intake (73.6%) compared with all other age groups ($P < .05$). Women reported changing eating habits, reducing sodium intake, and reducing alcohol consumption more than men but increasing their physical activity less than men. Compared with other race/ethnic groups, non-Hispanic blacks had higher proportions reporting changing eating habits, reducing their sodium intake, reducing alcohol consumption, and increasing their physical activity levels than non-Hispanic whites and Hispanics ($P < .05$).

In general, significantly smaller proportions of adults with hypertension who reported selected health risk factors (smoking, being overweight or obese, consuming five or fewer fruit or vegetable servings per day, heavy drinking, or low physical activity levels) took actions to control BP compared with adults without the same risk factors (Table I).

Overall, 87.2% of adults with hypertension reported taking two or more lifestyle actions to control BP (Table II). A significantly larger proportion of those aged 45 to 65 years (89.8%) took two or more lifestyle actions compared with those aged 18 to 44 years (85.8%) and those 65 years and older (87.0%). Significantly more women (89.5%) than men (85.2%) reported taking two or more actions, as did non-Hispanic blacks (92.7%) compared with

non-Hispanic whites (85.8%). A significantly higher proportion of retired adults (94.1%) reported taking two or more actions compared with unemployed (88.6%) or employed (85.3%) adults. A higher proportion of adults who reported taking antihypertensives (90.6%) took two or more actions compared with those not taking antihypertensives (79.4%).

Overall, 88% of hypertensive adults with one or more additional health risk factor took two or more actions. Significantly lower proportions of hypertensive adults with the additional health risk factors of consuming five or fewer servings of fruits and vegetables per day, consuming heavy alcohol, and being inactive reported taking two or more actions compared with respondents without these risk factors. A significantly higher proportion of hypertensive adults with diabetes reported taking two or more actions than those without diabetes.

Among hypertensive adults, the odds of taking two or more actions were 1.35 times higher for women than men (Figure). Non-Hispanic blacks and Hispanics were 2.35 and 2.23 times as likely to report taking two or more actions than non-Hispanic whites, respectively. Those with less than a high school education and high school education were 1.58 and 1.38 times as likely as college graduates to report taking two or more actions, respectively. Those taking antihypertensive medications were 1.83 times as likely to take two or more actions as those not taking antihypertensives. Adults who were overweight and obese were 1.31 and 1.22 times as likely to report taking two or more actions as those classified as under and normal weight, respectively. Adults who consumed five or fewer servings of fruits and vegetables per day were 1.61 as likely to report taking two or more actions as those who consumed fewer than five per day. Adults who were not heavy drinkers were 0.47 times as likely to report taking two or more actions as those classified as heavy drinkers. Insufficiently active adults were 2.14 times and active adults were 2.95 times as likely to report taking two or more actions as inactive adults. Finally, those with diabetes were 1.44 times and those with coronary heart disease were 1.83 times as likely to report taking two or more actions as their counterparts without these conditions.

The AOR modeling shows that hypertensive adults with one or more of the selected health risk factors were 1.66 as likely to take two or more actions as those with no health risk factors (Table III). Additionally, hypertensive adults with one or more health risk factors were 1.71 times as likely to take two or more actions than those without health risk factors when controlling for age, sex, race/ethnicity, education, and having health insurance and a primary care provider. Controlling for participants taking antihypertensive medications and having diabetes and coronary heart disease did not change the level of significance.

Among the 18 states and District of Columbia, the proportion of hypertensive adults who reported taking two or more actions varied by state from 75.1% in North Dakota to 90.7% in North Carolina (Table IV). The lowest quartile included North Dakota, Arizona, Iowa, District of Columbia, and Wisconsin.

DISCUSSION

We found that about 87% of US adults with self-reported hypertension were taking at least two actions to control their BP and that the prevalence of taking actions differed by descriptive characteristics, health risk factors, comorbidities, and geography. Another report using 1999–2002 data from the National Health and Nutrition Examination Survey (NHANES) showed that about two thirds of American adults followed most heart-healthy actions related to the Healthy People 2010 recommendations, eg, consuming <2400 mg/d of sodium (65%), engaging in 150 min/wk of physical activity (50%), and abstaining from alcohol or drinking moderately (50%).³¹ These estimates are lower than our study results, possibly because our study assessed only adults with self-reported hypertension taking actions to lower or control BP, such as reducing sodium intake (72.8%), engaging in physical activity (69.9%), and reducing alcohol consumption (78.8%). Additionally, NHANES measures dietary intake and physical activity instead of relying on self-report, therefore comparisons should be interpreted with caution.

Current guidelines for the prevention and treatment of hypertension recommend reducing dietary sodium intake, achieving and maintaining healthy weight, following the Dietary Approach to Stop Hypertension (DASH) diet,^{32–39} engaging in regular physical activity, and limiting alcohol consumption.^{2,7,8} Clinical trials have shown the effectiveness of lifestyle modifications^{36,40–43} among hypertensive adults with and without comorbidities. For example, studies have found that following the DASH recommendations lowers BP among people with hypertension,^{7,8} and hypertensive adults who follow DASH recommendations have improved BP control even while lowering or titrating medication amounts.^{40–46} Reducing sodium intake can be challenging because an estimated 75% of intake in the United States comes from processed and restaurant foods,^{32,33} and about 37% of meals are consumed away from home.³³ In addition, recent findings from the Institute of Medicine³³ indicate that preferences for salty foods may develop at an early age and could influence the consumption of sodium over the life course. Reducing dietary sodium intake should also be accompanied by regular physical activity, achieving and maintain healthy weight, and limiting alcohol consumption to optimize BP control.^{2,7,8,40–46}

