Research Paper

Hypertension among women of reproductive age: Impact of 2017 American College of Cardiology/American Heart Association high blood pressure guideline☆

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ABSTRACT

Objective: To estimate the prevalence of hypertension and antihypertensive medication recommended among U.S. reproductive-aged women according to the 2017 American College of Cardiology/American Heart Association (ACC/AHA) guideline as compared with the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) guideline and to identify factors associated with newly classified hypertensive women.

Methods: We analyzed data from the National Health and Nutrition Examination Survey 2005–2014. Hypertension was defined using blood pressure measurements and/or self-reported antihypertensive medication use. Multi-variable Poisson regression models with robust error variance were conducted.

Results: Among 4,575 (weighted n = 40,194,602) non-pregnant women aged 20–44 years, the prevalence of hypertension was 16.5% using the 2017 guideline, and 7.8% based on the JNC7 guideline. Following the 2017 guideline, 8.6% would be recommended for antihypertensive medication, similar to 8.5% according to JNC7 guideline. Following the 2017 guideline, women with older age (35–44 years), obesity, and diabetes were more likely, while Hispanic women were less likely, to be newly classified as hypertensive.

Conclusion: Among reproductive-aged women, compared to JNC7 guidelines, the prevalence of hypertension increased by 112% following the 2017 guideline, but the percentage of women recommended for antihypertensive medication was similar.

1. Introduction

Hypertension, or high blood pressure, is associated with various cardiovascular diseases (CVD), including angina, myocardial infarction, heart failure, stroke, peripheral artery disease, and abdominal aortic aneurysm [1]. Worldwide hypertension is one of the leading causes of death and disability-adjusted life years [2,3]. To mitigate these adverse outcomes, national guidelines advocate for the thresholds differentiating normal versus abnormal blood pressure and recommend interventions like diet modification, exercise, and, if warranted, medications.

In 2017, the American College of Cardiology/American Heart Association (ACC/AHA) published a new Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults [4]. The newer guideline supplants the “Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure” (JNC7) published in 2003 [5]. Compared to the JNC7, the 2017 ACC/AHA guideline defines hypertension using a lower threshold of systolic blood pressure (SBP) and diastolic blood pressure (DBP) levels [4,5]. The 2017 ACC/AHA guideline also proposes an extended criteria for pharmacological treatment relative to prior guidelines. In addition to the prior criteria for treatment with antihypertensive medication published by JNC7, the newer guidelines advocates for pharmacological intervention for adults who have high CVD risk with SBP of 130–139 mm Hg or DBP of 80–89 mm Hg and adults ≥65 years of age with SBP of 130–139 mm Hg [4].

While in general, women of reproductive age have relatively lower rates of hypertension than women with older age [6], it presents important clinical implications and challenges [7] vis-à-vis treatment [8,9].
when women with hypertension become pregnant. Using National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2008, Bateman et al. reported that hypertension occurs in about 8% of women of reproductive age (20–44 years), estimated according to the JNC7 guideline [10]. There is, however, a lack of reports which focus on the characteristics, prevalence of hypertension and potential need for antihypertensive medications for reproductive-aged women after the promulgation of 2017 ACC/AHA guideline [4,6].

The primary objective of the current analysis was to estimate the prevalence of hypertension and of adults recommended for antihypertensive medication among U.S. non-pregnant women of reproductive age (20–44 years) according to the 2017 ACC/AHA guideline as compared with the JNC7 guideline. The secondary objective was to identify factors associated with newly classified hypertension under the new guideline among this population.

2. Material and methods

This was a cross-sectional study using data from the National Health and Nutrition Examination Survey (NHANES), a nationally representative and multistage probability sample of the civilian, non-institutionalized US population conducted by the National Center for Health Statistics [11]. Since 1999, NHANES has been conducted biannually and data are released in 2-year cycles. NHANES participants were interviewed in their homes on various demographic and health-related topics, and underwent a physical examination in a mobile examination center (MEC). Because the NHANES data are completely de-identified and publicly available, this study was exempt from review by the institutional review boards at the University of Texas Health Science Center at Houston.

To provide more stable estimate prevalence of hypertension among women of reproductive age, NHANES data were combined and analyzed from 5 survey cycles collected from 2005 to 2006 to 2013–2014, the most recent cycle with completed data release. The overall NHANES response rates for the interview samples ranged from 71% to 80%; for the examined samples these rates ranged from 69% to 77%.

