

ORIGINAL RESEARCH

Racial, Ethnic, and Geographic Disparities in Cardiovascular Health Among Women of Childbearing Age in the United States

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BACKGROUND: In the United States, large disparities in cardiovascular health (CVH) exist in the general population, but little is known about the CVH status and its disparities among women of childbearing age (ie, 18–49 years).

METHODS AND RESULTS: In this cross-sectional study, we examined racial, ethnic, and geographic disparities in CVH among all women of childbearing age in the United States, using the 2011 to 2019 Behavioral Risk Factor Surveillance System. Life's Simple 7 (ie, blood pressure, glucose, total cholesterol, smoking, body mass index, physical activity, and diet) was used to examine CVH. Women with 7 ideal CVH metrics were determined to have ideal CVH. Among the 269 564 women of childbearing age, 13 800 (4.84%) had ideal CVH. After adjusting for potential confounders, non-Hispanic Black women were less likely to have ideal CVH (odds ratio, 0.54; 95% CI, 0.46–0.63) compared with non-Hispanic White women, and with significantly lower odds of having ideal metrics of blood pressure, blood glucose, body mass index, and physical activity. No significant difference in CVH was found between non-Hispanic White and Hispanic women. Large geographic disparities with temporal variations were observed, with the age- and race-adjusted ideal CVH prevalence ranging from 4.05% in the District of Columbia (2011) to 5.55% in Maine and Montana (2019). States with low ideal CVH prevalence and average CVH score were mostly clustered in the southern United States.

CONCLUSIONS: Large racial, ethnic, and geographic disparities in CVH exist among women of childbearing age. More efforts are warranted to understand and address these disparities.

Key Words: cardiovascular health ■ geographic disparities ■ racial disparities

Cardiovascular disease (CVD), the leading cause of death worldwide, contributed to ≈ 1 in every 5 deaths among women in the United States in 2017.¹ Conventional prevention strategies for CVD mainly focus on optimizing classical risk factors (eg, hypertension and diabetes mellitus). However, it is challenging to communicate a low absolute 10-year CVD risk with young people efficiently. Life's Simple 7 (LS7) was introduced by the American Heart Association to assess cardiovascular health (CVH),² which reframed CVD prevention focus from disease to health. LS7 includes 7 metrics: 3 health factors (blood pressure,

total cholesterol, and glucose) and 4 behavioral factors (body mass index [BMI], cigarette smoking, diet, and physical activity). Prior studies have shown that ideal CVH is not only associated with lower risks of subsequent CVD,^{3,4} but also other health outcomes such as cancer,⁵ cognitive impairment,⁶ and depression.⁷

In 2016, the American Heart Association initiated a new program, One Brave Idea,⁸ with a goal to end coronary heart disease and its consequences. More recently, an interim target for the CVD endgame strategy named “50×50×50” was proposed, targeting on “≥50% segments of the population ≤50 years old by

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CLINICAL PERSPECTIVE

What Is New?

- This is the first study examining racial, ethnic, and geographic disparities in cardiovascular health among women of childbearing age using a nationally representative sample.
- Large geographic disparities with temporal variations in cardiovascular health exist among women of childbearing age.
- Non-Hispanic Black women have worse cardiovascular health compared with non-Hispanic White women.

What Are the Clinical Implications?

- More efforts are warranted to address these disparities to achieve and maintain ideal cardiovascular health among women of childbearing age.

Nonstandard Abbreviations and Acronyms

Add Health	the National Longitudinal Study of Adolescent to Adult Health
BRFSS	the Behavioral Risk Factor Surveillance System
CVH	cardiovascular health
LS7	Life's Simple 7

2050 or sooner.”⁹ At present, the prevalence of ideal CVH among the US population is estimated to be 50% at 10 years old and declines to <10% by 50 years old.^{10,11} Thus, it is essential to decelerate loss of ideal CVH at earlier ages to achieve these goals. Compared with men, women of childbearing age experience events known to affect the risk of CVD, including pregnancy,¹² breastfeeding,¹³ and menopause.¹⁴ Furthermore, among women with children, a number of prepregnancy health conditions such as hypertension, diabetes mellitus, and obesity have been associated with not only women’s future CVH,^{15,16} but also the health of their children.^{17,18} Therefore, achieving and maintaining ideal CVH among women of childbearing age is of critical value in achieving the American Heart Association’s target of improving the population CVH.

Large racial, ethnic, and geographic disparities in CVH among the general population in the United States have been widely reported.^{19,20} Previous studies observed larger racial and ethnic disparities in CVD-related outcomes and important risk factors among women compared with men.^{21,22} Meanwhile, emerging evidence suggested that efforts should be made throughout young adulthood to achieve better

CVH.^{23,24} Recently, Perak et al²⁵ found significant racial and ethnic disparities in CVH among pregnant women and several other studies reported disparities in hypertension and diabetes mellitus among women of childbearing age.^{26,27} To our knowledge, disparities in CVH among women, particularly those of childbearing age, have not been systematically examined. Using data from the 2011 to 2019 Behavioral Risk Factor Surveillance System (BRFSS), we aim to examine both the racial, ethnic, and geographic disparities in CVH among women of childbearing age.

METHODS

Study Population

We used data from a nationally representative survey, the BRFSS, which are publicly available through the Centers for Disease Control and Prevention at <https://www.cdc.gov/brfss/index.html>. Informed consent was obtained from the participants by the BRFSS. Codes will be made freely available to those who request it. BRFSS is conducted annually using a multistage sampling design with random digit dialing, collecting data on risk health behaviors, chronic health status, and healthcare services use from US residents at the state and local levels. We used data from 2011 to 2019 (ie, 2011, 2013, 2015, 2017, and 2019) since data before 2011 used a different weighting method and information on all 7 CVH metrics were available only in odd years. Among 1 332 097 women in the BRFSS 2011 to 2019, a total of 269 564 women of childbearing age (ie, 18–49 years)²⁸ were identified after excluding those who were enrolled in Guam, Puerto Rico, and Virgin Islands (n=23 116), women over 49 years old (n=883 089), or those with missing information on race and ethnicity (n=5227) or any of the 7 CVH metrics (n=151 101). A flowchart of the inclusion and exclusion criteria is provided in Figure S1.

Assessment of CVH

We categorized each CVH metric as ideal (1 point) or nonideal (0 point) on the basis of the American Heart Association criteria of the LS7,² and an overall CVH score ranging from 0 to 7 was calculated, with a higher CVH score indicating better CVH.^{20,29} Women with a CVH score of 7 were determined to have ideal CVH.²⁹ Table S1 shows the detailed criteria. Specifically, participants were asked separately whether they have ever been told by a doctor or other health professional that they have high blood pressure, diabetes mellitus, or high cholesterol, and those who answered “No” to each question were defined as having ideal condition in the corresponding metric. BMI was calculated using self-reported height (meter) and weight (kilogram), and a value between 18.5 and

25 was considered as ideal. Ideal smoking status was defined as having smoked a lifetime total of <100 cigarettes or smoked at least 100 cigarettes but currently not smoking at all. According to self-reported frequency and duration of moderate and vigorous activities, total minutes of physical activity per week were calculated. Participants were considered to be physically active if they met the recommendations (≥ 150 minutes of moderate activity, ≥ 75 minutes of vigorous activity, or ≥ 150 minutes of the combination of both activities per week). Participants were asked several separate questions on how often (ie, times per day/week/month) they drink or eat different types of food (ie, fruit juices, fruits, dark green vegetables, potatoes/beans, orange-colored vegetables, and other vegetables in the 2011 to 2015 surveys, and fruits, juices, dark green vegetables, French fries, potatoes, and other vegetables in the 2017 and 2019 surveys), and average daily consumption of fruits and vegetables was calculated on the basis of their answers to these questions. Ideal diet was assigned if a participant reported ≥ 5 servings of daily fruit and vegetable consumption.

Assessment of Racial and Ethnicity

Race and ethnicity were obtained on the basis of self-reports and categorized into non-Hispanic White, non-Hispanic Black, Hispanic, and others (including multiracial individuals).

Covariates

Participants' sociodemographic status were obtained based on self-reported questionnaires, including age (18–24, 25–34, 35–44, and 45–49 years old), education (less than high school, high school or equivalent, some college, and college/graduate or above), marital status (never married, married or living with partner, and previously married), annual household income (<25 000, 25 000–50 000, and ≥ 50 000), pregnancy status (current, never, and ever) and history of CVD (a dichotomous variable indicating previous diagnosis of heart attack, stroke, angina, or coronary heart disease). Missing values were coded as an additional category for each covariate.

Statistical Analysis

Descriptive analyses were performed to examine the distributions of ideal CVH and CVH score by covariates. Weighted logistic and linear regression models were fitted to examine racial and ethnic disparities in ideal CVH, individual CVH metrics, and CVH score. Three sets of models were used, including a set of unadjusted models; a set of models crudely adjusted for age; and a set of models additionally adjusted for

education, annual household income, marital status, history of CVD, pregnancy status, and survey year. Odds ratios or beta coefficients with 95% CIs were calculated. To examine geographic disparities in ideal CVH, we calculated age- and race-adjusted prevalence of ideal CVH and average CVH score at the state level. Furthermore, the SaTScan software was employed to identify statistically significant spatial clusters using the *rsatscan* package.³⁰ Both ideal CVH prevalence and CVH score were categorized into quintiles in the maps. In addition, we assessed the potential temporal variations in geographic disparities. All analyses were conducted using the “survey” package in R 3.5.1 after accounting for the complex survey design.

This study was approved by the Institutional Review Board at the University of Florida (IRB201903278).

RESULTS

Table 1 shows the sociodemographic characteristics of the study sample by CVH status and the corresponding CVH scores. Among the 269 564 women of childbearing age, a total of 13 800 (4.84%) women had ideal CVH. The mean CVH score was 4.53 (95% CI, 4.52–5.54). Compared with women with ideal CVH status, those who had nonideal CVH were more likely to be 45 to 49 years old, non-Hispanic Black or Hispanic, previously married or never married, of lower education levels, of lower income, or have a history of CVD, confirming known risk factors. Consistently, lowest CVH scores were also seen among similar subgroups of women.

Table 2 shows the racial and ethnic disparities in CVH among women of childbearing age. Racial and ethnic disparities were observed for both the presence of ideal CVH and CVH scores. In the crude and age-adjusted models, non-Hispanic Black and Hispanic women demonstrated significantly lower odds of ideal CVH and lower CVH scores compared with non-Hispanic White women. After further controlling for education, income, marital status, history of CVD, pregnancy status, and survey year, significantly lower odds of ideal CVH were still observed in non-Hispanic Black women (odds ratio, 0.54; 95% CI, 0.46–0.63) but not in Hispanic women. Similarly in the fully adjusted model, non-Hispanic Black race was associated with a 0.22-point lower CVH score (95% CI, –0.25 to –0.20), while Hispanic race (β coefficient, 0.13; 95% CI, 0.11–0.16) and other races/ethnicities (β coefficient, 0.12; 95% CI, 0.08–0.16) were associated a higher CVH score, as compared with those who are non-Hispanic White. Table S2 shows the racial and ethnic disparities in each of the individual CVH metrics.

Figure shows the overall age- and race-adjusted prevalence of ideal CVH and CVH scores by state.