A previous report using 2007 BRFSS data found that black adults with hypertension had a greater prevalence of engaging in physical activity, reducing sodium intake, changing dietary habits, and taking antihypertensives to control hypertension than white adults ($P<.001$).²⁰ However, the 2007 report did not include Hispanic ethnicity. In our report, a greater proportion of non-Hispanic blacks and Hispanics compared with non-Hispanic whites reported taking two or more lifestyle actions. We found that adults with hypertension who had a primary care physician (PCP) or routine place for healthcare were more likely to take two or more lifestyle actions than those without a PCP. These findings are comparable to data from the 2003–2010 NHANES showing that people who had been diagnosed with hypertension who had their BP under control were more likely to have a routine place for healthcare than were those with uncontrolled BP.⁴⁷ Hispanics also had the greatest prevalence of uncontrolled hypertension compared with their counterparts, and the prevalence of uncontrolled hypertension within each racial/ethnic group varied by age group, healthcare coverage, and having a routine place for healthcare.⁴⁷ There were some patterns

that could provide information on intervention to improve healthy behaviors among patients with hypertension. Furthermore, hypertensive women, Hispanics, and those with the lowest income had lower rates of physical activity compared with their counterparts. This suggests that there are still opportunities to increase physical activity among these populations. Further examinations of socioeconomic characteristics that may account for these sex and racial/ethnic differences in taking lifestyle actions to control BP are needed.

We found that adults who took antihypertensive medications were significantly more likely to take two or more actions than those not taking antihypertensive medications. Compared with a previous report using 2005 BRFSS data from 20 states, our estimates show that a higher proportion of adults with hypertension are taking medication, but lower proportions are reducing salt intake; there was no change in proportion who engaged in physical activity.¹⁹ However, the previous report was conducted in different states, and comparisons should be interpreted with caution.

Patients with hypertension and their providers must work together to initiate and sustain lifestyle modifications and adhere to medications when prescribed. Although those with some health risk factors (eg, fewer than five servings of fruits/vegetables, physical inactivity, and comorbidities) were more likely to take two or more actions than those without the same risk factors, those with other health risk factors (eg, heavy drinking, smoking) were less likely to take action to control their BP. Patients who participate in their care by monitoring their own BP or getting involved in medication decisions may have better hypertension control.^{48,49} Intensification of healthcare provider advice and counseling, patient education, and clinician-patient partnerships could help adults with hypertension to take more action.³¹

One novel tool to develop community interventions for BP control is the Motivators of and Barriers to Health-Smart Behaviors Inventory (MB-HSBI), which identifies motivators in different racial and ethnic communities.⁵⁰ MB-HSBI scores can guide the development of assessment-based, culturally sensitive interventions customized to populations of focus. Broader public health education programs in schools and work-places, as well as health communication efforts through the media, may also further educate the public about the importance of getting diagnosed and treated for hyper-tension and making lifestyle changes to keep BP under control.

The CDC has funded National HDSP programs from 1998 to 2013. An assessment of the programs funded from 1998 through 2004 showed that 41 states and the District of Columbia were funded—28 as CB programs and 14 as BI programs. The states with the highest quartiles of hypertensive adults who reported taking two or more actions are those who started HDSP programs during 1998 and 2000, the first years of funding. The states with the lowest quartile of hyper-tensive adults that reported taking two or more actions started HDSP programs after 2001. Those with shorter funding periods (eg, 1–2 y) are not expected to have proportions of hypertensive patients who reported taking two or more actions similar to states with longer funding periods. South Carolina had the highest proportion of hypertensive adults who reported taking two or more actions and was one of the first states to receive funding.

STUDY LIMITATIONS

This report has several limitations. First, because of the cross-sectional design of the survey we are unable to examine temporal associations. Second, all data for hypertension, risk factors, and behaviors were based on self-report and subject to recall bias. Additionally, self-reported information may be less accurate than that based on physical measurements, and this potential bias can result in underreporting.⁵¹ Also, using self-reported data, there is an inability to verify “intention to treat” or that the individuals are really adopting the actions that they reported.⁵² Third, the survey included only households with a landline telephone number; however, studies have established the validity of the BRFSS telephone survey.^{24,25} Lastly, the overall number of BRFSS respondents is sufficiently large for statistical inference purposes, but subgroup analyses may lead to estimates that are unreliable.⁵¹ However, the BRFSS is a large, nationally representative sample of US adults, with oversampling of priority population subgroups; it is also the only data source to compare state-level public health action.^{15,24,25,51}

CONCLUSIONS

Almost all US adults with self-reported hypertension reported taking one or more lifestyle action to lower their BP, and 87% were taking two or more actions recommended by guidelines. Lifestyle actions are effective at preventing and controlling hypertension. Health-care providers, public health professionals, and other key stakeholders should encourage and promote the adoption of lifestyle actions for priority populations at risk for hypertension and among those with hypertension. Further analysis of this association is needed to determine whether the associations seen can be considered causal factors and why. Additional examination of whether access to health care or other factors play contributing roles in these differences.

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References

1. Nwankwo T, Yoon SS, Burt V, Gu Q. Hypertension among adults in the United States: National Health and Nutrition Examination Survey, 2011–2012. NCHS Data Brief 2013;133:1–8 <http://www.cdc.gov/nchs/data/databriefs/db133.pdf>. Accessed June 30, 2014.
2. Go AS, Mozaffarian D, Roger VL, et al. Heart Disease and Stroke Statistical Update 2014: a report from the American Heart Association. *Circulation*. 2014;129:e28–e291. [PubMed: 24352519]
3. Fields LE, Burt VL, Cutler JA, et al. The burden of adult hypertension in the United States 1999 to 2000: a rising tide. *Hypertension*. 2004;44:398–404. [PubMed: 15326093]
4. Egan BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988–2008. *JAMA*. 2010;303:2043–2050. [PubMed: 20501926]
5. Gillespie C, Kuklina EV, Briss PA, et al. Vital signs: prevalence, treatment and control of hypertension – United States, 1999–2002 and 2005–2008. *MMWR Morb Mortal Wkly Rep*. 2011;60:103–108. [PubMed: 21293325]