Our study population included adult women of reproductive age between 20 and 44 years who had home interviews and physical examination at MECs. We excluded women who were pregnant at the time of examination, because of the physiological changes in blood pressure during pregnancy [12,13], and the potential for hypertensive disease of pregnancy [14], and they are likely to change their behaviors and report different risks, such as smoking during pregnancy. Participants who did not have three SBP and DBP measurements obtained during their study visit or were missing data on self-reported antihypertensive medication used for assessing hypertension were also excluded. Lastly, participants without data for determining recommended antihypertensive medication were also excluded.

The 2017 ACC/AHA and JNC7 guideline definitions of hypertension, and criteria for recommending antihypertensive medication are provided in Table 1 [4,5]. Hypertension was defined using blood pressure measurements and/or self-reported antihypertensive medication use. In NHANES data, blood pressure was measured by a trained physician using an appropriately sized cuff. Readings were obtained after 5 min of seated rest. Three measurements of blood pressure were obtained during the MEC examination. The mean of the three measurements was used to define SBP and DBP. Participants were considered to be taking antihypertensive medication if they responded “yes” to both of the questions: “Have you ever been told by a doctor or other healthcare professional that you had hypertension, also called high blood pressure?” and “Are you now taking prescribed medication for high blood pressure?”

Several criteria for defining recommended antihypertensive medication (Table 1) were also assessed. A history of CVD was defined by self-report of a prior diagnosis of myocardial infarction, coronary heart disease, stroke or heart failure. Among those without a history of CVD, 10-year predicted CVD risk was calculated using the pooled cohort risk equations [15]. A high CVD risk was defined as having a history of CVD or a 10-year predicted CVD risk ≥10%. Diabetes mellitus was defined as fasting serum glucose ≥126 mg/dL, non-fasting serum glucose ≥200 mg/dL, hemoglobin A1c ≥6.5% or self-report of a history of diabetes with concurrent glucose lowering medication use. Chronic kidney disease (CKD) was defined as estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73 m² calculated using measured serum creatinine and the Chronic Kidney Disease Epidemiology Collaboration equation [16].

Sample characteristics were described using frequency and percent-age. The prevalence of hypertension and recommended antihypertensive medication according to the 2017 ACC/AHA guideline as compared with the JNC7 guideline were determined. A woman was considered to have newly classified hypertension if she was non-hypertensive using JNC7 guideline, but was classified as hypertensive using the 2017 ACC/AHA guideline. Multivariable Poisson regression models with robust error variance were conducted to identify factors associated with newly classified hypertension. The factors examined in the multivariable analyses (20–44 years, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic), age (less than high school, high school, some college, college and above), household income ($<35,000, 35,000–54,999, 55,000–74,999, ≥75,000), body mass index (BMI), together height (overweight, normal weight, overweight, obese), insurance status (insured, uninsured), current cigarette use (yes, no), high CVD risk (yes, no), diabetes (yes, no), and survey cycle (2010–2006, 2007–2008, 2009–2010, 2011–2012, 2013–2014). The results were presented as adjusted relative risk (aRRs) with accompanying 95% confidence intervals (CIs).

To account for the complex, multistage probably survey design, NHANES sample weights, stratification and clustering were employed in the analyses to account for sampling methodology. Our results were reported with unweighted numbers from the original sample and weighted values after accounting for sample weights to reflect the U.S. nationally representative estimates. Statistical significance was defined as p < 0.05. All analyses were conducted using SAS Version 9.4 (SAS Institute, Inc. Cary, NC, USA) and STATA software version 14 (StataCorp LP, College Station, TX).

3. Results

Over the 5 NHANES cycles, 6,239 adult women of reproductive age between 20 and 44 years who had home interviews and physical Table 1