Table 1. Sociodemographic Characteristics by CVH Status and Distribution of CVH Score Among Women of Childbearing Age, BRFSS 2011 to 2019 (n=269 564)

Characteristics	Ideal CVH	Nonideal CVH	Total	CVH Score
	No. % (95% CI)*	No. % (95% CI)*	No. % (95% CI)*	Mean (95% CI)†
Overall	13 800 4.8 (4.7–5.0)	255 764 95.2 (95.0–95.3)	269 564 100	4.53 (4.52–4.54)
Age, y				
18–24	1345 18.7 (17.2–20.2)	23 784 16.8 (16.5–17.1)	25 129 16.9 (16.6–17.2)	4.94 (4.92–4.96)
25–34	3687 30.9 (29.3–32.5)	67 097 30.7 (30.4–31.1)	70 784 30.7 (30.4–31.1)	4.65 (4.63–4.66)
35–44	5606 35.2 (33.6–36.7)	100 295 35.0 (34.6–35.3)	105 901 35.0 (34.6–35.3)	4.42 (4.40–4.44)
45–49	3162 15.2 (14.2–16.2)	64 588 17.5 (17.3–17.8)	67 750 17.4 (17.2–17.7)	4.16 (4.14–4.19)
Race/Ethnicity				
Non-Hispanic White	11 123 67.5 (65.8–69.3)	180 466 58.7 (58.3–59.1)	191 589 59.1 (58.8–59.5)	4.59 (4.58–4.60)
Non-Hispanic Black	552 6.6 (5.7–7.5)	27 186 13.7 (13.4–13.9)	27 738 13.3 (13.1–13.6)	4.19 (4.16–4.21)
Hispanic	1092 14.6 (13.2–16.1)	27 787 18.3 (18.0–18.6)	28 879 18.1 (17.8–18.5)	4.48 (4.45–4.50)
Other †race/ethnicity	1033 11.2 (9.8–12.6)	20 325 9.3 (9.0–9.5)	21 358 9.4 (9.1–9.6)	4.78 (4.74–4.81)
Education				
Less than high school	185 3.2 (2.5–3.9)	13 153 10.0 (9.7–10.3)	13 338 9.7 (9.4–9.9)	3.94 (3.90–3.98)
High school	1260 12.5 (11.2–13.7)	51 526 22.4 (22.1–22.7)	52 786 21.9 (21.6–22.2)	4.27 (4.25–4.29)
Some college or associate of arts degree	2888 30.7 (29.0–32.5)	75 687 33.5 (33.2–33.9)	78 575 33.4 (33.0–33.7)	4.49 (4.47–4.51)
College graduate or above	9452 53.5 (51.8–55.2)	115 213 33.9 (33.6–34.3)	124 665 34.9 (34.6–35.2)	4.9 (4.89–4.92)
Missing	15 0.1 (0.0–0.2)	185 0.1 (0.1–0.1)	200 0.1 (0.1–0.1)	4.33 (3.92–4.75)
Annual household income				
<\$25 000	1291 12.5 (11.3–13.7)	55 478 24.5 (24.2–24.8)	56 769 23.9 (23.6–24.3)	4.1 (4.08–4.12)
\$25 000–\$50 000	1905 15.0 (13.8–16.3)	51 823 19.9 (19.6–20.2)	53 728 19.7 (19.4–20.0)	4.42 (4.40–4.45)
≥%50 000	9468 62.1 (60.4–63.7)	126 492 45.2 (44.9–45.6)	135 960 46.1 (45.7–46.4)	4.79 (4.78–4.80)
Missing	1136 10.4 (9.3–11.5)	21 971 10.3 (10.1–10.5)	23 107 10.3 (10.1–10.6)	4.6 (4.57–4.63)
Marital status				
Married/living with partner	10 007 64.8 (63.1–66.5)	155 933 56.7 (56.3–57.1)	165 940 57.1 (56.7–57.5)	4.59 (4.58–4.60)
Previously married	1308 8.0 (7.1–8.9)	40 690 12.8 (12.5–13.0)	41 998 12.5 (12.3–12.7)	4.07 (4.04–4.10)

(Continued)

Table 1. Continued

Characteristics	Ideal CVH	Nonideal CVH	Total	CVH Score
	No. % (95% CI)*	No. % (95% CI)*	No. % (95% CI)*	Mean (95% CI)†
Never married	2456	58 594	61 050	4.61
	27.0 (25.3–28.6)	30.3 (29.9–30.7)	30.1 (29.8–30.5)	(4.60–4.63)
Missing	29	547	576	4.55
	0.2 (0.1–0.3)	0.2 (0.2–0.3)	0.2 (0.2–0.3)	(4.30–4.81)
History of CVD				
No.	13 669	247 411	261 080	4.57
	99.3 (99.1–99.5)	97.0 (96.9–97.1)	97.1 (97.0–97.2)	(4.56–4.58)
Yes	115	7434	7549	3.32
	0.6 (0.4–0.8)	2.6 (2.5–2.7)	2.5 (2.4–2.6)	(3.26–3.38)
Missing	16	919	935	3.44
	0.1 (0.0–0.2)	0.4 (0.3–0.4)	0.3 (0.3–0.4)	(3.16–3.72)
Pregnancy status				
Currently pregnant	447	7121	7568	4.72
	3.2 (2.7–3.6)	3.3 (3.1–3.4)	3.2 (3.1–3.4)	(4.67–4.76)
Ever pregnant	4208	73 995	78 203	4.49
	25.2 (23.8–26.5)	26.5 (26.2–26.8)	26.4 (26.1–26.7)	(4.47–4.51)
Never pregnant	7492	140 548	148 040	4.6
	64.1 (62.6–65.6)	61.8 (61.5–62.2)	61.9 (61.6–62.3)	(4.59–4.61)
Missing	1653	34 100	35 753	4.11
	7.6 (6.9–8.3)	8.5 (8.3–8.6)	8.4 (8.2–8.6)	(4.08–4.14)
Year				
2011	3684	60 342	64 026	4.51
	20.7 (19.5–21.9)	18.8 (18.5–19.0)	18.9 (18.6–19.1)	(4.49–4.53)
2013	3038	53 993	57 031	4.49
	19.0 (17.7–20.2)	18.4 (18.1–18.6)	18.4 (18.1–18.7)	(4.47–4.51)
2015	2543	42 898	45 441	4.55
	19.9 (18.6–21.2)	17.7 (17.5–18.0)	17.8 (17.6–18.1)	(4.53–4.57)
2017	2621	52 455	55 076	4.57
	22.1 (20.6–23.6)	23.1 (22.8–23.4)	23.0 (22.7–23.4)	(4.55–4.59)
2019	1914	46 076	47 990	4.52
	18.3 (16.8–19.8)	22.0 (21.7–22.4)	21.9 (21.5–22.2)	(4.50–4.54)

BRFSS indicates the Behavioral Risk Factor Surveillance System; CVD, cardiovascular diseases; CVH, cardiovascular health.

*Number of participants and weighted percentage with 95% CI.

†Weighted average CVH score with 95% CI.

‡Other includes American Indian or Alaska Native, Asian, and Pacific Islander.

Geographic disparities in ideal CVH were observed among women of childbearing age, with the prevalence of ideal CVH ranging from 4.16% to 5.50%. Overall, the lowest ideal CVH prevalence was observed in Mississippi (4.16%), followed by the District of Columbia (4.27%) and Georgia (4.34%), while the highest ideal CVH prevalence was found in Montana (5.50%), followed by a prevalence of 5.49% in Vermont, South Dakota, and Maine. A total of 19 states had an ideal CVH prevalence below the average prevalence of 4.84%. Five statistically significant spatial clusters of low ideal CVH prevalence were observed, locating in the Southwest, South, Midwest,

and Mid-Atlantic, with the largest cluster located in the southern United States. The average CVH scores ranged from 4.43 (Mississippi) to 4.66 (Hawaii), and 14 states showed a CVH score below the average value of 4.53. Consistently, 3 significant spatial clusters of low CVH scores were identified in the same regions, with the largest cluster located in the South, Midwest, and Mid-Atlantic.

Large geographic disparities with significant temporal variations in CVH among women of childbearing age were observed (Tables S3 and S4), with the age- and race-adjusted ideal CVH prevalence ranging from 4.05% in the District of Columbia (2011) to 5.55% in

Table 2. Racial Disparities in CVH Among Women of Childbearing Age, BRFSS 2011 to 2019 (n=269 564)

CVH status	Unadjusted	Age-Adjusted	Fully Adjusted*
	Odds Ratio (95% CI) [†]		
Ideal CVH			
Non-Hispanic White	Reference	Reference	Reference
Non-Hispanic Black	0.42 (0.36 to 0.49)	0.42 (0.36 to 0.48)	0.54 (0.46 to 0.63)
Hispanic	0.70 (0.62 to 0.78)	0.68 (0.61 to 0.77)	1.03 (0.91 to 1.16)
Other race/ethnicity	1.05 (0.91 to 1.22)	1.04 (0.90 to 1.20)	1.00 (0.86 to 1.16)
	β Coefficient (95% CI) [‡]		
CVH score			
Non-Hispanic White	Reference	Reference	Reference
Non-Hispanic Black	-0.40 (-0.43 to -0.37)	-0.43 (-0.45 to -0.40)	-0.22 (-0.25 to -0.20)
Hispanic	-0.11 (-0.14 to -0.08)	-0.16 (-0.19 to -0.13)	0.13 (0.11 to 0.16)
Other †race/ethnicity	0.19 (0.15 to 0.23)	0.14 (0.11 to 0.18)	0.12 (0.08 to 0.16)

BRFSS indicates the Behavioral Risk Factor Surveillance System; CVD, cardiovascular disease; and CVH, cardiovascular health.

*Models adjusted for age, education, income, marital status, history of CVD, pregnancy status, and year.

[†]Weighted odds ratio and β coefficient with 95% CI. [‡] Other includes American Indian or Alaska Native, Asian, and Pacific Islander.

[‡] Other includes American Indian or Alaska Native, Asian, and Pacific Islander.

Maine and Montana (2019). Consistent with the overall patterns, the largest spatial clusters of both low ideal CVH prevalence and low average CVH scores were identified in the South, Midwest, and Mid-Atlantic across the years (Figures S2 and S3). Table S5 shows the age- and race-adjusted prevalence with 95% CI of ideal status on individual CVH metrics by state, and Figure S4 shows the spatial clusters of each individual CVH metric.

DISCUSSION

To our knowledge, this is the first study examining both racial, ethnic, and geographic disparities in CVH among women of childbearing age using a nationally representative sample. Using the BRFSS 2011 to 2019, we observed large disparities in CVH among women of childbearing age. Non-Hispanic Black women have worse CVH compared with non-Hispanic White women, and are especially disadvantaged in maintaining ideal status on blood pressure, glucose, BMI, and physical activity. No significant difference in overall CVH were found between non-Hispanic White and Hispanic women, despite significant differences in individual CVH metrics such as glucose, BMI, and physical activity. In addition, we also observed large geographic disparities with temporal variations. To note, states with worse CVH were mainly clustered in the South, especially in the historical “Stroke Belt.”³¹ Compared with findings in the general population,²⁹ women of childbearing age had a slightly higher overall CVH score.

The majorities of studies examining racial and ethnic disparities in CVH among childbearing-aged

women focused only on 1 or 2 CVH metrics. Britton et al²⁷ found large racial and ethnic disparities in dysglycemia among women of reproductive age using data from the Add Health (National Longitudinal Study of Adolescent to Adult Health) study, where non-Hispanic Black women had the highest prevalence of both diabetes mellitus and prediabetes (15.0% and 38.5%, respectively) compared with other races/ethnicities (4.5%–7.5% and 16.6%–27.8%). Another study using the 1999 to 2008 National Health and Nutrition Examination Survey also suggested that the dysglycemia prevalence was roughly twice as high in both non-Hispanic Black and Mexican American women of childbearing age with BMI <25 kg/m² compared with non-Hispanic White women.³² Similar results were also observed for comorbid hypertension and diabetes mellitus,²⁶ overweight, and obesity,³³ where non-Hispanic Black women of childbearing age were more likely to have unfavorable status compared with women of other races/ethnicities. Consistent with previous findings, our study also found that non-Hispanic Black women of childbearing age are less likely to have ideal status on blood pressure, blood glucose, and BMI. These 3 factors along with physical activity are likely to be the main contributors to the racial and ethnic disparities among non-Hispanic Black women in overall CVH. Although no significant racial and ethnic disparities in overall CVH were found for Hispanic women, our study showed that Hispanic women of childbearing age were less likely to have ideal status on glucose, BMI, and physical activity. Disparities in these individual CVH metrics were also found in the general population. For example, using the 1999 to 2012 National