6. Keenan NL, Rosendorf KA. Prevalence of hypertension and controlled hypertension – United States, 2005–2008. *Morb Mortal Weekly Rep.* 2011;60:94–97.
7. Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension.* 2003;42:1206–1252. [PubMed: 14656957]
8. James PA, Oparil S, Carter BL, et al. 2014 evidence-based guidelines for management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC8) *JAMA.* 2014;311:507–520. [PubMed: 24352797]
9. Go AS, Bauman MA, Coleman King SM, et al. Effective approach to high blood pressure control: a science advisory from the American Heart Association, the American College of Cardiology and the Centers for Disease Control and Prevention. *Hypertension.* 2014;63:878–885. [PubMed: 24243703]
10. Flack JM, Sica DA, Bakris G, et al. Management of high blood pressure in blacks: an update of the International Society on Hypertension in Blacks consensus statement. *Hypertension.* 2010;56:780–800. [PubMed: 20921433]
11. Fang J, Keenan NL, Dai S. Fruits and Vegetable intake and physical activity among adults with high cholesterol. *Am J Health Behav.* 2011;35:689–98. [PubMed: 22251760]
12. Fang J, Keenan NL, Ayala C, Dai S. Fruit and vegetable intake and physical activity among hypertensive adults in the US – BRFSS, 2003–2007. *Am J Hypertens.* 2010;23:762–6. [PubMed: 20300071]
13. Ayala C, Tong X, Valderrama AL, et al. Actions taken to reduce sodium intake among adults with self-reported hypertension HealthStyles Survey, 2005 and 2008. *J Clin Hypertens (Greenwich)* 2010;12:793–799. [PubMed: 21029342]
14. Valderrama AL, Tong X, Ayala C, et al. Prevalence of self-reported hypertension, advice received from health care professionals, and actions taken to reduce blood pressure among US adults – Health-Styles, 2008. *J Clin Hypertens (Greenwich).* 2010;12:784–792. [PubMed: 21029341]
15. Ayala C, Neff LJ, Croft JB, et al. Prevalence of self-reported high blood pressure awareness, advice received from health professionals, and actions taken to reduce high blood pressure among U.S. adults – HealthStyles, 2002. *J Clin Hypertens (Greenwich).* 2005;7:513–519. [PubMed: 16227770]
16. Li C, Balluz LS, Ford ES, et al. A comparison of prevalence estimates for selected health factors and chronic diseases or conditions from the Behavioral Risk Factor Surveillance System, the National Health Interview Survey, and the National Health and Nutrition Examination Survey, 2007–2008. *Prev Med.* 2012;52:381–87.
17. Li C, Balluz LS, Okoro CA, et al. Surveillance of certain health behaviors and conditions among states and selected local areas – Behavioral Risk Factor Surveillance System, United States, 2009. *MMWR Surveill Summ.* 2011;60:1–250.
18. Cory S, Ussery-Hall A, Griffin-Blakes S, et al. Prevalence of selected risk behaviors and chronic diseases and conditions-steps communities, United States, 2006–2007. *MMWR Surveill Summ.* 2010;59:1–37.
19. Denny CH, Greenlund KJ, Ayala C, Croft JB. Prevalence of actions to control high blood pressure – 20 states, 2005. *Morb Mortal Wkly Rep.* 2007;56:420–423.
20. Ellis C, Grubaugh AL, Egede LE. The effect of minority status and rural residence on actions to control high blood pressure in the U.S. *Public Health Rep.* 2010;125:801–809. [PubMed: 21121225]
21. U.S. Department of Health and Human Services. *Healthy People 2010* (conference ed., 2 vols). Washington, DC: U.S. Department of Health and Human Services, 2000 <http://www.healthypeople.gov/2010/>. Accessed April 6, 2012.
22. U.S. Department of Health and Human Services. *Tracking Healthy People 2010*. Washington, DC: US Government Printing Office, 11 2000 <http://www.healthypeople.gov/2010/Document/tableofcontents.htm#tracking>. Accessed April 7, 2012.
23. U.S. Department of Health and Human Services. *Healthy People 2020 – Heart Disease and Stroke Objectives*. Washington, DC: U.S. Department of Health and Human Services, 2011 <http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=21>. Accessed April 7, 2012.

24. Bowlin SJ, Morrill BW, Nafziger AN, et al. Reliability and changes in validity of self-reported cardiovascular disease risk factors using dual response – Behavioral Risk Factor Surveillance System. *J Clin Epidemiol.* 1996;49:511–7. [PubMed: 8636724]
25. Nelson DE, Holtzman D, Bolen J, et al. Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Social and Prev Med.* 2001;46(suppl 1):S03–42.
26. CDC. Behavioral Risk Factor Surveillance System operational and user’s guide, Version 3.0, 2006 <ftp://ftp.cdc.gov/pub/Data/Brfss/userguide.pdf>. Accessed March 29, 2012.
27. The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. North American Association for the Study of Obesity (NAASO) and the National Heart, Lung, and Blood Institute (NHLBI), 1998 http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_b.pdf. Accessed March 29, 2012.
28. World Health Organization. Physical Status: The Use and Interpretation of Anthropometry WHO Technical Report Series 854. Geneva: WHO, 1995.
29. U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans Washington, DC: U.S. Department of Health and Human Services, 2008 <http://www.health.gov/paguidelines/guidelines/default.aspx>. Accessed May 18, 2012.
30. Frane J SUDAAN: Professional Software for Survival Data Analysis. Research Triangle Park, NC: Research Triangle Institute, 1989.
31. Hajjar I, Kotchen TA. Trends in prevalence, awareness, treatment, and control of hypertension in the United States, 1988–2000. *JAMA.* 2003;290:199–206. [PubMed: 12851274]
32. Mattes RD, Donnelly D. Relative contributions of dietary sodium sources. *J Am Coll Nutr.* 1991;10:383–393. [PubMed: 1910064]
33. Institute of Medicine. Strategies to Reduce Sodium Intake in the United States. Washington, DC: Institute of Medicine of the National Academies, 2010 <http://www.iom.edu/Reports/2010/Strategies-to-Reduce-Sodium-Intake-in-the-United-States.aspx>. Accessed July 31, 2011.
34. August KJ, Sorkin DH. Racial/ethnic disparities in exercise and dietary behaviors of middle-aged and older adults. *J Gen Intern Med.* 2010;26:245–50. [PubMed: 20865342]
35. Appel LJ, Moore TJ, Obarzanek E, et al. DASH Collaborative Research Group. *N Engl J Med.* 1997;336:1117–1124. [PubMed: 9099655]
36. Wright JD, Hirsch R, Wang C. One-third of U.S. adults embraced more heart healthy behaviors in 1999–2002. *NCHS Data Brief.* 2009;17:1–7.
37. Appel LJ, Brands MW, Daniels SR, et al. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. *Hypertension.* 2006;47:296–308. [PubMed: 16434724]
38. Karanja NM, Obarzanek E, Lin PH, et al. Descriptive characteristics of the dietary patterns used in the Dietary Approaches to Stop Hypertension Trial. DASH Collaborative Research Group. *J Am Diet Assoc.* 1999;8(suppl):S19–27.
39. Svetkey LP, Simons-Morton D, Vollmer WM, et al. Effects of dietary patterns on blood pressure: subgroup analysis of the Dietary Approaches to Stop Hypertension (DASH) randomized clinical trial. *Arch Intern Med.* 1999;159:285–293. [PubMed: 9989541]
40. Miller ER, Erlinger TP, Young DR, et al. Results of the diet exercise and weight loss intervention trial (DEW-IT). *Hypertension.* 2002;40:612–8. [PubMed: 12411452]
41. Maruthur NM, Wang NH, Appel LJ. Lifestyle interventions reduce coronary heart disease risk: results from the Premier Trials. *Circulation.* 2009;119:2026–31. [PubMed: 19349322]
42. Scala D, D’Avino M, Cozzolino S, et al. Promotion of behavioral changes in people with hypertension: an intervention study. *Pharm World Sci.* 2008;30:834–9. [PubMed: 18584303]
43. Xue F, Yao W, Lewin RJ. A randomized trial of a 5 week manual based self-management program for hypertension delivered in a cardiac patient club in Shanghai. *BMC Cardiovasc Disord.* 2008;8:1–11. [PubMed: 18201384]
44. Eakin EG, Reeves MM, Lawler SP, et al. The Logan Health Living Program: a cluster randomized trial of a telephone-delivered physical activity and dietary behavior intervention for primary care patients with type-2 diabetes or hypertension from a socially disadvantaged community – rationale, design and recruitment. *Contemp Clin Trials.* 2008;29:439–54. [PubMed: 18055274]