| Blood pressure thresholds to define hypertension and recommend antihypertensive medication. |
|-------------------------------------------------|
| **2017 ACC/AHA** | SBP/DBP (mm Hg) | **2017 ACC/AHA** | SBP/DBP (mm Hg) |
| **(a) Definition of hypertension** | | **(b) Recommended antihypertensive medication** | |
| Normal blood pressure | SBP < 120 and DBP < 80 | Normal blood pressure | |
| Elevated blood pressure | SBP ≥120 and DBP ≥80 | Prehypertension | |
| Stage 1 Hypertension | SBP 130–139 or DBP 80–89 | Prehypertension | |
| Stage 2 Hypertension | SBP 140–159 or DBP 90–99 | Stage 1 Hypertension | |
| Stage 2 Hypertension | SBP ≥160 or DBP ≥100 | Stage 2 Hypertension | |
examination at MECs were included. We excluded women who were
pregnant at the time of examination (n = 572), who did not have three SBP
and DBP measurements obtained during their study visit or were missing
data on self-reported antihypertensive medication used for assessing hy-
ertension (n = 794). Also, participants without data (i.e., diabetes, CKD,
or high CVD risk) for determining recommended antihypertensive medi-
cation were excluded (n = 298). Consequently, our study population
included 4,575 (weighted n = 40,194,602) non-pregnant women aged 20
to 44 who met the inclusion criteria. The majority of reproductive-aged
women were non-Hispanic white (61.8%), had more than high school
education (67.4%), being overweight or obese (57.9%), had health ins-
urance (75.9%), and did not use cigarette currently (77.6%); in addition,
about 1.7% had a high risk for CVD, and 4.5% had diabetes (Table 2).

The overall prevalence of hypertension among U.S. reproductive-aged
women was 16.5% according to the 2017 ACC/AHA guideline, and 7.8%
when estimated based on JNC7 guideline—an increase in the prevalence of
hypertension by 112%. The prevalence of hypertension using 2017 ACC/
AHA guideline, compared to estimates using JNC7 guideline, was persis-
tently higher within all subgroups of maternal characteristics (Table 2).

Table 3 presents factors associated with newly classified hyperten-
sion. Among non-hypertensive women (n = 4,194, weighted n = 37,069,511) classified by JNC7 guideline, 9.4% were newly classified as
having hypertension using the 2017 ACC/AHA guideline. The results of
multivariable analyses showed that women with older age of 30–34 years
(aRR = 1.52, 95% CI = 1.01–2.29), 35–39 years (aRR = 2.33, 95% CI =
1.56–3.49) or 40–44 years (aRR = 3.01, 95% CI = 1.96–4.63), who were
obese (aRR = 2.42, 95% CI = 1.79–3.27), and who had diabetes (aRR =
1.68, 95% CI = 1.17–2.42) were more likely to be newly classified hy-
pertension following the implementation of the new guideline. Among
racial/ethnic subgroups, compared to non-Hispanic white women, His-
panic women (aRR = 0.60, 95% CI = 0.43–0.84) were less likely to have
newly classified hypertension.