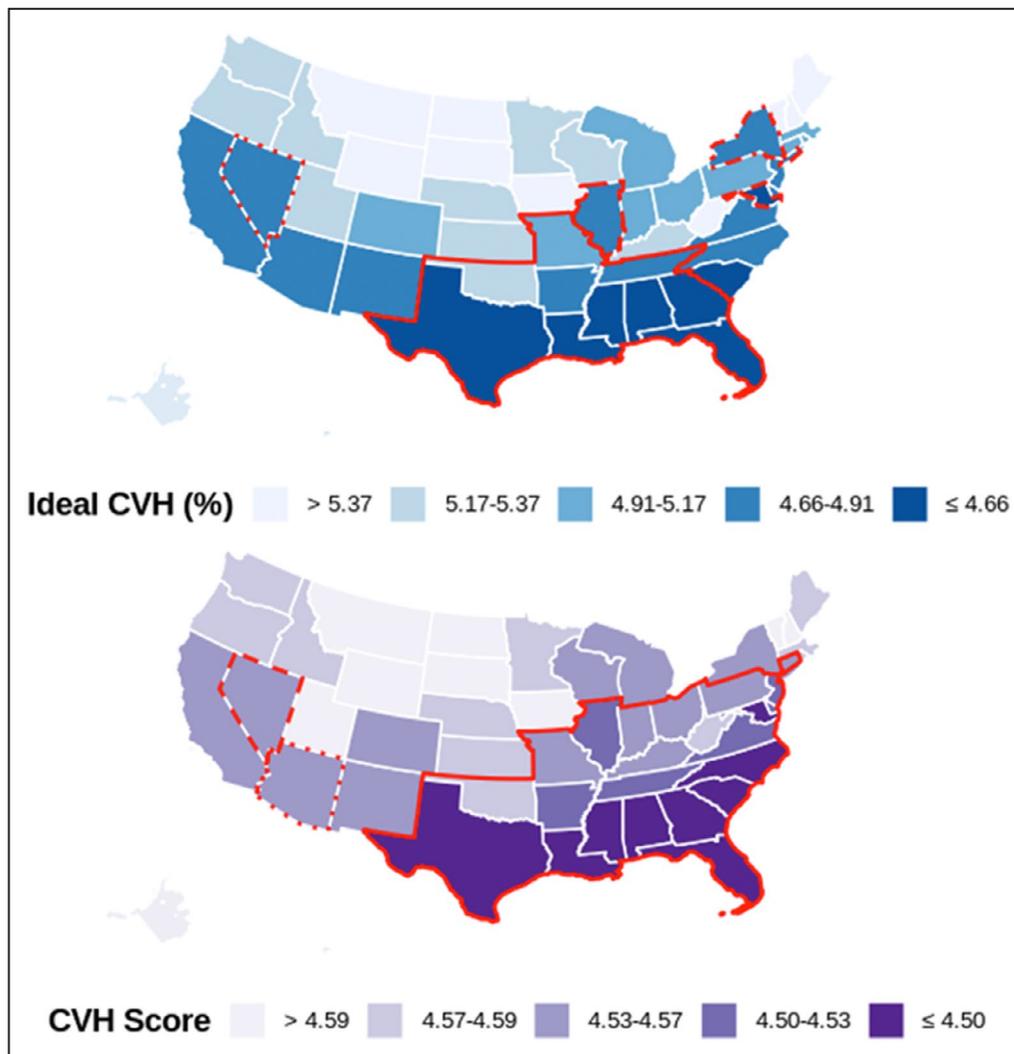


Figure. Age- and race-adjusted and weighted prevalence of ideal cardiovascular health (CVH) and CVH score among women of childbearing age, BRFSS 2011 to 2019 (n=269 564).

Health and Nutrition Examination Survey, Pool et al¹⁹ found that non-Hispanic Black women are less likely to have ideal status on blood pressure, fasting glucose, BMI, and physical activity than non-Hispanic White women, while Mexican American women had worse status on glucose, BMI, and physical activity.

Notably, compared with non-Hispanic White women, non-Hispanic Black and Hispanic women were found to have higher odds of ideal smoking status and ideal diet. Similar results on smoking status were also observed in previous studies.^{19,34} Non-Hispanic Black and Mexican American women generally had higher scores for smoking status than non-Hispanic White women, but there was no significant difference in diet across the 3 racial and ethnic groups. One possible explanation for the inconsistent results on diet could be the different measurement methods.

We observed large racial and ethnic disparities in overall CVH among women of childbearing age, which are consistent with previous studies focusing on the general population.^{3,10,19,35} For instance, Shay et al¹⁰ found that in the general population, non-Hispanic Black and Hispanic women are less likely to have ideal CVH compared with non-Hispanic White women. Similarly, Pool et al¹⁹ found significantly lower CVH scores among non-Hispanic Black (difference=0.93) and Hispanic women (difference=0.71) compared with non-Hispanic White women in the 2011 to 2012 National Health and Nutrition Examination Survey. In the present study, lower odds of ideal CVH and significantly lower CVH scores were also observed for non-Hispanic Black women in comparison with non-Hispanic White women. However, we did not find significant disparities in overall CVH among Hispanic women of childbearing

age. Furthermore, Hispanic race was found to be associated with a slightly increased CVH score. This indicates that the disparities among Hispanic women may be largely explained by socioeconomic factors, including household income and education.

Similar to the large geographic disparities in CVH observed in the general population,^{29,36} we also found geographic disparities among women of childbearing age, with worse CVH observed generally in the southern United States. Fang et al²⁹ found large geographic variations in the prevalence of ideal CVH in the general population, ranging from 1.2% in Oklahoma to 6.9% in the District of Columbia in 2009. Substantial differences in CVH status by state were also reported by Gebreab et al,³⁶ who found that the prevalence of poor CVH was the highest in Louisiana (17.2%) and lowest in Colorado (6.0%) in 2011. However, these findings are inconsistent with our results since previous studies used 1-year data from the BRFSS, and the prevalence they reported was adjusted by age only. In this study, we leveraged data during 2011 to 2019 and found that the overall age- and race-adjusted ideal CVH prevalence ranges from 4.16% in Mississippi to 5.50% in Maine among women of childbearing age, with majority of the states showing significant temporal variations in average CVH score over the study period.

This study has several strengths. First, we used multiyear data from a nationally representative survey to ensure the generalizability of the findings. Second, both racial, ethnic, and geographic disparities in CVH among women of childbearing age were examined, with additional analyses conducted on individual CVH metrics. Nevertheless, several limitations also need to be noted. First, our analyses controlled only for a limited number of socioeconomic factors such as education and household income. It is possible that racial and ethnic disparities in CVH may be affected by other factors that were not included in the analysis. Second, the BRFSS assessed CVH metrics based on self-reports, which may lead to measurement bias and potential misclassifications. Specifically, the 3 health factors (ie, blood pressure, total cholesterol, and glucose) were derived from a binary response from the participants, while ideally they should be measured as continuous variables. In addition, BMI was found to be underreported in the BRFSS, particularly among women 20 to 39 years old. On the other hand, self-reported diagnoses of chronic conditions, physical activity measures, and tobacco smoking measures from the BRFSS data were supported by previous validity assessment,³⁷ which are comparable to those from other national surveys such as the National Health Interview Survey and National Health and Nutrition Examination Survey.^{38,39} Third, the overall CVH score was calculated by summing all 7 metrics as

defined by the LS7, assuming each metric contributed equally. In this case, any given score may represent different combinations of presence or absence of CVH metrics. While more efforts are warranted to specify the contribution of each metric, such as assigning weights to individual metrics according to their health effects, previous studies showed that CVH measured by LS7 is a stable and strong predictor of CVD outcomes.^{3,24,40} Finally, although women with missing data on race and ethnicity or any CVH metric were excluded from this study, this may lead to minimal selection bias attributable to the incorporation of sampling weights in the analyses.⁴¹

CONCLUSIONS

Large racial, ethnic, and geographic disparities in CVH exist among women of childbearing age. Non-Hispanic Black women are less likely to have ideal CVH, which may be largely driven by their poor status on blood glucose, BMI, and physical activity. Women residing in the southern United States also have worse CVH in general. The results showed the urgent need to better understand the underlying factors contributing to the CVH disparities among women of childbearing age with longitudinal data and to develop targeted interventions to improve CVH among women.

ARTICLE INFORMATION

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Disclosures

None.

Supplementary Material

Tables S1–S5
Figures S1–S4

REFERENCES

- Centers for Disease Control and Prevention. Underlying cause of death, 1999–2017 on CDC wonder online database, released December, 2018. Data are from the multiple cause of death files, 1999–2017, as compiled from data provided by the 57 vital statistics jurisdictions through the vital statistics cooperative program. 2019. Available at: <http://wonder.cdc.gov/ucd-icd10.html>. View in Article. Accessed February 15, 2019.

2. Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, Van Horn L, Greenlund K, Daniels S, Nichol G, Tomaselli GF, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation*. 2010;121:586–613. DOI: 10.1161/CIRCULATIONAHA.109.192703.
3. Yang Q, Cogswell ME, Flanders WD, Hong Y, Zhang Z, Loustalot F, Gillespie C, Merritt R, Hu FB. Trends in cardiovascular health metrics and associations with all-cause and CVD mortality among US adults. *JAMA*. 2012;307:1273–1283. DOI: 10.1001/jama.2012.339.
4. Kulshreshtha A, Vaccarino V, Judd SE, Howard VJ, McClellan WM, Muntner P, Hong Y, Safford MM, Goyal A, Cushman M. Life's Simple 7 and risk of incident stroke: the reasons for geographic and racial differences in stroke study. *Stroke*. 2013;44:1909–1914. DOI: 10.1161/STROKEAHA.111.000352.
5. Ogunmoroti O, Allen NB, Cushman M, Michos ED, Rundek T, Rana JS, Blankstein R, Blumenthal RS, Blaha MJ, Veledar E, et al. Association between Life's Simple 7 and noncardiovascular disease: the Multi-Ethnic Study of Atherosclerosis. *J Am Heart Assoc*. 2016;5:e003954. DOI: 10.1161/JAHA.116.003954.
6. Thacker EL, Gillett SR, Wadley VG, Unverzagt FW, Judd SE, McClure LA, Howard VJ, Cushman M. The American Heart Association Life's Simple 7 and incident cognitive impairment: the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study. *J Am Heart Assoc*. 2014;3:e000635. DOI: 10.1161/JAHA.113.000635.
7. Kronish IM, Carson AP, Davidson KW, Muntner P, Safford MM. Depressive symptoms and cardiovascular health by the American Heart Association's definition in the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study. *PLoS One*. 2012;7:e52771. DOI: 10.1371/journal.pone.0052771.
8. Cranley J, MacRae CA. A new approach to an old problem: one brave idea. *Circ Res*. 2018;122:1172–1175. DOI: 10.1161/CIRCRESAHA.118.310941.
9. Labarthe D, Lloyd-Jones DM. 50x 50x 50: cardiovascular health and the cardiovascular disease endgame. *Circulation*. 2018;138:968–970. DOI: 10.1161/CIRCULATIONAHA.118.035985.
10. Shay CM, Ning H, Allen NB, Carnethon MR, Chiuve SE, Greenlund KJ, Daviglius ML, Lloyd-Jones DM. Status of cardiovascular health in US adults: prevalence estimates from the National Health and Nutrition Examination Surveys (NHANES) 2003–2008. *Circulation*. 2012;125:45–56. DOI: 10.1161/CIRCULATIONAHA.111.035733.
11. Ning H, Labarthe DR, Shay CM, Daniels SR, Hou L, Van Horn L, Lloyd-Jones DM. Status of cardiovascular health in US children up to 11 years of age: the National Health and Nutrition Examination Surveys 2003–2010. *Circ Cardiovasc Qual Outcomes*. 2015;8:164–171. DOI: 10.1161/CIRCOUTCOMES.114.001274.
12. Ramlakhan KP, Johnson MR, Roos-Hesselink JW. Pregnancy and cardiovascular disease. *Nat Rev Cardiol*. 2020;17:718–731. DOI: 10.1038/s41569-020-0390-z
13. Martin RM, Ben-Shlomo Y, Gunnell D, Elwood P, Yarnell JW, Smith GD. Breast feeding and cardiovascular disease risk factors, incidence, and mortality: the Caerphilly study. *J Epidemiol Community Health*. 2005;59:121–129. DOI: 10.1136/jech.2003.018952.
14. Rosano G, Vitale C, Marazzi G, Volterrani M. Menopause and cardiovascular disease: the evidence. *Climacteric*. 2007;10:19–24. DOI: 10.1080/13697130601114917.
15. Samuels-Kalow ME, Funai EF, Buhimschi C, Norwitz E, Perrin M, Calderon-Margalit R, Deutsch L, Paltiel O, Friedlander Y, Manor O, et al. Prepregnancy body mass index, hypertensive disorders of pregnancy, and long-term maternal mortality. *Am J Obstet Gynecol*. 2007;197:490. e491–490.e496. DOI: 10.1016/j.ajog.2007.04.043.
16. Poston L, Caleyachetty R, Cnattingius S, Corvalán C, Uauy R, Herring S, Gillman MW. Preconceptional and maternal obesity: epidemiology and health consequences. *Lancet Diabetes Endocrinol*. 2016;4:1025–1036. DOI: 10.1016/S2213-8587(16)30217-0.
17. Godfrey KM, Reynolds RM, Prescott SL, Nyirenda M, Jaddoe VW, Eriksson JG, Broekman BF. Influence of maternal obesity on the long-term health of offspring. *Lancet Diabetes Endocrinol*. 2017;5:53–64. DOI: 10.1016/S2213-8587(16)30107-3.
18. Chou H-H, Chiou M-J, Liang F-W, Chen L-H, Lu T-H, Li C-Y. Association of maternal chronic disease with risk of congenital heart disease in offspring. *CMAJ*. 2016;188:E438–E446. DOI: 10.1503/cmaj.160061.
19. Pool LR, Ning H, Lloyd-Jones DM, Allen NB. Trends in racial/ethnic disparities in cardiovascular health among US adults from 1999–2012. *J Am Heart Assoc*. 2017;6:e006027. DOI: 10.1161/JAHA.117.006027.
20. Gebreab SY, Davis SK, Symanzik J, Mensah GA, Gibbons GH, Diez-Roux AV. Geographic variations in cardiovascular health in the United States: contributions of state- and individual-level factors. *J Am Heart Assoc*. 2015;4:e001673. DOI: 10.1161/JAHA.114.001673.
21. Safford MM, Brown TM, Muntner PM, Durant RW, Glasser S, Halanynch JH, Shikany JM, Prineas RJ, Samdarshi T, Bittner VA, et al. Association of race and sex with risk of incident acute coronary heart disease events. *JAMA*. 2012;308:1768–1774. DOI: 10.1001/jama.2012.14306.
22. Kanchi R, Perlman SE, Chernov C, Wu W, Tabaei BP, Trinh-Shevrin C, Islam N, Seixas A, Rodriguez-Lopez J, Thorpe LE. Gender and race disparities in cardiovascular disease risk factors among New York City adults: New York City Health and Nutrition Examination Survey (NYC Hanes) 2013–2014. *J Urban Health*. 2018;95:801–812. DOI: 10.1007/s11524-018-0287-x.
23. Liu K, Daviglius ML, Loria CM, Colangelo LA, Spring B, Moller AC, Lloyd-Jones DM. Healthy lifestyle through young adulthood and the presence of low cardiovascular disease risk profile in middle age: the Coronary Artery Risk Development in (young) Adults (CARDIA) study. *Circulation*. 2012;125:996–1004. DOI: 10.1161/CIRCULATIONAHA.111.060681.
24. Folsom AR, Yatsuya H, Nettleton JA, Lutsey PL, Cushman M, Rosamond WD. Community prevalence of ideal cardiovascular health, by the aha definition, and relation to cardiovascular disease incidence. *J Am Coll Cardiol*. 2011;57:1690–1696. DOI: 10.1016/j.jacc.2010.11.041
25. Perak AM, Ning H, Khan SS, Van Horn LV, Grobman WA, Lloyd-Jones DM. Cardiovascular health among pregnant women, aged 20 to 44 years, in the United States. *J Am Heart Assoc*. 2020;9:e015123. DOI: 10.1161/JAHA.119.015123.
26. Britton LE, Berry DC, Hussey JM. Comorbid hypertension and diabetes among US women of reproductive age: prevalence and disparities. *J Diabetes Complications*. 2018;32:1148–1152. DOI: 10.1016/j.jdiacomp.2018.09.014.
27. Britton LE, Hussey JM, Crandell JL, Berry DC, Brooks JL, Bryant AG. Racial/ethnic disparities in diabetes diagnosis and glycemic control among women of reproductive age. *J Womens Health (Larchmt)*. 2018;27:1271–1277. DOI: 10.1089/jwh.2017.6845.
28. Anyalechi GE, Hong J, Kreisel K, Torrone E, Boulet S, Gorwitz R, Kirkcaldy RD, Bernstein K. Self-reported infertility and associated pelvic inflammatory disease among women of reproductive age—National Health and Nutrition Examination Survey, United States, 2013–2016. *Sex Transm Dis*. 2019;46:446–451. DOI: 10.1097/OLQ.0000000000000996.
29. Fang J, Yang Q, Hong Y, Loustalot F. Status of cardiovascular health among adult Americans in the 50 states and the District of Columbia, 2009. *J Am Heart Assoc*. 2012;1:e005371. DOI: 10.1161/JAHA.112.005371.
30. Rsatscan KK. Tools, classes, and methods for interfacing with rsatscan stand-alone software. 2015. Available at: <https://CRAN.R-project.org/package=rsatscan>. Accessed February 1, 2021
31. Howard G, Howard VJ. Twenty years of progress toward understanding the stroke belt. *Stroke*. 2020;51:742–750. DOI: 10.1161/STROKEAHA.119.024155.
32. Marcinkevage JA, Alverson C, Narayan KV, Kahn HS, Ruben J, Correa A. Race/ethnicity disparities in dysglycemia among us women of childbearing age found mainly in the nonoverweight/nonobese. *Diabetes Care*. 2013;36:3033–3039. DOI: 10.2337/dc12-2312.
33. Vahratian A. Prevalence of overweight and obesity among women of childbearing age: results from the 2002 National Survey of Family Growth. *Matern Child Health J*. 2009;13:268. DOI: 10.1007/s10995-008-0340-6.
34. Caleyachetty R, Echouffo-Tcheugui JB, Muennig P, Zhu W, Muntner P, Shimbo D. Association between cumulative social risk and ideal cardiovascular health in US adults: NHANES 1999–2006. *Int J Cardiol*. 2015;191:296–300. DOI: 10.1016/j.ijcard.2015.05.007.
35. Brown AF, Liang L-J, Vassar SD, Escarce JJ, Merkin SS, Cheng E, Richards A, Seeman T, Longstreth W Jr. Trends in racial/ethnic and nativity disparities in cardiovascular health among adults without prevalent cardiovascular disease in the United States, 1988 to 2014. *Ann Intern Med*. 2018;168:541. DOI: 10.7326/M17-0996.
36. Gebreab SY, Davis SK, Symanzik J, Mensah GA, Gibbons GH, Diez-Roux AV. Geographic variations in cardiovascular health in the United States: contributions of state- and individual-level factors. *J Am Heart Assoc*. 2015;4:e001673. DOI: 10.1161/JAHA.114.001673.

-
37. Pierannunzi C, Hu SS, Balluz L. A systematic review of publications assessing reliability and validity of the Behavioral Risk Factor Surveillance System (BRFSS), 2004–2011. *BMC Med Res Methodol*. 2013;13:1–14. DOI: 10.1186/1471-2288-13-49.
 38. Nelson DE, Powell-Griner E, Town M, Kovar MG. A comparison of national estimates from the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. *Am J Public Health*. 2003;93:1335–1341. DOI: 10.2105/AJPH.93.8.1335.
 39. Fahimi M, Link M, Mokdad A, Schwartz DA, Levy P. Peer reviewed: tracking chronic disease and risk behavior prevalence as survey participation declines: statistics from the Behavioral Risk Factor Surveillance System and other national surveys. *Prev Chronic Dis*. 2008;5:A80.
 40. Berry JD, Dyer A, Cai X, Garside DB, Ning H, Thomas A, Greenland P, Van Horn L, Tracy RP, Lloyd-Jones DM. Lifetime risks of cardiovascular disease. *N Engl J Med*. 2012;366:321–329. DOI: 10.1056/NEJMo a1012848.
 41. Mirel LB, Burt V, Curtin LR, Zhang C. Different approaches for non-response adjustments to statistical weights in the continuous NHANES (2003–04). Federal Committee on Statistical Methodology Research Conference. 2010.

SUPPLEMENTAL MATERIAL

Table S1. Definition of ideal CVH using BRFSS 2011-2019. (n=269,564).

CVH metrics	Criteria of ideal status based on survey questions
Blood pressure	No high blood pressure.
Glucose	No diabetes.
Total cholesterol	No high total cholesterol.
Smoking	Smoked < 100 cigarettes lifetime or smoked \geq 100 cigarettes but currently not smoking.
BMI	BMI between 18.5 and 25.0.
Physical activity	Sufficient activity to meet moderate or vigorous recommendations. *
Diet	\geq 5 servings of average daily fruits and vegetables consumption. **
Overall CVH	7 ideal metrics

BMI, body mass index; BRFSS, the Behavioral Risk Factor Surveillance System; CVH, cardiovascular health.

* Recommendations on moderate and vigorous activities: \geq 150 minutes of moderate activity, \geq 75 minutes of vigorous activity, or \geq 150 minutes of the combination of both activities per week.

** Fruits and vegetable consumption includes fruit juices, fruits, dark green vegetables, potatoes/beans, orange-colored vegetables, and other vegetables.

Table S2. Racial disparities in individual CVH metrics among women of childbearing age, BRFSS 2011-2019 (n=269,564).

Ideal status on individual CVH metrics		Odds ratio (95% CI) *		
		Unadjusted	Age-adjusted	Fully-adjusted **
Blood pressure	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	0.49 (0.47, 0.51)	0.45 (0.43, 0.48)	0.53 (0.51, 0.56)
	Hispanic	1.04 (0.98, 1.11)	0.94 (0.89, 1.00)	1.25 (1.18, 1.34)
	Other race/ethnicity	1.30 (1.20, 1.41)	1.20 (1.11, 1.31)	1.18 (1.09, 1.29)
Glucose	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	0.67 (0.63, 0.72)	0.64 (0.59, 0.68)	0.76 (0.70, 0.82)
	Hispanic	0.60 (0.56, 0.64)	0.54 (0.50, 0.57)	0.78 (0.72, 0.84)
	Other race/ethnicity	0.77 (0.69, 0.86)	0.70 (0.63, 0.79)	0.68 (0.61, 0.76)
Total cholesterol	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	1.07 (1.01, 1.14)	1.02 (0.96, 1.08)	1.17 (1.10, 1.24)
	Hispanic	0.97 (0.91, 1.02)	0.86 (0.81, 0.91)	1.02 (0.96, 1.09)
	Other race/ethnicity	1.16 (1.07, 1.27)	1.07 (0.98, 1.16)	1.05 (0.96, 1.14)
Smoking	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	1.32 (1.24, 1.39)	1.31 (1.23, 1.38)	2.23 (2.10, 2.38)
	Hispanic	2.35 (2.19, 2.53)	2.32 (2.15, 2.49)	4.61 (4.22, 5.04)
	Other race/ethnicity	1.86 (1.72, 2.01)	1.82 (1.68, 1.97)	1.78 (1.63, 1.94)
BMI	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	0.44 (0.42, 0.46)	0.42 (0.40, 0.45)	0.49 (0.46, 0.52)
	Hispanic	0.61 (0.58, 0.64)	0.58 (0.55, 0.61)	0.76 (0.72, 0.80)
	Other race/ethnicity	1.47 (1.38, 1.57)	1.42 (1.33, 1.51)	1.38 (1.29, 1.47)
Physical activity	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	0.65 (0.62, 0.68)	0.64 (0.61, 0.67)	0.70 (0.67, 0.73)
	Hispanic	0.77 (0.74, 0.80)	0.76 (0.73, 0.79)	0.91 (0.87, 0.95)
	Other race/ethnicity	0.87 (0.82, 0.93)	0.86 (0.81, 0.92)	0.86 (0.81, 0.92)
Diet	Non-Hispanic White	Reference	Reference	Reference
	Non-Hispanic Black	0.98 (0.93, 1.03)	0.98 (0.93, 1.03)	1.09 (1.03, 1.15)
	Hispanic	1.10 (1.05, 1.16)	1.11 (1.05, 1.17)	1.21 (1.14, 1.28)
	Other race/ethnicity	1.10 (1.02, 1.18)	1.11 (1.03, 1.19)	1.11 (1.03, 1.19)

BMI, body mass index; BRFSS, the Behavioral Risk Factor Surveillance System; CI, confidence interval; CVD, cardiovascular diseases; CVH, cardiovascular health.

* Weighted odds ratio with 95% CI.