45. Prochaska JJ, Springer B, Nigg CR. Multiple health behavior change research – an introduction and overview. *Prev Med.* 2008;46:181–8. [PubMed: 18319098]
46. Erikson KM, Westborg CJ, Eliasson MCE. A randomized trial of lifestyle intervention in primary healthcare for the modification of cardiovascular disease risk factors: the Bjorknas Study. *Scand J Public Health.* 2006;34:453–61. [PubMed: 16990155]
47. Mercado C, Valderrama AL, Gillespie CD. Racial/ethnic disparities in the awareness, treatment, and control of hypertension — United States, 2003–2010. *Morb Mortal Wkly Rep.* 2013;62:351–5.
48. Chodosh J, Morton SC, Mojica W, et al. Meta-analysis: chronic disease self-management programs for older adults. *Ann Intern Med.* 2005;143:427–438. [PubMed: 16172441]
49. McManus RJ, Man J, Bray EP, et al. Telemonitoring and self-management in the control of hypertension (TASMINH2): a randomized controlled trial. *Lancet.* 2010;376:163–172. [PubMed: 20619448]
50. Tucker CM, Rice KG, Hou W, et al. Development of the Motivators of and Barriers to Health-Smart Behaviors Inventory. *Psychol Assess.* 2011;23:487–503. [PubMed: 21443361]
51. CDC. Behavioral Risk Factor Surveillance System Summary data quality reports. http://www.cdc.gov/brfss/annual_data/2009/2009_Summary_Data_Quality_Report.docx. Accessed January 13, 2015.
52. Giles WH, Croft JB, Keenan NL, et al. The validity of self-reported hypertension and correlates of hypertension awareness among blacks and whites within the stroke belt. *Am J Prev Med.* 1995;11:163–9. [PubMed: 7662395]