### Table 2

| Race/Ethnicity       | Overall | Age (years) | Race/Ethnicity       | Overall | Age (years) |
|----------------------|---------|------------|----------------------|---------|------------|
| Overall              | 4,575   | 7.8        | Overall              | 4,575   | 7.8        |
| Age (years)          |         |            | Age (years)          |         |            |
| 20-24                | 917     | 0.8        | 20-24                | 917     | 0.8        |
| 25-29                | 825     | 3.3        | 25-29                | 825     | 3.3        |
| 30-34                | 880     | 4.9        | 30-34                | 880     | 4.9        |
| 35-39                | 929     | 10.6       | 35-39                | 929     | 10.6       |
| 40-44                | 1,024   | 17.3       | 40-44                | 1,024   | 17.3       |
| Race/Ethnicity       |         |            | Race/Ethnicity       |         |            |
| Non-Hispanic White   | 1,842   | 6.9        | Non-Hispanic White   | 1,842   | 6.9        |
| Non-Hispanic Black   | 932     | 16.1       | Non-Hispanic Black   | 932     | 16.1       |
| Hispanic             | 1,286   | 5.6        | Hispanic             | 1,286   | 5.6        |
| Non-Hispanic Other   | 515     | 5.7        | Non-Hispanic Other   | 515     | 5.7        |
| Education            |         |            | Education            |         |            |
| Less than High School| 898     | 8.1        | Less than High School| 898     | 8.1        |
| High School          | 880     | 9.8        | High School          | 880     | 9.8        |
| Some College         | 1,620   | 8.7        | Some College         | 1,620   | 8.7        |
| College and Above    | 1,172   | 5.4        | College and Above    | 1,172   | 5.4        |
| Household Income ($) |         |            | Household Income ($) |         |            |
| <35,000              | 1,823   | 8.5        | <35,000              | 1,823   | 8.5        |
| 35,000-54,999        | 761     | 9.2        | 35,000-54,999        | 761     | 9.2        |
| 55,000-74,999        | 517     | 9.3        | 55,000-74,999        | 517     | 9.3        |
| ≥75,000              | 996     | 6.2        | ≥75,000              | 996     | 6.2        |
| Body Mass Index (kg/m²)|        |            | Body Mass Index (kg/m²)|        |            |
| Underweight (<18.5) | 143     | 2.9        | Underweight (<18.5) | 143     | 2.9        |
| Normal Weight (18.5-24.9) | 1,625 | 3.0      | Normal Weight (18.5-24.9) | 1,625 | 3.0      |
| Overweight (25-29.9) | 1,196   | 13.4       | Overweight (25-29.9) | 1,196   | 13.4       |
| Obese (≥30)          | 1,611   | 29.1       | Obese (≥30)          | 1,611   | 29.1       |
| Health Insurance     |         |            | Health Insurance     |         |            |
| Insured              | 3,216   | 8.2        | Insured              | 3,216   | 8.2        |
| Uninsured            | 1,355   | 6.5        | Uninsured            | 1,355   | 6.5        |
| Current Cigarette Use|         |            | Current Cigarette Use|         |            |
| No                   | 3,587   | 7.4        | No                   | 3,587   | 7.4        |
| Yes                  | 988     | 9.2        | Yes                  | 988     | 9.2        |
| High CVD Risk        |         |            | High CVD Risk        |         |            |
| No                   | 4,492   | 7.3        | No                   | 4,492   | 7.3        |
| Yes                  | 83      | 16.0       | Yes                  | 83      | 16.0       |
| Diabetes             |         |            | Diabetes             |         |            |
| No                   | 4,330   | 6.5        | No                   | 4,330   | 6.5        |
| Yes                  | 245     | 35.8       | Yes                  | 245     | 35.8       |
| Survey Cycle         |         |            | Survey Cycle         |         |            |
| 2005-2006            | 672     | 17.6       | 2005-2006            | 672     | 17.6       |
| 2007-2008            | 887     | 7.7        | 2007-2008            | 887     | 7.7        |
| 2009-2010            | 1,089   | 6.1        | 2009-2010            | 1,089   | 6.1        |
| 2011-2012            | 913     | 9.9        | 2011-2012            | 913     | 9.9        |
| 2013-2014            | 1,014   | 9.3        | 2013-2014            | 1,014   | 9.3        |

2017 ACC/AHA guideline - 2017 American College of Cardiology/American Heart Association Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults (Reference #4).

JNC7 guideline - Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (Reference #5).

CVD: cardiovascular disease.

All analyses of % are weighted.
For women of reproductive age in the US. We found that the prevalence of hypertension would increase substantially (112%) following the 2017 ACC/AHA guideline. Women with older age, obesity, or diabetes were more likely to have newly classified hypertension following the new guideline, while Hispanic women were significantly less likely to be considered hypertensive. However, there was no significant difference in the prevalence of antihypertensive medication recommended between the estimates using these two guidelines.

The rationale for ACC/AHA to lower the threshold of BP to intervene is the meta-analysis of 15 trials that addressed targets for BP lowering during antihypertensive therapy in adults [17]. The conclusion of the meta-analysis was that BP lowering significantly reduced the risk major cardiovascular events (RR: 0.81; 95% CI: 0.70-0.94); myocardial infarction (RR: 0.86; 95% CI: 0.76-0.99); stroke (RR: 0.77; 95% CI: 0.65-0.91); heart failure (RR: 0.75; 95% CI: 0.56-0.99), albeit with no significant difference in overall rate of mortality (RR: 0.89; 95% CI: 0.77-1.02). In conjunction with the guideline’s publication, Munter et al. [6] reported on the potential U.S. population impact. Using NHANES data, they reported that over 103.3 million U.S. adults meet the definition for hypertension according to the 2017 ACC/AHA guideline compared with 72.2 million U.S. adults according to the JNC7 guideline, an increase of 43%. For women 20 years and older, 52.8 million will have hypertension with the ACC/AHA criteria, compared to 37.4 million, using JNC7 thresholds, an increase of 41%.

For five reasons we focused on non-pregnant reproductive aged women. Firstly, the likelihood of hypertension, the underlying pathophysiology, awareness about the disease, and the management of abnormal BP varies among men and women [18-20]. Secondly, early identification of women with abnormal BP, potentially permits early interventions (e.g. physical activity, reduction in daily alcohol consumption, quitting cigarette use) to mitigate the increased risk of adverse outcomes in menopausal years [20]. Thirdly, preconception blood pressure influences pregnancy outcomes and as obstetrician-gynecologist, we need to be aware of the new guideline from ACC/AHA. Fourthly, for health policy makers, clinical researchers and obstetricians need to be aware of the potential impact of the guideline on preconception care, antepartum management, and peripartum outcomes among women who have hypertension by the new guideline. Fifthly, by delineating the population who are potentially prescribed pharmacological interventions by the new guideline, we can focus on strategies to ensure compliance with the new recommendations.