** Models adjusted for age, education, income, marital status, history of CVD, pregnancy status and year.

Table S3. Age- and race-adjusted prevalence of ideal CVH among women of childbearing age, BRFSS 2011-2019. (n=269,564)

States	Ideal CVH					p-value**	Overall
	2011	2013	2015	2017	2019		
Alabama	1,010 4.58 (4.47, 4.69)	737 4.57 (4.44, 4.70)	890 4.49 (4.36, 4.61)	905 4.60 (4.48, 4.72)	915 4.47 (4.36, 4.59)	0.454	4,457 4.54 (4.49, 4.60)
Alaska	496 5.40 (5.29, 5.50)	648 5.33 (5.22, 5.44)	448 5.23 (5.08, 5.38)	374 5.42 (5.28, 5.56)	344 5.30 (5.08, 5.51)	0.334	2,310 5.33 (5.26, 5.40)
Arizona	677 4.96 (4.80, 5.11)	426 4.92 (4.73, 5.10)	729 4.89 (4.79, 5.00)	1,711 4.87 (4.81, 4.94)	904 4.86 (4.74, 4.98)	0.865	4,447 4.90 (4.84, 4.95)
Arkansas	453 4.89 (4.73, 5.06)	479 4.70 (4.54, 4.86)	421 4.90 (4.72, 5.07)	463 4.91 (4.74, 5.08)	459 4.74 (4.58, 4.90)	0.223	2,275 4.83 (4.75, 4.90)
California	2,467 4.78 (4.73, 4.84)	1,498 4.70 (4.62, 4.79)	1,689 4.72 (4.65, 4.78)	1,523 4.77 (4.70, 4.85)	1,750 4.77 (4.70, 4.84)	0.370	8,927 4.75 (4.72, 4.79)
Colorado	1,677 5.09 (5.03, 5.15)	1,645 5.05 (4.99, 5.11)	1,422 5.14 (5.07, 5.20)	1,199 5.09 (5.02, 5.15)	1,104 5.13 (5.06, 5.19)	0.380	7,047 5.10 (5.07, 5.13)
Connecticut	1,047 5.06 (4.96, 5.15)	972 4.92 (4.82, 5.03)	1,226 4.97 (4.88, 5.05)	1,181 4.96 (4.87, 5.05)	849 4.89 (4.80, 4.99)	0.149	5,275 4.96 (4.92, 5.00)
Delaware	672 4.67 (4.53, 4.81)	682 4.59 (4.45, 4.72)	398 4.72 (4.54, 4.89)	468 4.71 (4.55, 4.88)	448 4.76 (4.57, 4.94)	0.602	2,668 4.69 (4.62, 4.76)
District of Columbia	686 4.05 (3.90, 4.20)	654 4.21 (4.05, 4.37)	396 4.33 (4.12, 4.55)	613 4.38 (4.25, 4.51)	360 4.32 (4.16, 4.48)	0.017*	2,709 4.27 (4.20, 4.34)
Florida	1,326 4.55 (4.45, 4.66)	3,087 4.51 (4.41, 4.60)	818 4.55 (4.43, 4.68)	2,801 4.58 (4.47, 4.69)	1,711 4.53 (4.41, 4.65)	0.900	9,743 4.55 (4.50, 4.60)
Georgia	1,368 4.45 (4.34, 4.55)	1,117 4.28 (4.17, 4.40)	490 4.33 (4.17, 4.50)	801 4.24 (4.11, 4.37)	917 4.42 (4.27, 4.56)	0.102	4,693 4.34 (4.28, 4.40)
Hawaii	848 5.37 (5.29, 5.45)	956 5.38 (5.31, 5.45)	730 5.40 (5.34, 5.46)	1,034 5.39 (5.29, 5.48)	1,048 5.38 (5.30, 5.47)	0.982	4,616 5.38 (5.35, 5.42)
Idaho	695 5.33 (5.24, 5.42)	608 5.38 (5.32, 5.45)	594 5.37 (5.30, 5.44)	640 5.34 (5.25, 5.43)	631 5.35 (5.26, 5.44)	0.869	3,168 5.35 (5.31, 5.39)
Illinois	769 4.81 (4.69, 4.93)	721 4.75 (4.62, 4.88)	635 4.77 (4.65, 4.90)	780 4.77 (4.66, 4.89)	893 4.73 (4.62, 4.83)	0.887	3,798 4.77 (4.71, 4.82)
Indiana	982 5.17 (5.08, 5.25)	1,126 5.11 (5.04, 5.18)	553 5.14 (5.02, 5.26)	1,525 5.10 (5.03, 5.17)	968 5.12 (5.03, 5.20)	0.770	5,154 5.13 (5.05, 5.16)
Iowa	899 5.40 (5.35, 5.45)	912 5.39 (5.33, 5.46)	563 5.36 (5.28, 5.44)	958 5.40 (5.35, 5.46)	1,204 5.35 (5.30, 5.40)	0.564	4,536 5.38 (5.35, 5.41)
Kansas	2,490 5.23 (5.19, 5.28)	2,588 5.21 (5.16, 5.26)	2,228 5.19 (5.14, 5.25)	2,579 5.21 (5.15, 5.26)	1,385 5.20 (5.14, 5.26)	0.782	11,270 5.21 (5.18, 5.23)
Kentucky	1,356 5.23 (5.14, 5.32)	1,385 5.24 (5.15, 5.32)	953 5.25 (5.16, 5.35)	1,148 5.17 (5.06, 5.27)	668 5.21 (5.08, 5.33)	0.811	5,510 5.22 (5.17, 5.26)
Louisiana	1,453 4.50 (4.40, 4.61)	612 4.39 (4.22, 4.56)	494 4.41 (4.24, 4.57)	647 4.45 (4.31, 4.60)	705 4.40 (4.27, 4.53)	0.683	3,911 4.43 (4.37, 4.49)
Maine	1,691 5.47 (5.44, 5.49)	923 5.46 (5.41, 5.50)	932 5.48 (5.44, 5.52)	1,092 5.47 (5.41, 5.53)	954 5.55 (5.50, 5.59)	0.022*	5,592 5.49 (5.47, 5.51)
Maryland	1,665 4.46 (4.36, 4.57)	1,654 4.36 (4.25, 4.47)	1,222 4.39 (4.24, 4.55)	1,473 4.38 (4.27, 4.48)	1,762 4.34 (4.25, 4.44)	0.560	7,776 4.39 (4.34, 4.44)
Massachusetts	3,282 5.24 (5.20, 5.28)	2,023 5.19 (5.12, 5.26)	1,047 5.08 (5.00, 5.17)	835 5.17 (5.06, 5.29)	923 5.15 (5.07, 5.23)	0.017*	8,110 5.17 (5.13, 5.21)
Michigan	1,415 5.03 (4.94, 5.11)	1,563 4.98 (4.90, 5.06)	1,053 4.93 (4.83, 5.02)	1,371 4.99 (4.91, 5.08)	1,368 4.99 (4.91, 5.07)	0.681	6,770 4.99 (4.95, 5.02)
Minnesota	2,294 5.37 (5.33, 5.41)	1,917 5.31 (5.25, 5.37)	1,958 5.27 (5.21, 5.32)	2,264 5.31 (5.26, 5.36)	2,151 5.33 (5.28, 5.38)	0.056	10,584 5.32 (5.29, 5.34)
Mississippi	1,122 4.19 (4.08, 4.31)	855 4.18 (4.04, 4.32)	590 4.11 (3.95, 4.27)	578 4.20 (4.03, 4.36)	749 4.13 (4.00, 4.27)	0.902	3,894 4.16 (4.10, 4.23)
Missouri	751 5.12 (5.01, 5.23)	633 5.05 (4.91, 5.19)	728 5.13 (5.02, 5.23)	952 5.10 (5.00, 5.19)	878 5.02 (4.92, 5.12)	0.595	3,942 5.08 (5.03, 5.13)
Montana	1,090 5.51 (5.47, 5.54)	1,005 5.47 (5.43, 5.52)	540 5.46 (5.39, 5.53)	677 5.50 (5.45, 5.56)	743 5.55 (5.51, 5.59)	0.062	4,055 5.50 (5.48, 5.53)

Nebraska	3,085	1,930	1,834	1,946	1,879	0.530	10,674
	5.32 (5.28, 5.36)	5.27 (5.20, 5.33)	5.29 (5.23, 5.36)	5.26 (5.20, 5.33)	5.28 (5.22, 5.34)		5.28 (5.25, 5.31)
Nevada	701	625	315	454	389	0.818	2,484
	4.82 (4.67, 4.97)	4.75 (4.58, 4.92)	4.75 (4.55, 4.95)	4.82 (4.66, 4.97)	4.70 (4.54, 4.86)		4.77 (4.69, 4.84)
New Hampshire	869	779	658	579	517	0.946	3,402
	5.48 (5.44, 5.52)	5.47 (5.42, 5.52)	5.46 (5.42, 5.50)	5.47 (5.40, 5.54)	5.46 (5.39, 5.53)		5.47 (5.44, 5.49)
New Jersey	2,240	1,827	1,364	1,338	0	0.310	6,769
	4.78 (4.71, 4.86)	4.86 (4.78, 4.95)	4.77 (4.67, 4.87)	4.76 (4.65, 4.86)	0.00 (0.00, 0.00)		4.79 (4.74, 4.84)
New Mexico	1,132	1,002	632	750	691	0.921	4,207
	4.69 (4.61, 4.77)	4.64 (4.55, 4.74)	4.66 (4.53, 4.78)	4.69 (4.58, 4.80)	4.65 (4.54, 4.75)		4.67 (4.62, 4.71)
New York	1,124	1,281	1,443	1,676	1,580	0.783	7,104
	4.80 (4.70, 4.90)	4.76 (4.67, 4.86)	4.75 (4.66, 4.83)	4.81 (4.74, 4.89)	4.76 (4.68, 4.85)		4.78 (4.74, 4.82)
North Carolina	1,608	1,140	872	757	670	0.248	5,047
	4.76 (4.67, 4.86)	4.70 (4.60, 4.81)	4.66 (4.55, 4.77)	4.77 (4.65, 4.90)	4.61 (4.49, 4.74)		4.70 (4.65, 4.75)
North Dakota	619	794	439	670	504	0.529	3,026
	5.48 (5.43, 5.54)	5.43 (5.34, 5.51)	5.44 (5.35, 5.53)	5.47 (5.39, 5.54)	5.52 (5.44, 5.59)		5.47 (5.44, 5.51)
Ohio	1,213	1,412	1,042	1,400	1,313	0.918	6,380
	5.06 (4.97, 5.15)	5.04 (4.95, 5.13)	5.10 (4.99, 5.21)	5.09 (5.00, 5.17)	5.06 (4.96, 5.16)		5.07 (5.03, 5.11)
Oklahoma	1,061	957	671	766	665	0.623	4,120
	5.16 (5.09, 5.24)	5.15 (5.07, 5.23)	5.21 (5.12, 5.30)	5.16 (5.06, 5.25)	5.24 (5.14, 5.33)		5.18 (5.14, 5.22)
Oregon	669	560	480	690	829	0.380	3,228
	5.28 (5.19, 5.37)	5.28 (5.19, 5.37)	5.37 (5.29, 5.45)	5.30 (5.22, 5.37)	5.35 (5.29, 5.41)		5.32 (5.28, 5.35)
Pennsylvania	1,383	1,286	635	981	883	0.884	5,168
	5.08 (5.01, 5.16)	5.08 (5.00, 5.15)	5.02 (4.91, 5.14)	5.09 (5.00, 5.18)	5.10 (5.00, 5.19)		5.08 (5.03, 5.12)
Rhode Island	994	861	607	671	621	0.767	3,754
	5.17 (5.09, 5.25)	5.12 (5.04, 5.21)	5.12 (5.02, 5.22)	5.10 (4.99, 5.21)	5.17 (5.07, 5.26)		5.14 (5.09, 5.18)
South Carolina	1,669	1,214	1,263	1,232	723	0.254	6,101
	4.45 (4.34, 4.55)	4.51 (4.40, 4.61)	4.54 (4.44, 4.64)	4.58 (4.48, 4.68)	4.61 (4.48, 4.73)		4.54 (4.49, 4.59)
South Dakota	1,012	834	715	850	744	0.906	4,155
	5.49 (5.43, 5.55)	5.50 (5.45, 5.56)	5.50 (5.44, 5.56)	5.45 (5.36, 5.54)	5.50 (5.41, 5.59)		5.49 (5.45, 5.52)
Tennessee	704	690	600	822	810	0.785	3,626
	4.99 (4.84, 5.14)	4.93 (4.80, 5.05)	4.88 (4.74, 5.03)	4.88 (4.75, 5.01)	4.88 (4.76, 5.01)		4.91 (4.85, 4.97)
Texas	1,735	1,305	1,418	1,554	1,550	0.223	7,562
	4.61 (4.51, 4.72)	4.45 (4.34, 4.56)	4.48 (4.36, 4.61)	4.46 (4.34, 4.58)	4.50 (4.39, 4.61)		4.50 (4.45, 4.55)
Utah	1,897	1,829	1,553	1,744	1,936	0.065	8,959
	5.41 (5.37, 5.44)	5.34 (5.29, 5.39)	5.34 (5.30, 5.39)	5.38 (5.33, 5.43)	5.33 (5.28, 5.38)		5.36 (5.34, 5.38)
Vermont	916	748	690	753	630	0.693	3,737
	5.48 (5.45, 5.51)	5.48 (5.44, 5.52)	5.51 (5.47, 5.56)	5.47 (5.41, 5.53)	5.50 (5.44, 5.55)		5.49 (5.47, 5.51)
Virginia	892	1,147	1,089	1,289	1,245	0.255	5,662
	4.80 (4.68, 4.92)	4.80 (4.69, 4.90)	4.73 (4.62, 4.84)	4.83 (4.73, 4.93)	4.89 (4.80, 4.99)		4.81 (4.77, 4.86)
Washington	1,609	1,263	1,529	1,627	1,462	0.497	7,490
	5.33 (5.27, 5.39)	5.27 (5.20, 5.33)	5.32 (5.26, 5.38)	5.29 (5.23, 5.34)	5.28 (5.22, 5.33)		5.29 (5.27, 5.32)
West Virginia	721	769	733	698	615	0.575	3,536
	5.40 (5.34, 5.46)	5.39 (5.32, 5.46)	5.42 (5.37, 5.48)	5.45 (5.39, 5.51)	5.45 (5.38, 5.53)		5.42 (5.39, 5.45)
Wisconsin	653	743	677	739	509	0.899	3,321
	5.22 (5.11, 5.33)	5.21 (5.09, 5.32)	5.15 (5.03, 5.27)	5.19 (5.06, 5.32)	5.16 (5.04, 5.28)		5.19 (5.13, 5.24)
Wyoming	839	609	435	498	434	0.393	2,815
	5.44 (5.39, 5.49)	5.37 (5.31, 5.44)	5.36 (5.26, 5.46)	5.39 (5.33, 5.46)	5.39 (5.30, 5.48)		5.39 (5.35, 5.42)

CVH, cardiovascular health; CI, confidence interval.