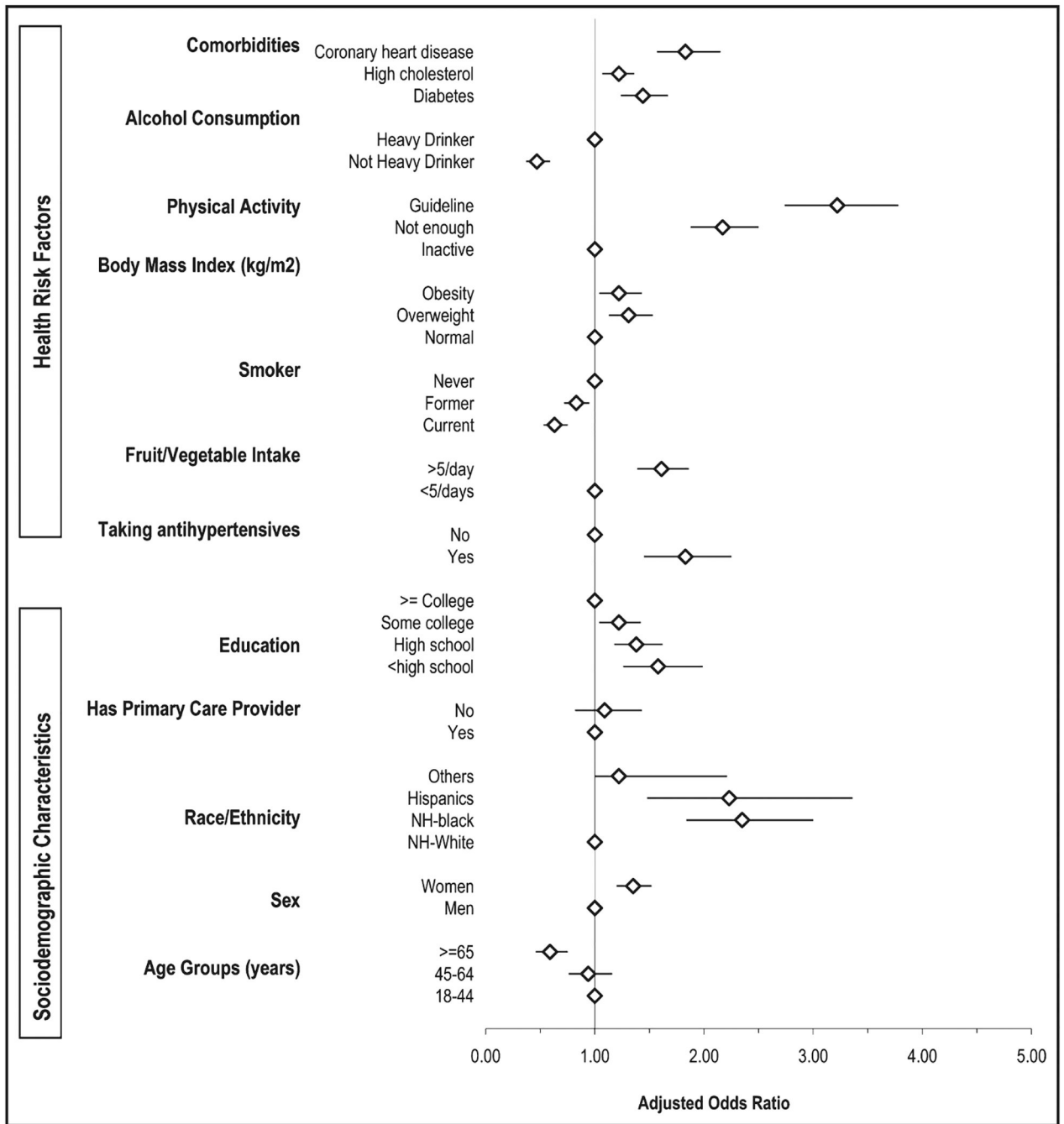


FIGURE. 18 states and the District of Columbia, 2009.^{a,b,c} NH indicates non-Hispanic.

TABLE I.

Prevalence of Medication Adherence and Taking Actions to Lower or Control Blood Pressure Among Hypertensive Adults by Descriptive Characteristics, Health Risk Factors, and Comorbidities in 18 States and the District of Columbia, 2009^{a,b}

Characteristic	Currently Take Medication			Change Eating Habits			Reduce Sodium Intake			Reduce Alcohol Consumption			Engage in Physical Activity		
	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)
Overall	36,142	75.0	(73.1–76.9)	28,882	73.1	(71.2–75.0)	29,430	72.8	(70.8–74.6)	32,555	78.8	(77.0–80.5)	26,860	69.9	(68.0–71.7)
Descriptive															
Age, y															
18–44	2300	64.3	(61.3–67.2)	2436	73.1	(70.2–75.7)	2406	72.3	(69.4–75.0)	2590	77.3	(74.7–79.6)	2335	69.7	(66.9–72.4)
45–64	15,320	89.4	(88.7–90.1)	13,363	78.4	(77.4–79.4)	12,969	75.7	(74.7–76.7)	14,059	81.3	(80.3–82.2)	11,763	70.1	(69.0–71.1)
65	18,282	96.3	(95.9–96.7)	12,887	68.1	(67.1–69.1)	13,861	73.6	(72.6–74.5)	15,694	81.3	(80.5–82.1)	12,568	66.1	(65.1–67.1)
Sex															
Male	12,834	73.6	(70.7–76.3)	9969	71.9	(69.2–74.5)	10,192	70.7	(67.8–73.4)	10,779	74.0	(71.3–76.5)	10,190	71.6	(69–74.1)
Female	23,308	76.6	(74.2–78.8)	18,913	74.0	(71.5–76.4)	19,238	75.3	(73–77.5)	21,776	84.3	(82.3–86.1)	16,670	67.9	(65.4–70.2)
Race/ethnicity															
Non-Hispanic white	28,059	74.0	(71.6–76.3)	21,726	71.1	(68.7–73.3)	22,388	70.7	(68.3–73)	24,677	75.4	(73–77.6)	20,719	69.1	(66.8–71.3)
Non-Hispanic black	5700	80.6	(76.6–84.1)	5132	81.7	(78.2–84.7)	5019	81.0	(77.5–84.2)	5580	89.3	(87.1–91.1)	4275	73.1	(70.2–75.8)
Hispanic	683	66.9	(55.6–76.6)	589	69.6	(56.2–80.3)	610	72.7	(58.6–83.3)	663	87.1	(81.7–91.1)	537	66.1	(53.5–76.7)
Non-Hispanic other	1223	76.3	(69.9–81.6)	1074	78.3	(72.8–82.9)	1020	73.1	(67.5–78.1)	1199	84.5	(79–88.8)	981	73.5	(67.7–78.5)
Household income, \$															
<25,000	12,509	73.6	(69.6–77.1)	10,120	72.3	(68.7–75.6)	10,413	73.9	(70.4–77.2)	12,310	87.0	(84.6–89.2)	8717	64.1	(60.8–67.2)
25,000–49,999	9250	71.7	(67.3–75.7)	7322	71.5	(66.6–76)	7655	74.9	(69.7–79.4)	8296	77.9	(73.1–82.1)	6943	68.3	(63.1–73.2)
50,000	9012	76.7	(73.4–79.7)	7413	73.1	(69.5–76.4)	7226	71.0	(67.3–74.5)	7065	68.0	(64.2–71.5)	7441	76.7	(74.8–78.6)
Education ^c															
<High school diploma	5301	75.2	(70.7–79.3)	4155	73.0	(68.6–77)	4382	75.5	(71.1–79.4)	5225	89.7	(87.1–91.8)	3525	65.2	(60.6–69.5)
High school diploma	13,022	74.6	(70.8–78.1)	10,386	71.7	(68.1–75)	10,727	73.2	(69.5–76.5)	12,376	84.3	(81.1–87)	9314	65.6	(62–69)
Some college	9173	74.6	(71.1–77.8)	7466	73.9	(70.6–76.9)	7429	72.4	(68.9–75.6)	8267	76.9	(73.8–79.7)	6994	71.3	(68.5–73.9)
College degree	8562	75.9	(70.8–80.4)	6808	72.8	(67.5–77.6)	6829	69.7	(64.3–74.6)	6610	64.8	(60.4–69)	6973	77.4	(73.8–80.7)
Employment															
Employed	11,318	73.9	(71.5–76.1)	9779	72.6	(70–75.1)	9559	70.5	(67.8–73)	10,039	73.1	(70.3–75.6)	9272	72.0	(69.4–74.5)