In our study, although we observed significant increase in the prevalence of hypertension using the new guideline, there was no significant difference in the prevalence of women recommended for antihypertensive medication between the estimates using the old and new guidelines. Since the new guideline of recommending antihypertensive medication mostly target the elderly population older than 65 years (Table 1), it showed less impact among women of reproductive age.

Bateman et al. [10] used NHANES data from 1999 to 2008 and examined the prevalence of hypertension in women of reproductive age according to the JNC7 guideline. They reported that non-Hispanic Black women at an increased odds of hypertension (adjusted odds ratio = 2.3, 95% CI = 1.5–3.5), while Hispanic women were associated with a reduced risk of hypertension (adjusted odds ratio = 0.6, 95% CI = 0.3–1.0), compared to non-Hispanic White women. Our study, however, utilized more contemporary NHANES data from 2005 to 2014, and examined the prevalence of hypertension in reproductive-aged women according to the 2017 ACC/AHA guideline and the JNC7 guideline. Our study showed similar results that the prevalence of hypertension was the highest in non-Hispanic Black women, but the lowest in Hispanic women of reproductive age. In addition, we observed that the risk of newly
Finally, NHANES data are cross-sectional, which is limited in establishing causality. It is, however, noteworthy NHANES data is appropriate for describing population-based estimates of prevalence of disease conditions (e.g., asthma, coronary heart disease, CKD, chronic obstructive pulmonary disease, diabetes, hypertension, and obesity) and their risk factors, and has been widely used in epidemiological studies to monitor the health of the U.S. population [21–27].

5. Conclusions

The 2017 ACC/AHA guideline suggested that hypertension occurred in about 16.5% of women of reproductive age, a substantial increase from using the JNC7 guideline. Several factors associated with newly classified hypertension were identified. Our results would potentially lead to a better development of innovative, patient-centered, intervention strategies, which help to lower the prevalence of hypertension congruent with 2017 ACC/AHA guideline.

Table 4
Prevalence of antihypertensive medication recommended according to the 2017 ACC/AHA guideline and the JNC7 guideline.