* Number of participants and age- and race-adjusted and weighted prevalence of ideal CVH with 95% CI.

** P-values were calculated by survey-weighted groupwise comparisons.

Table S4. Age- and race-adjusted average CVH score among women of childbearing age, BRFSS 2011-2019. (n=269,564)

States	CVH score						Overall
	2011	2013	2015	2017	2019	p-value **	
Alabama	4.46 (4.43, 4.48)	4.45 (4.42, 4.48)	4.46 (4.43, 4.48)	4.52 (4.49, 4.55)	4.48 (4.45, 4.51)	0.003	4.48 (4.46, 4.49)
Alaska	4.59 (4.56, 4.62)	4.59 (4.56, 4.62)	4.59 (4.54, 4.63)	4.64 (4.59, 4.68)	4.64 (4.60, 4.69)	0.148	4.61 (4.59, 4.63)
Arizona	4.53 (4.50, 4.57)	4.53 (4.48, 4.57)	4.56 (4.53, 4.58)	4.58 (4.56, 4.59)	4.58 (4.55, 4.61)	0.034	4.56 (4.54, 4.57)
Arkansas	4.50 (4.46, 4.53)	4.46 (4.43, 4.50)	4.51 (4.47, 4.54)	4.53 (4.49, 4.57)	4.53 (4.50, 4.57)	0.038	4.51 (4.49, 4.52)
California	4.53 (4.51, 4.55)	4.54 (4.51, 4.56)	4.54 (4.52, 4.55)	4.58 (4.56, 4.60)	4.58 (4.56, 4.60)	<0.001	4.56 (4.55, 4.56)
Colorado	4.52 (4.50, 4.54)	4.54 (4.52, 4.56)	4.56 (4.54, 4.58)	4.59 (4.57, 4.61)	4.58 (4.57, 4.60)	<0.001	4.56 (4.55, 4.57)
Connecticut	4.53 (4.50, 4.56)	4.50 (4.48, 4.53)	4.53 (4.51, 4.55)	4.56 (4.54, 4.59)	4.57 (4.54, 4.59)	0.002	4.54 (4.53, 4.55)
Delaware	4.47 (4.44, 4.50)	4.46 (4.43, 4.49)	4.50 (4.46, 4.54)	4.53 (4.49, 4.57)	4.54 (4.49, 4.59)	0.010	4.50 (4.48, 4.52)
District of Columbia	4.44 (4.40, 4.47)	4.46 (4.42, 4.50)	4.49 (4.44, 4.53)	4.51 (4.48, 4.54)	4.52 (4.48, 4.55)	0.004	4.49 (4.47, 4.50)
Florida	4.47 (4.45, 4.49)	4.48 (4.46, 4.50)	4.49 (4.46, 4.52)	4.52 (4.50, 4.55)	4.51 (4.48, 4.54)	0.030	4.50 (4.48, 4.51)
Georgia	4.45 (4.43, 4.48)	4.42 (4.40, 4.45)	4.44 (4.41, 4.48)	4.46 (4.43, 4.49)	4.50 (4.46, 4.53)	0.018	4.46 (4.44, 4.47)
Hawaii	4.63 (4.61, 4.66)	4.65 (4.63, 4.67)	4.64 (4.62, 4.66)	4.68 (4.66, 4.70)	4.67 (4.65, 4.69)	0.012	4.66 (4.65, 4.67)
Idaho	4.55 (4.52, 4.58)	4.57 (4.55, 4.60)	4.57 (4.55, 4.59)	4.61 (4.59, 4.64)	4.62 (4.59, 4.64)	0.001	4.59 (4.58, 4.60)
Illinois	4.49 (4.47, 4.52)	4.49 (4.46, 4.51)	4.51 (4.48, 4.54)	4.54 (4.51, 4.57)	4.54 (4.51, 4.56)	0.009	4.52 (4.50, 4.53)
Indiana	4.53 (4.51, 4.55)	4.52 (4.50, 4.54)	4.53 (4.50, 4.56)	4.57 (4.55, 4.59)	4.58 (4.56, 4.60)	<0.001	4.55 (4.54, 4.56)
Iowa	4.55 (4.53, 4.57)	4.59 (4.57, 4.61)	4.57 (4.55, 4.60)	4.62 (4.60, 4.64)	4.61 (4.59, 4.63)	<0.001	4.59 (4.58, 4.60)
Kansas	4.54 (4.52, 4.55)	4.55 (4.54, 4.56)	4.55 (4.54, 4.57)	4.60 (4.59, 4.61)	4.60 (4.58, 4.62)	<0.001	4.57 (4.56, 4.58)
Kentucky	4.53 (4.51, 4.55)	4.55 (4.53, 4.57)	4.54 (4.52, 4.57)	4.57 (4.55, 4.60)	4.58 (4.55, 4.61)	0.034	4.56 (4.55, 4.57)
Louisiana	4.45 (4.42, 4.47)	4.42 (4.38, 4.46)	4.44 (4.41, 4.48)	4.49 (4.46, 4.52)	4.49 (4.46, 4.52)	0.007	4.46 (4.45, 4.47)
Maine	4.55 (4.53, 4.56)	4.56 (4.54, 4.57)	4.57 (4.55, 4.59)	4.61 (4.59, 4.63)	4.63 (4.61, 4.66)	<0.001	4.58 (4.57, 4.59)
Maryland	4.46 (4.43, 4.48)	4.43 (4.41, 4.46)	4.46 (4.42, 4.50)	4.49 (4.46, 4.51)	4.48 (4.46, 4.50)	0.030	4.47 (4.45, 4.48)
Massachusetts	4.56 (4.54, 4.57)	4.57 (4.55, 4.59)	4.55 (4.52, 4.57)	4.60 (4.56, 4.63)	4.62 (4.59, 4.64)	<0.001	4.58 (4.57, 4.59)
Michigan	4.52 (4.50, 4.54)	4.51 (4.49, 4.53)	4.52 (4.49, 4.54)	4.55 (4.53, 4.57)	4.58 (4.56, 4.60)	<0.001	4.54 (4.53, 4.55)
Minnesota	4.56 (4.54, 4.57)	4.55 (4.54, 4.57)	4.56 (4.54, 4.57)	4.61 (4.59, 4.62)	4.60 (4.59, 4.62)	<0.001	4.58 (4.57, 4.58)
Mississippi	4.40 (4.37, 4.42)	4.41 (4.38, 4.44)	4.41 (4.37, 4.44)	4.47 (4.43, 4.50)	4.44 (4.41, 4.48)	0.012	4.43 (4.41, 4.44)
Missouri	4.50 (4.47, 4.53)	4.51 (4.48, 4.54)	4.53 (4.51, 4.56)	4.58 (4.55, 4.60)	4.56 (4.54, 4.59)	<0.001	4.54 (4.53, 4.55)
Montana	4.58 (4.56, 4.60)	4.59 (4.57, 4.61)	4.60 (4.57, 4.62)	4.63 (4.61, 4.65)	4.64 (4.62, 4.65)	<0.001	4.61 (4.60, 4.62)
Nebraska	4.57 (4.55, 4.58)	4.57 (4.55, 4.58)	4.57 (4.55, 4.58)	4.61 (4.59, 4.63)	4.61 (4.59, 4.62)	<0.001	4.59 (4.58, 4.59)
Nevada	4.50 (4.47, 4.54)	4.51 (4.47, 4.55)	4.51 (4.46, 4.56)	4.55 (4.51, 4.59)	4.56 (4.52, 4.60)	0.146	4.53 (4.51, 4.55)
New Hampshire	4.56 (4.54, 4.58)	4.57 (4.55, 4.59)	4.58 (4.56, 4.60)	4.62 (4.59, 4.65)	4.61 (4.59, 4.64)	0.001	4.59 (4.58, 4.60)
New Jersey	4.50 (4.48, 4.52)	4.52 (4.50, 4.55)	4.53 (4.50, 4.56)	4.55 (4.53, 4.58)	0.00 (0.00, 0.00)	0.007	4.53 (4.51, 4.54)
New Mexico	4.50 (4.48, 4.52)	4.51 (4.48, 4.53)	4.52 (4.49, 4.55)	4.56 (4.53, 4.59)	4.56 (4.53, 4.58)	0.003	4.53 (4.52, 4.54)
New York	4.52 (4.49, 4.54)	4.51 (4.49, 4.53)	4.52 (4.50, 4.54)	4.56 (4.55, 4.58)	4.56 (4.54, 4.58)	<0.001	4.54 (4.53, 4.55)
North Carolina	4.48 (4.46, 4.50)	4.47 (4.45, 4.49)	4.47 (4.44, 4.49)	4.52 (4.49, 4.55)	4.52 (4.49, 4.55)	0.012	4.49 (4.48, 4.50)
North Dakota	4.60 (4.58, 4.63)	4.58 (4.56, 4.61)	4.59 (4.56, 4.62)	4.66 (4.64, 4.68)	4.66 (4.63, 4.69)	<0.001	4.62 (4.61, 4.64)
Ohio	4.50 (4.48, 4.52)	4.50 (4.48, 4.52)	4.53 (4.50, 4.55)	4.58 (4.56, 4.60)	4.57 (4.54, 4.59)	<0.001	4.54 (4.53, 4.55)
Oklahoma	4.55 (4.53, 4.57)	4.55 (4.52, 4.57)	4.57 (4.55, 4.60)	4.58 (4.56, 4.60)	4.61 (4.59, 4.64)	<0.001	4.57 (4.56, 4.59)
Oregon	4.53 (4.51, 4.55)	4.57 (4.54, 4.59)	4.58 (4.56, 4.61)	4.62 (4.60, 4.64)	4.61 (4.59, 4.63)	<0.001	4.58 (4.57, 4.60)
Pennsylvania	4.53 (4.51, 4.55)	4.53 (4.51, 4.55)	4.51 (4.48, 4.54)	4.58 (4.56, 4.61)	4.59 (4.57, 4.62)	<0.001	4.55 (4.54, 4.56)
Rhode Island	4.56 (4.53, 4.58)	4.55 (4.52, 4.57)	4.57 (4.54, 4.59)	4.60 (4.57, 4.63)	4.63 (4.60, 4.66)	<0.001	4.58 (4.57, 4.59)
South Carolina	4.43 (4.41, 4.45)	4.45 (4.42, 4.47)	4.45 (4.43, 4.48)	4.50 (4.48, 4.52)	4.51 (4.48, 4.53)	<0.001	4.47 (4.46, 4.48)
South Dakota	4.57 (4.55, 4.60)	4.60 (4.57, 4.62)	4.60 (4.58, 4.63)	4.63 (4.60, 4.66)	4.63 (4.60, 4.66)	0.035	4.61 (4.60, 4.62)
Tennessee	4.50 (4.46, 4.54)	4.53 (4.48, 4.56)	4.51 (4.48, 4.55)	4.55 (4.52, 4.58)	4.55 (4.52, 4.58)	0.213	4.53 (4.52, 4.54)
Texas	4.48 (4.45, 4.51)	4.47 (4.44, 4.50)	4.48 (4.45, 4.51)	4.52 (4.49, 4.55)	4.53 (4.50, 4.56)	0.007	4.50 (4.49, 4.51)
Utah	4.59 (4.58, 4.61)	4.58 (4.57, 4.60)	4.59 (4.58, 4.61)	4.64 (4.62, 4.65)	4.63 (4.61, 4.64)	<0.001	4.61 (4.60, 4.62)
Vermont	4.55 (4.53, 4.57)	4.56 (4.54, 4.59)	4.59 (4.57, 4.62)	4.63 (4.60, 4.66)	4.62 (4.60, 4.65)	<0.001	4.59 (4.58, 4.60)
Virginia	4.49 (4.46, 4.52)	4.49 (4.47, 4.52)	4.49 (4.47, 4.52)	4.54 (4.52, 4.57)	4.57 (4.54, 4.59)	<0.001	4.52 (4.51, 4.53)
Washington	4.56 (4.54, 4.57)	4.57 (4.56, 4.59)	4.58 (4.57, 4.60)	4.61 (4.59, 4.63)	4.61 (4.59, 4.62)	<0.001	4.59 (4.58, 4.60)
West Virginia	4.56 (4.54, 4.58)	4.58 (4.56, 4.60)	4.59 (4.57, 4.61)	4.61 (4.58, 4.63)	4.61 (4.59, 4.64)	0.011	4.59 (4.58, 4.60)
Wisconsin	4.53 (4.50, 4.56)	4.53 (4.50, 4.56)	4.54 (4.52, 4.57)	4.58 (4.54, 4.61)	4.58 (4.55, 4.61)	0.045	4.55 (4.54, 4.57)
Wyoming	4.58 (4.56, 4.60)	4.57 (4.55, 4.59)	4.58 (4.55, 4.61)	4.62 (4.59, 4.64)	4.63 (4.60, 4.65)	0.005	4.60 (4.59, 4.61)

CVH, cardiovascular health; CI: confidence interval.