Characteristic	Action ^c														
	Currently Take Medication			Change Eating Habits			Reduce Sodium Intake			Reduce Alcohol Consumption			Engage in Physical Activity		
	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)
Unemployed	8746	74.1	(70.9–77.1)	7527	72.8	(69.7–75.7)	7494	74.5	(71.3–77.4)	8814	87.9	(86.1–89.6)	6147	64.0	(61.1–66.9)
Retired	16,021	95.0	(89.3–97.8)	11,533	83.3	(78.6–87.1)	12,329	58.1	(43.3–71.6)	13,649	68.5	(49.4–82.9)	11,400	79.0	(69.8–86)
Health insurance															
Yes	33,587	77.5	(75.3–79.6)	26,383	74.1	(72–76.1)	26,932	73.6	(71.4–75.7)	29,680	77.6	(75.4–79.6)	24,725	70.8	(68.7–72.8)
No	2504	63.8	(59.5–67.9)	2456	67.9	(62.9–72.4)	2456	69.4	(64.6–73.8)	2822	84.7	(81.5–87.5)	2096	63.4	(59.3–67.4)
Regular primary physician															
Yes	34,586	79.5	(77.2–81.7)	27,340	74.0	(71.8–76.1)	27,841	73.3	(71.1–75.5)	30,695	79.2	(77–81.2)	25,374	70.2	(68–72.3)
No	1492	49.6	(45.7–53.5)	1487	65.6	(60.3–70.5)	1531	67.6	(62.3–72.4)	1794	76.7	(72.3–80.6)	1433	64.4	(59.6–68.9)
Health risk factor ^d															
Body mass index, kg/m ²															
24.9 (under and normal weight)	7604	69.2	(65.1–73)	5518	67.8	(64.3–71.2)	6027	70.5	(66.9–73.8)	6688	71.7	(67.4–75.5)	5986	71.7	(68–75.1)
25–29.9 (overweight)	12,407	75.9	(71.9–79.5)	9928	73.5	(70.1–76.7)	10,105	73.7	(70.1–76.9)	10,920	78.0	(74.9–80.9)	9777	74.5	(71.6–77.3)
30 (obese)	14,566	76.5	(74–78.9)	12,149	75.1	(72.3–77.7)	11,986	73.1	(70.2–75.8)	13,466	81.2	(78.4–83.8)	10,001	66.5	(63.7–69.2)
Fruit and vegetable consumption															
<5/d	28,107	73.9	(71.7–76)	21,917	71.1	(68.8–73.2)	22,664	72.1	(69.9–74.3)	25,351	78.1	(75.9–80.1)	20,140	67.3	(65.1–69.4)
5/d	7893	80.0	(75.8–83.7)	6840	81.5	(77.9–84.7)	6644	75.7	(71.7–79.2)	7064	82.5	(79.2–85.3)	6622	80.9	(77.8–83.6)
Smoking status															
Current	5345	67.4	(64.3–70.4)	4296	65.4	(62.1–68.6)	4473	70.6	(67.5–73.5)	5165	78.1	(75.2–80.7)	3678	62.7	(59.6–65.7)
Former	13,071	73.9	(68.8–78.5)	10,116	77.9	(75–80.5)	10,384	75.3	(71.7–78.5)	11,169	75.4	(68.6–81.1)	9581	71.6	(68.4–74.6)
Never	17,577	78.6	(75.8–81.2)	14,361	75.9	(73.2–78.4)	14,458	73.6	(70.8–76.3)	16,086	80.0	(77.5–82.3)	13,489	72.6	(70–75)
Alcohol consumption															
Not heavy	34,324	75.8	(73.7–77.9)	27,572	73.7	(71.6–75.6)	28,037	73.2	(71.1–75.2)	31,540	81.5	(79.6–83.3)	25,522	70.5	(68.5–72.3)
Heavy	1252	64.9	(59.6–69.8)	887	61.9	(55.9–67.5)	959	64.8	(58.9–70.2)	597	36.3	(30.5–42.6)	927	63.1	(56.4–69.4)
Physical activity															
Inactive	8285	76.4	(71–81.1)	5861	65.1	(59.7–70.1)	6309	69.5	(64.3–74.3)	7676	85.7	(83–88)	2844	29.9	(25.8–34.4)
Insufficient	14,210	77.1	(73.4–80.4)	11,569	75.3	(72.8–77.6)	11,740	75.1	(72–78)	12,749	79.9	(77.5–82.1)	11,168	72.1	(69.7–74.4)
Active	11,889	72.4	(69.7–74.9)	10,154	76.3	(73.5–78.9)	10,028	73.4	(70.4–76.2)	10,557	75.7	(72.8–78.4)	11,604	86.9	(84.2–89.2)
Comorbidity															

Characteristic	Action ^c														
	Currently Take Medication		Change Eating Habits		Reduce Sodium Intake		Reduce Alcohol Consumption		Engage in Physical Activity						
	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)	No.	%	(95% CI)			
Diabetes	9401	89.5	(81.5–94.3)	7829	84.2	(81.8–86.4)	7570	80.5	(78–82.7)	8823	89.6	(87.6–91.2)	6394	70.9	(67.9–73.8)
High cholesterol	21,299	76.5	(73–79.6)	17,350	76.4	(72.7–79.8)	17,352	71.6	(67.7–75.2)	19,009	78.2	(74.3–81.7)	15,466	73.1	(71–75.1)
Coronary heart disease	7039	82.9	(73.3–89.6)	5757	82.0	(74.6–87.6)	5663	78.6	(70.9–84.7)	6416	86.3	(78–91.8)	4791	59.4	(52.3–66.2)
Stroke	3219	81.3	(73.2–87.3)	2539	81.8	(76.6–86)	2542	80.6	(75.3–85)	3007	79.5	(77.2–81.7)	2130	68.6	(62.9–73.8)

Abbreviations: BMI, body mass index; CI, confidence interval.