| n       | Weighted n | %       | Antihypertensive medication recommended (%) |
|---------|------------|---------|---------------------------------------------|
|         |            |         | JNC7 | 2017 ACC/AHA | Difference (95% CI) |
| Overall | 4,575      | 40,194,602 | 100.0 | 8.5     | 8.6     | 0.1 (0.0-0.2) |
| Age (years) |          |         |       |         |         |                  |
| 20-24   | 917        | 7,942,721 | 19.8  | 1.0     | 1.0     | 0                |
| 25-29   | 825        | 7,496,563 | 18.7  | 3.7     | 3.7     | 0                |
| 30-34   | 880        | 7,464,555 | 18.6  | 5.8     | 5.8     | 0                |
| 35-39   | 929        | 8,196,787 | 20.4  | 11.4    | 11.5    | 0.1 (0.0-0.3)    |
| 40-44   | 1,024      | 9,093,976 | 22.6  | 18.7    | 19.0    | 0.3 (0.0-0.8)    |
| Race/Ethnicity |     |         |       |         |         |                  |
| Non-Hispanic White | 1,842  | 24,854,993 | 61.8  | 7.5     | 7.6     | 0.1 (0.0-0.3)    |
| Non-Hispanic Black | 932  | 5,088,224 | 12.7  | 16.9    | 17.0    | 0.1 (0.0-0.3)    |
| Hispanic | 1,286    | 6,929,631 | 17.2  | 7.0     | 7.0     | 0                |
| Non-Hispanic Other | 515  | 3,217,755 | 8.3   | 6.4     | 6.5     | 0.1 (0.0-0.4)    |
| Education |          |         |       |         |         |                  |
| Less than High School | 898  | 5,754,790 | 14.3  | 8.8     | 8.8     | 0                |
| High School | 880  | 7,342,912 | 18.3  | 10.4    | 10.6    | 0.1 (0.0-0.3)    |
| Some College | 1,620  | 14,613,626 | 36.4  | 9.7     | 9.9     | 0.2 (0.0-0.5)    |
| College and Above | 1,172  | 12,450,922 | 31.0  | 5.8     | 5.8     | 0                |
| Household Income ($) |     |         |       |         |         |                  |
| <35,000 | 1,823      | 12,747,031 | 31.7  | 9.4     | 9.5     | 0.1 (0.0-0.3)    |
| 35,000-54,999 | 761  | 6,636,787 | 16.5  | 9.7     | 10.0    | 0.3 (0.0-0.9)    |
| 55,000-74,999 | 317  | 5,356,687 | 13.3  | 9.7     | 9.7     | 0                |
| >75,000 | 996        | 10,845,098 | 27.0  | 6.9     | 6.9     | 0                |
| Unknown | 478        | 4,609,000 | 11.5  | 6.6     | 6.6     | 0                |
| Body Mass Index (kg/m²) |     |         |       |         |         |                  |
| Underweight (<18.5) | 143  | 1,272,689 | 3.2   | 3.2     | 3.2     | 0                |
| Normal Weight (18.5-24.9) | 1,625  | 15,660,474 | 39.0  | 3.3     | 3.3     | 0                |
| Overweight (25-29) | 1,196  | 10,319,570 | 25.7  | 5.7     | 6.0     | 0.3 (0.0-0.7)    |
| Obese (≥30) | 1,611  | 12,941,869 | 32.2  | 17.6    | 17.7    | 0.0 (0.0-0.1)    |
| Health Insurance |     |         |       |         |         |                  |
| Insured | 3,216      | 30,469,675 | 75.9  | 8.9     | 9.0     | 0.1 (0.0-0.2)    |
| Uninsured | 1,355  | 9,683,596 | 24.1  | 7.4     | 7.5     | 0.1 (0.0-0.2)    |
| Current Cigarette User |     |         |       |         |         |                  |
| No | 3,587      | 31,198,839 | 77.6  | 8.1     | 8.2     | 0.1 (0.0-0.2)    |
| Yes | 988        | 8,995,764 | 22.4  | 9.9     | 10.1    | 0.2 (0.0-0.3)    |
| High CVD Risk |     |         |       |         |         |                  |
| No | 4,492      | 39,501,633 | 98.3  | 8.0     | 8.0     | 0                |
| Yes | 83         | 692,970  | 1.7   | 38.0    | 43.6    | 5.6 (0.0-11.8)   |
| Diabetes |     |         |       |         |         |                  |
| No | 4,330      | 38,389,683 | 95.5  | 6.5     | 6.6     | 0.1 (0.0-0.2)    |
| Yes | 245        | 1,804,920 | 4.5   | 51.8    | 51.8    | 0                |
| Survey Cycle |     |         |       |         |         |                  |
| 2005-2006 | 672  | 7,077,578 | 17.6  | 6.3     | 6.3     | 0                |
| 2007-2008 | 887  | 7,839,854 | 19.5  | 8.7     | 9.1     | 0.4 (0.0-0.9)    |
| 2009-2010 | 1,089  | 8,517,646 | 21.2  | 6.8     | 6.9     | 0.1 (0.0-0.2)    |
| 2011-2012 | 913  | 8,160,761 | 20.3  | 10.3    | 10.3    | 0                |
| 2013-2014 | 1,014  | 8,596,763 | 21.4  | 10.2    | 10.2    | 0                |

2017 ACC/AHA guideline - 2017 American College of Cardiology/American Heart Association Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults (Reference #4).

JNC7 guideline - Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (Reference #5).

CVD: cardiovascular disease.

All analyses if % are weighted.

classified hypertension in Hispanic women was significantly lower, compared to non-Hispanic white women. Future studies examining racial/ethnic disparity in hypertension prevention and management are warranted after the promulgation of 2017 guideline.

The strengths of this study include its population-based design and its contemporary sample of nationally representative women of reproductive age using NHANES data. NHANES enrols a large sample size of participants and provides nationally representative estimates for the non-institutionalized US population. Thus, the results of this analysis have broad generalizability. In addition, NHANES data were collected using a rigorous study protocol, and blood pressure was measured thrice during physical examination following a standardized protocol.

Several limitations need to be acknowledged, however, when interpreting the present findings. First, our study was restricted to reproductive-aged women of 20–44 years, which should not be extrapolated to women in other age group. Second, some study data rely on self-reported information may be subject to recall and social desirability bias.
Conflict of interest

The authors report no conflict of interest.

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