* Age- and race-adjusted and weighted average CVH score with 95% CI.

** P-values were calculated by survey-weighted groupwise comparisons.

Table S5. Age- and race-adjusted prevalence of ideal status on CVH metrics among women of childbearing age, BRFSS 2011-2019. (n=269,564)

States	Prevalence of ideal status (95% CI)*						
	Blood pressure	Glucose	Total cholesterol	Smoking	BMI	Physical activity	Diet
Alabama	80.37 (80.02, 80.71)	91.35 (91.21, 91.50)	82.35 (82.08, 82.62)	82.93 (82.77, 83.10)	38.18 (37.79, 38.58)	50.85 (50.66, 51.04)	21.51 (21.42, 21.60)
Alaska	84.24 (83.78, 84.69)	91.60 (91.34, 91.86)	82.71 (82.27, 83.16)	83.74 (83.45, 84.03)	44.32 (43.66, 44.97)	52.44 (52.14, 52.74)	22.14 (22.00, 22.28)
Arizona	83.75 (83.42, 84.08)	90.70 (90.48, 90.93)	81.97 (81.62, 82.32)	85.27 (85.04, 85.51)	40.24 (39.77, 40.72)	51.43 (51.23, 51.64)	22.24 (22.15, 22.33)
Arkansas	81.52 (81.07, 81.98)	91.49 (91.29, 91.69)	81.99 (81.59, 82.39)	82.67 (82.44, 82.91)	39.77 (39.23, 40.30)	51.79 (51.53, 52.06)	21.59 (21.46, 21.72)
California	83.77 (83.57, 83.98)	89.91 (89.76, 90.05)	81.87 (81.65, 82.09)	86.91 (86.79, 87.03)	40.01 (39.69, 40.33)	50.53 (50.41, 50.65)	22.50 (22.44, 22.56)
Colorado	83.56 (83.37, 83.76)	91.32 (91.20, 91.44)	81.90 (81.69, 82.12)	83.64 (83.51, 83.78)	41.32 (41.05, 41.59)	52.46 (52.34, 52.57)	21.99 (21.93, 22.04)
Connecticut	82.65 (82.36, 82.94)	91.19 (91.03, 91.35)	81.79 (81.51, 82.08)	83.72 (83.54, 83.89)	40.76 (40.38, 41.13)	52.01 (51.85, 52.17)	21.78 (21.70, 21.86)
Delaware	81.16 (80.66, 81.67)	91.17 (90.94, 91.39)	82.16 (81.76, 82.55)	83.39 (83.17, 83.61)	39.40 (38.82, 39.98)	51.11 (50.85, 51.38)	21.61 (21.49, 21.74)
District of Columbia	80.87 (80.40, 81.34)	91.18 (90.97, 91.39)	83.70 (83.39, 84.02)	84.22 (83.98, 84.46)	37.13 (36.55, 37.70)	49.54 (49.28, 49.81)	21.90 (21.78, 22.03)
Florida	81.86 (81.53, 82.18)	90.52 (90.33, 90.70)	81.85 (81.56, 82.13)	84.81 (84.63, 84.99)	37.99 (37.59, 38.39)	50.57 (50.39, 50.75)	21.98 (21.91, 22.06)
Georgia	79.88 (79.48, 80.29)	90.88 (90.71, 91.06)	82.27 (81.98, 82.56)	83.83 (83.65, 84.02)	37.31 (36.86, 37.76)	49.99 (49.78, 50.20)	21.51 (21.41, 21.61)
Hawaii	84.86 (84.61, 85.11)	90.00 (89.83, 90.17)	82.26 (81.98, 82.53)	87.09 (86.94, 87.23)	47.32 (46.95, 47.68)	51.14 (50.98, 51.30)	23.09 (23.01, 23.17)
Idaho	84.05 (83.77, 84.33)	91.91 (91.72, 92.09)	82.08 (81.73, 82.43)	82.70 (82.49, 82.91)	42.89 (42.52, 43.26)	53.53 (53.37, 53.68)	21.76 (21.67, 21.85)
Illinois	82.15 (81.83, 82.46)	90.92 (90.75, 91.09)	81.78 (81.49, 82.07)	83.99 (83.80, 84.18)	39.47 (39.06, 39.88)	51.28 (51.10, 51.47)	21.91 (21.82, 22.00)
Indiana	82.71 (82.45, 82.96)	91.83 (91.71, 91.96)	81.97 (81.72, 82.22)	82.40 (82.27, 82.54)	41.53 (41.23, 41.82)	52.85 (52.71, 52.98)	21.59 (21.51, 21.66)
Iowa	83.88 (83.65, 84.11)	92.26 (92.14, 92.38)	82.26 (82.00, 82.52)	82.16 (82.01, 82.30)	43.39 (43.11, 43.68)	53.78 (53.67, 53.89)	21.55 (21.47, 21.62)
Kansas	83.43 (83.26, 83.60)	91.79 (91.70, 91.88)	82.15 (81.97, 82.32)	82.89 (82.78, 83.00)	42.21 (41.99, 42.43)	52.94 (52.85, 53.04)	21.75 (21.70, 21.80)
Kentucky	82.80 (82.52, 83.09)	92.03 (91.90, 92.16)	82.03 (81.75, 82.31)	81.92 (81.77, 82.06)	42.06 (41.72, 42.40)	53.20 (53.04, 53.36)	21.54 (21.46, 21.62)
Louisiana	79.95 (79.53, 80.37)	91.15 (90.98, 91.32)	82.33 (82.03, 82.63)	83.16 (82.97, 83.34)	37.55 (37.09, 38.02)	50.37 (50.15, 50.60)	21.54 (21.44, 21.64)
Maine	83.57 (83.34, 83.79)	92.24 (92.13, 92.36)	81.63 (81.36, 81.91)	81.57 (81.44, 81.70)	43.70 (43.45, 43.96)	54.08 (53.99, 54.17)	21.54 (21.46, 21.62)
Maryland	80.06 (79.71, 80.40)	90.78 (90.63, 90.93)	82.31 (82.07, 82.56)	84.00 (83.85, 84.16)	37.83 (37.42, 38.23)	49.98 (49.80, 50.15)	21.62 (21.53, 21.71)
Massachusetts	83.51 (83.24, 83.79)	91.72 (91.57, 91.86)	82.37 (82.11, 82.63)	83.31 (83.16, 83.46)	42.64 (42.30, 42.98)	52.70 (52.55, 52.84)	21.68 (21.60, 21.76)
Michigan	82.13 (81.86, 82.39)	91.66 (91.54, 91.78)	82.16 (81.94, 82.38)	82.74 (82.62, 82.86)	41.12 (40.81, 41.42)	52.31 (52.17, 52.45)	21.53 (21.46, 21.59)
Minnesota	83.40 (83.23, 83.58)	91.98 (91.89, 92.07)	82.09 (81.90, 82.27)	82.29 (82.19, 82.39)	43.09 (42.87, 43.30)	53.27 (53.17, 53.36)	21.71 (21.66, 21.76)
Mississippi	78.88 (78.44, 79.31)	91.06 (90.89, 91.23)	82.50 (82.19, 82.81)	83.21 (83.03, 83.39)	36.04 (35.56, 36.51)	49.64 (49.41, 49.87)	21.37 (21.25, 21.48)
Missouri	82.35 (82.01, 82.68)	91.79 (91.64, 91.94)	82.02 (81.72, 82.31)	82.38 (82.23, 82.53)	41.41 (41.03, 41.79)	52.65 (52.47, 52.82)	21.57 (21.49, 21.65)
Montana	84.22 (84.00, 84.45)	92.28 (92.16, 92.41)	82.36 (82.09, 82.64)	82.12 (81.97, 82.27)	44.32 (44.06, 44.58)	53.90 (53.79, 54.01)	21.71 (21.63, 21.79)
Nebraska	83.75 (83.55, 83.94)	92.05 (91.95, 92.15)	82.37 (82.17, 82.57)	82.58 (82.47, 82.70)	42.75 (42.51, 42.98)	53.34 (53.24, 53.45)	21.66 (21.60, 21.72)
Nevada	82.90 (82.42, 83.38)	90.19 (89.89, 90.49)	81.57 (81.12, 82.02)	85.51 (85.22, 85.79)	39.58 (38.92, 40.25)	50.99 (50.72, 51.26)	22.27 (22.15, 22.39)
New Hampshire	83.76 (83.49, 84.03)	92.24 (92.09, 92.39)	81.89 (81.56, 82.22)	81.71 (81.56, 81.87)	43.83 (43.52, 44.13)	54.01 (53.89, 54.12)	21.57 (21.48, 21.67)
New Jersey	82.34 (82.04, 82.64)	90.72 (90.55, 90.90)	81.80 (81.51, 82.09)	84.62 (84.44, 84.80)	40.15 (39.73, 40.57)	51.08 (50.91, 51.26)	21.95 (21.86, 22.05)
New Mexico	83.67 (83.38, 83.95)	89.62 (89.40, 89.84)	81.19 (80.86, 81.53)	86.99 (86.79, 87.19)	38.58 (38.15, 39.00)	50.47 (50.30, 50.64)	22.60 (22.52, 22.68)
New York	82.54 (82.28, 82.80)	90.94 (90.81, 91.08)	82.31 (82.08, 82.53)	84.54 (84.40, 84.68)	40.14 (39.79, 40.48)	51.19 (51.04, 51.34)	21.92 (21.84, 21.99)
North Carolina	80.99 (80.65, 81.34)	91.19 (91.04, 91.33)	82.00 (81.73, 82.26)	83.16 (83.01, 83.31)	39.13 (38.74, 39.51)	51.18 (51.00, 51.36)	21.65 (21.57, 21.73)
North Dakota	84.57 (84.28, 84.86)	92.51 (92.35, 92.66)	82.97 (82.65, 83.29)	82.43 (82.22, 82.63)	44.50 (44.14, 44.86)	53.82 (53.68, 53.97)	21.61 (21.51, 21.71)
Ohio	82.22 (81.92, 82.51)	91.80 (91.67, 91.93)	82.06 (81.82, 82.31)	82.26 (82.13, 82.39)	41.37 (41.03, 41.71)	52.60 (52.44, 52.75)	21.57 (21.50, 21.65)
Oklahoma	83.35 (83.08, 83.63)	91.42 (91.27, 91.57)	82.07 (81.79, 82.35)	83.54 (83.37, 83.72)	42.73 (42.37, 43.08)	52.42 (52.26, 52.58)	21.93 (21.85, 22.01)
Oregon	83.87 (83.61, 84.13)	91.71 (91.55, 91.88)	82.02 (81.72, 82.32)	83.04 (82.84, 83.25)	42.74 (42.41, 43.07)	53.17 (53.03, 53.31)	21.92 (21.84, 22.00)
Pennsylvania	82.77 (82.48, 83.06)	91.83 (91.68, 91.97)	82.24 (81.96, 82.52)	82.76 (82.60, 82.92)	41.54 (41.19, 41.88)	52.65 (52.49, 52.80)	21.56 (21.48, 21.64)
Rhode Island	83.83 (83.53, 84.14)	91.78 (91.60, 91.96)	82.51 (82.18, 82.84)	83.53 (83.32, 83.74)	42.09 (41.68, 42.50)	52.75 (52.58, 52.92)	21.69 (21.59, 21.79)
South Carolina	80.20 (79.88, 80.52)	91.21 (91.08, 91.34)	82.10 (81.86, 82.34)	82.95 (82.82, 83.09)	38.11 (37.76, 38.47)	50.81 (50.63, 50.98)	21.52 (21.44, 21.59)
South Dakota	84.20 (83.87, 84.52)	92.13 (91.95, 92.32)	82.32 (81.94, 82.70)	82.43 (82.22, 82.64)	44.44 (44.05, 44.84)	53.72 (53.55, 53.88)	21.72 (21.61, 21.83)
Tennessee	81.95 (81.55, 82.34)	91.83 (91.66, 92.00)	82.50 (82.18, 82.83)	82.56 (82.37, 82.75)	40.51 (40.05, 40.98)	52.07 (51.85, 52.29)	21.52 (21.42, 21.63)
Texas	82.34 (81.98, 82.70)	90.10 (89.90, 90.29)	81.70 (81.41, 82.00)	85.91 (85.73, 86.10)	37.46 (37.02, 37.89)	50.20 (50.01, 50.38)	22.24 (22.16, 22.31)
Utah	84.57 (84.41, 84.73)	92.10 (92.00, 92.21)	82.75 (82.56, 82.94)	82.93 (82.81, 83.05)	43.37 (43.14, 43.60)	53.56 (53.47, 53.66)	21.74 (21.69, 21.80)
Vermont	83.80 (83.52, 84.07)	92.38 (92.24, 92.52)	81.86 (81.53, 82.19)	81.69 (81.53, 81.84)	43.98 (43.68, 44.29)	54.20 (54.10, 54.30)	21.41 (21.32, 21.50)
Virginia	81.73 (81.41, 82.06)	91.25 (91.10, 91.41)	82.17 (81.91, 82.43)	83.50 (83.34, 83.67)	40.24 (39.85, 40.63)	51.47 (51.29, 51.64)	21.70 (21.63, 21.78)
Washington	83.76 (83.57, 83.96)	91.47 (91.35, 91.58)	82.00 (81.79, 82.21)	83.47 (83.34, 83.61)	43.33 (43.07, 43.59)	52.77 (52.66, 52.88)	21.98 (21.92, 22.04)
West Virginia	83.72 (83.47, 83.97)	92.43 (92.31, 92.56)	82.20 (81.91, 82.49)	81.63 (81.50, 81.77)	43.54 (43.26, 43.82)	54.02 (53.91, 54.13)	21.44 (21.35, 21.52)
Wisconsin	82.84 (82.46, 83.22)	91.81 (91.63, 91.99)	81.87 (81.52, 82.22)	82.31 (82.12, 82.50)	41.96 (41.51, 42.40)	52.98 (52.78, 53.19)	21.62 (21.53, 21.72)
Wyoming	84.19 (83.92, 84.47)	92.18 (92.01, 92.35)	82.38 (82.03, 82.72)	82.39 (82.18, 82.61)	43.18 (42.82, 43.53)	53.64 (53.49, 53.79)	21.74 (21.65, 21.84)