^aData are from the Behavioral Risk Factor Surveillance System and are weighted to adjust for differences in age, sex, race, household income, and educational level and age-standardized to the 2000 US standard population (when applicable).

^bActions to control blood pressure include changing eating habits, reducing sodium intake, reducing alcohol consumption, and increasing physical activity.

^cRespondents with self-reported hypertension were defined as being told on two or more occasions by a doctor or other healthcare provider that they had hypertension. Questions about taking medications and taking actions to control high blood pressure were only asked in the optional "Actions to Control High Blood Pressure" module.

^dHealth risk factors include the following: being overweight or obese, currently smoking, consuming five or fewer servings of fruits and vegetables per day, being a heavy alcohol drinker (consuming an average of one or more drinks per day for women and two or more drinks per day for men), and being inactive (no physical activity) or insufficiently active (<30 min/d physical activity, <5 d/wk).

TABLE II.

Number of Lifestyle Actions Taken to Lower or Control Blood Pressure Among Hypertensive Adults by Descriptive Characteristics, Health Risk Factors, and Comorbidities in 18 States and the District of Columbia, 2009^{a,b}

Characteristic	No. of Actions ^c					
	No.	%	(95% CI)	No.	%	(95% CI)
Overall	4600	12.8	(11.3–14.5)	35,126	87.2	(85.5–88.7)
Descriptive age, y						
18–44	465	14.2	(12.0–16.6)	2855	85.8	(83.4–88.0)
45–64	1703	10.2	(9.5–11.0)	15,386	89.8	(89.0–90.5)
65+	2409	13.0	(12.3–13.8)	16,651	87.0	(86.2–87.7)
Sex						
Male	2051	14.8	(12.5–17.4)	12,333	85.2	(82.6–87.5)
Female	2549	10.5	(9.4–11.8)	22,793	89.5	(88.2–90.6)
Race/ethnicity						
Non-Hispanic white	4007	14.2	(12.3–16.3)	26,869	85.8	(83.7–87.7)
Non-Hispanic black	335	7.3	(5.6–9.4)	5823	92.7	(90.6–94.4)
Hispanic	74	14.9	(6.1–32.1)	703	85.1	(67.9–93.9)
Non-Hispanic other	137	10.9	(7.0–16.6)	1274	89.1	(83.4–93.0)
Household income, \$						
<25,000	1387	12.6	(10.2–15.5)	12,370	87.4	(84.5–89.8)
25,000–49,999	1145	13.7	(9.4–19.6)	8967	86.3	(80.4–90.6)
50,000	1371	14.3	(11.2–18.0)	8719	85.7	(82.0–88.8)
Education						
<High school diploma	578	11.2	(9.0–14.0)	5185	88.8	(86.0–91.0)
High school diploma	1501	13.7	(10.7–17.3)	12,714	86.3	(82.7–89.3)
Some college	1195	12.3	(10.5–14.3)	8981	87.7	(85.7–89.5)
College degree	1315	14.9	(10.4–21.0)	8167	85.1	(79.0–89.6)
Employment						
Yes	1651	14.7	(12.5–17.3)	11,414	85.3	(82.7–87.5)
No	950	11.4	(9.3–13.9)	8909	88.6	(86.1–90.7)

Characteristic	No. of Actions ^c					
	0-1			2		
	No.	%	(95% CI)	No.	%	(95% CI)
Retired	1995	539	(5.3–6.6)	14,746	94.1	(93.4–94.7)
Health insurance						
Yes	4232	12.4	(10.7–14.3)	32,176	87.6	(85.7–89.3)
No	360	15.3	(11.8–19.6)	2895	84.7	(80.4–88.2)
Have primary care provider						
Yes	4220	12.0	(10.4–13.9)	33,174	88.0	(86.1–89.6)
No	374	18.3	(13.9–23.7)	1882	81.7	(76.3–86.1)
Taking antihypertensive medication						
Yes	3920	9.4	(8.6–10.3)	32,222	90.6	(89.7–91.4)
No	676	20.6	(17.6–24.0)	2879	79.4	(79.4–82.4)
Health risk factor ^d						
BMI, kg/m ²						
<25 (under and normal weight)	1253	16.1	(13.6–19.0)	7256	83.9	(81.0–86.4)
25–29.9 (overweight)	1532	11.8	(10.2–13.7)	12,096	88.2	(86.3–89.8)
30 (obese)	1657	12.1	(9.9–14.9)	14,220	87.9	(85.1–90.1)
Fruit and vegetable consumption						
<5/d	3902	14.1	(12.3–16.2)	27,064	85.9	(83.8–87.7)
5/d	682	7.2	(5.9–8.9)	7919	92.8	(91.1–94.1)
Smoking status						
Current	1040	16.1	(14.3–18.1)	5312	83.9	(81.9–85.7)
Former	1730	11.4	(9.4–13.9)	12,364	88.6	(88.6–90.6)
Never	1813	11.7	(9.7–14.4)	17,308	88.3	(85.6–90.5)
Alcohol consumption						
Heavy drinker	4082	11.9	(10.3–13.7)	33,560	88.1	(86.3–89.7)
Not heavy drinker	397	28.8	(23.7–34.5)	1057	71.2	(65.5–76.3)
Physical activity						
Inactive	1591	20.2	(16.4–24.6)	7291	79.8	(75.4–83.6)
Insufficient	1589	11.8	(10.3–13.5)	13,938	88.2	(86.5–89.7)
Active	1171	9.3	(7.2–11.8)	12,252	90.7	(88.2–92.8)

Characteristic	No. of Actions ^c			
	0-1		2	
	No.	%	No.	%
Comorbidity				
Diabetes	745	7.1 (5.6-9.0)	9093	92.9 (91.0-94.4)
No diabetes	3854	13.8 (12.2-15.6)	25,996	86.2 (84.4-87.8)
High cholesterol	2305	12.2 (9.3-15.9)	20,614	87.8 (84.1-90.7)
No high cholesterol	1882	12.6 (10.1-15.5)	12,645	87.4 (84.5-89.9)
Coronary heart disease	623	8.7 (4.2-17.1)	6782	91.3 (82.9-95.8)
No coronary heart disease	3903	13.4 (11.8-15.2)	27,800	86.6 (84.8-88.2)
Stroke	355	7.2 (4.1-12.4)	3062	92.8 (87.6-95.9)
No stroke	4229	13.0 (11.4-14.7)	31,925	87.0 (85.3-88.6)

Abbreviations: BMI, body mass index; CI, confidence interval.