BMI, body mass index; BRFSS, the Behavioral Risk Factor Surveillance System; CVH, cardiovascular health; CI, confidence interval.

* Age- and race-adjusted and weighted prevalence with 95% CI.

Figure S1. Inclusion and exclusion criteria of study population.

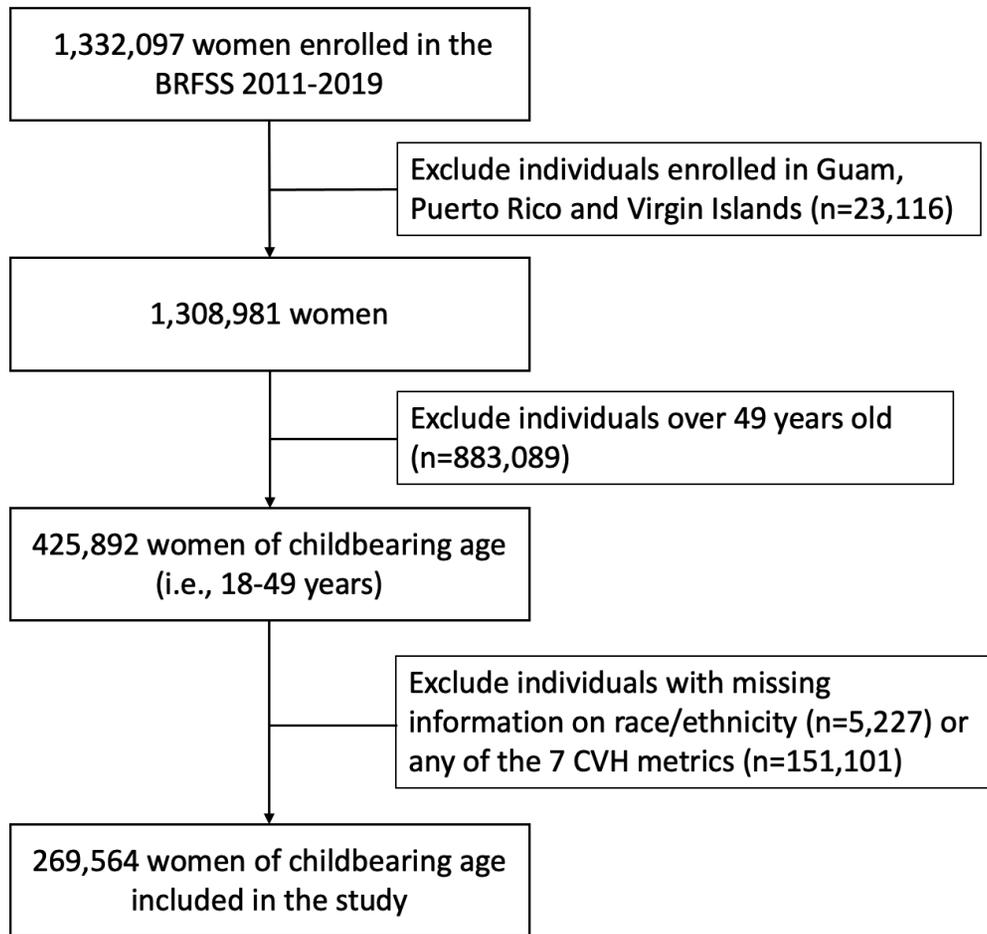


Figure S2. Geographic and temporal variations in age- and race-adjusted and weighted prevalence of ideal cardiovascular health (CVH) among women of childbearing age, BRFSS 2011-2019 (n=269,564).

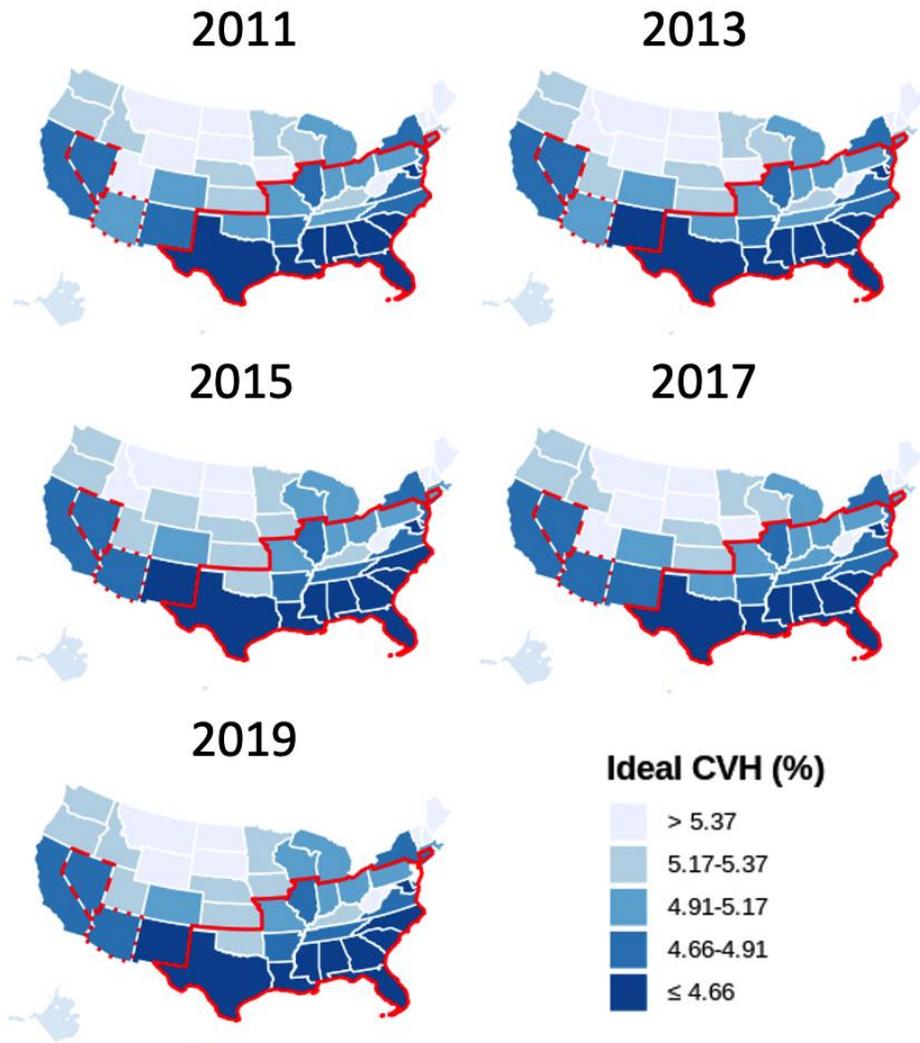


Figure S3. Geographic and temporal variations in age- and race-adjusted and weighted cardiovascular health (CVH) score among women of childbearing age, BRFSS 2011-2019 (n=269,564).

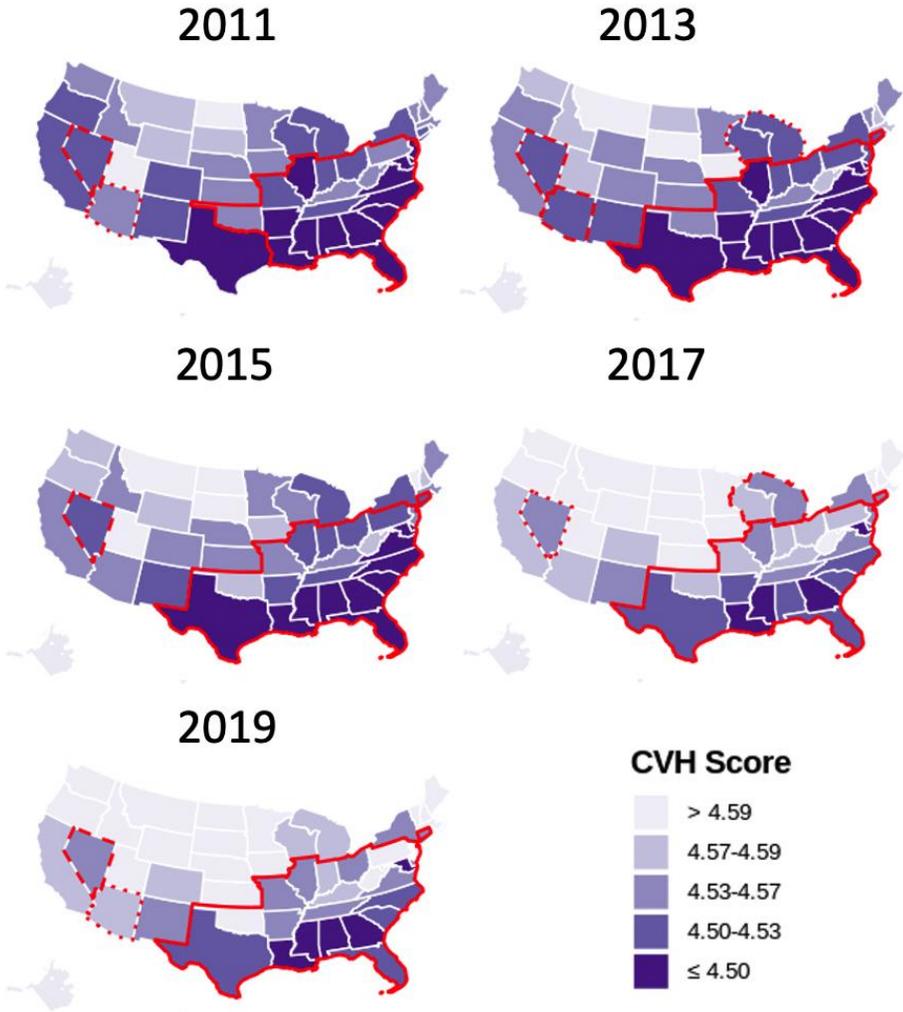


Figure S4. Geographic variations in prevalence of ideal status on each cardiovascular health (CVH) metric among women of childbearing age, BRFSS 2011-2019 (n=269,564).