^aData are from the Behavioral Risk Factor Surveillance System and are weighted for age, sex, race, household income, and educational level and age-standardized to the 2000 US standard population (when applicable).

^b Respondents with self-reported hypertension were defined as being told on two or more occasions by a doctor or other healthcare provider that they had hypertension. Questions about taking medications and taking actions to control high blood pressure were only asked in the optional "Actions to Control High Blood Pressure" module.

^c Actions to control blood pressure include changing eating habits, reducing sodium intake, reducing alcohol consumption, and increasing physical activity.

^d Health risk factors include the following: being overweight or obese, currently smoking, consuming five or fewer servings of fruits and vegetables per day, being a heavy alcohol drinker (consuming an average of one or more drinks per day for women and two or more drinks per day for men), and being inactive (no physical activity) or insufficiently active (<30 min/d physical activity, <5 d/wk).

TABLE III.

Odds of Taking Two or More Lifestyle Actions to Control Blood Pressure Among Hypertensive Adults by Presence of Health Risk Factors in 18 States and the District of Columbia, 2009^{a,b,c,d}

Model	AOR	(95% CI)
1: Unadjusted Taken 2 actions vs <2, having no risk factors (positive health) vs 1	1.66	(1.07–2.60)
2: Same as model 1 plus adjusted for: Age, sex, race/ethnicity, education Having health insurance, primary care provider	1.71	(1.08–2.71)
3: Same as model 2 plus adjusted for taking antihypertensive medication and having diabetes	1.85	(1.18–2.96)

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.

^aData are from the Behavioral Risk Factor Surveillance System and are weighted for sample characteristics age, sex, race, household income, and education level and age-standardized to the 2000 US standard population (when applicable).

^bActions to control blood pressure include changing eating habits, reducing sodium intake, reducing alcohol consumption, and increasing physical activity.

^cRespondents with self-reported hypertension were defined as being told on two or more occasions by a doctor or other healthcare provider that they had hypertension. Questions about taking medications and taking actions to control high blood pressure were only asked in the optional “Actions to Control High Blood Pressure” module.

^dHealth risk factors include the following: being overweight or obese, currently smoking, consuming fewer than five servings of fruits and vegetables per day, being a heavy alcohol drinker (consuming an average of one or more drinks per for women and two or more drinks per day for men), and being inactive (no physical activity) or insufficiently active (<30 min/d physical activity, <5 d/wk).

TABLE IV.

Prevalence of Taking Two or More Actions to Lower or Control Blood Pressure Among Hypertensive Adults by Jurisdiction and History of Jurisdiction's HDSP Programs in 18 States and the District of Columbia, 2009^{a,b,c}

State	No.	Percentage	(95% CI)	HDSP History ^d	Initial Year	Status in 2009
Total	35,126	87.2	(85.5–88.7)	NA	NA	NA
Quartile 1						
North Dakota	1147	75.1	(71.2–78.6)	2003 — CB		CB
Arizona	1363	79.7	(74.3–84.2)	2007 — CB		CB
Iowa	1353	82.3	(74.0–88.3)	2008 — CB		CB
District of Columbia	900	84.1	(76.9–89.3)	2001 — CB		CB
Wisconsin	1146	84.1	(78.2–88.6)	2001 — CB		CB
Quartile 2						
Missouri	1389	85.9	(80.9–89.7)	1998 — CB		BI (2000)
North Carolina	3706	86.3	(79.7–91.0)	1998 — BI		BI (1998)
Connecticut	1559	86.7	(82.8–89.9)	2000 — CB		CB
Louisiana	2733	86.8	(83.6–89.5)	1998 — CB		CB
Arkansas	1291	87.4	(81.9–91.3)	2000 — CB		BI (2004)
Quartile 3						
Georgia	1584	87.6	(80.8–92.3)	1998 — CB		BI (2002)
Tennessee	1460	88.0	(82.1–92.1)	2001 — CB		CB
Montana	1770	88.1	(85.2–90.5)	2000 — CB		BI (2003)
Kentucky	3342	88.4	(83.9–91.7)	1998 — CB		CB
Minnesota	1151	89.0	(85.1–92.0)	1998 — CB		CB
Quartile 4						
Alabama	2173	89.6	(85.8–92.5)	1998 — CB		CB
Ohio	2754	89.7	(87.1–91.8)	2000 — CB		CB
West Virginia	1313	89.8	(87.2–91.9)	1998 — CB		BI (2003)
South Carolina	2992	90.7	(88.0–92.9)	2000 — CB		BI (2001)

Abbreviations: BI, basic intervention; CB, capacity building; CI, confidence interval; HDSP, Heart Disease and Stroke Prevention; NA, not applicable.

^aData are from the Behavioral Risk Factor Surveillance System and are weighted for sample characteristics for age, sex, race, household income, and education level and age-standardized to the 2000 US standard population (when applicable).

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^q Respondents with self-reported hypertension were defined as being told on two or more occasions by a doctor or other healthcare provider that they had hypertension. Questions about taking medications and taking actions to control high blood pressure were only asked in the optional “Actions to Control High Blood Pressure” module.

^c Actions to control blood pressure include changing eating habits, reducing sodium intake, reducing alcohol consumption, and increasing physical activity.

^d We identified each state program’s participation as CB, BI, and the year they first received funding and the status of the program in 2009. Additional details about HDSP state programs can be found at http://www.cdc.gov/dhdsp/programs/hhdsp_program/index.htm.