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Prevalence and Correlates of Undiagnosed Hypertension Among United States Adults: A Cross-Sectional Analysis of NHANES 2017–2018

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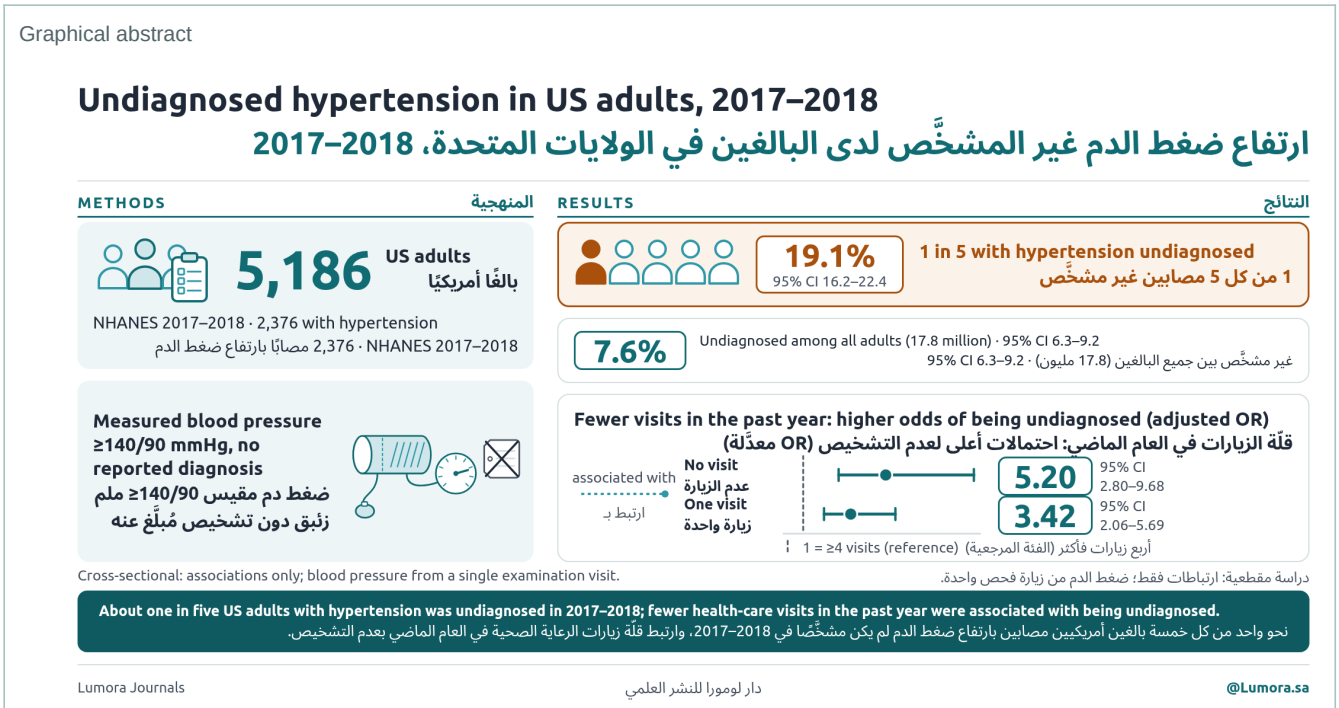
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Graphical abstract



Graphical abstract: About one in five US adults with hypertension was undiagnosed in 2017–2018; fewer health-care visits in the past year were associated with being undiagnosed. Designed by the Lumora Journals production team using hand-coded HTML/SVG rendered in Google Chrome.

Abstract

Background/Objectives: National estimates of undiagnosed hypertension that separate health-care contact from demographic characteristics are scarce for the last pre-pandemic period. We estimated its prevalence and correlates among US adults in 2017–2018.

Methods: Cross-sectional analysis of 5,186 examined, non-pregnant adults in the National Health and Nutrition Examination Survey 2017–2018. Undiagnosed hypertension was a mean measured blood pressure of at least 140 mmHg systolic or 90 mmHg diastolic without a reported diagnosis. Survey-weighted prevalence and logistic regression were used.

Results: Undiagnosed hypertension affected 7.6% (95% CI 6.3–9.2) of adults (17.8 million people) and 19.1% (95% CI 16.2–22.4) of adults with hypertension. Compared with four or more health-care visits in the past year, no visit (adjusted odds ratio 5.20 (95% CI 2.80–9.68)) and one visit (3.42 (95% CI 2.06–5.69)) were associated with being undiagnosed; insurance and a routine place for care were not once visit frequency was included. Obesity (0.43 (95% CI 0.26–0.71)) and diabetes (0.37 (95% CI 0.20–0.68)) were associated with lower odds. Under the lower 130 mmHg systolic or 80 mmHg diastolic threshold the prevalence was 19.4% (95% CI 17.8–21.1).

Conclusions: About one in thirteen US adults and one in five adults with hypertension were undiagnosed in 2017–2018; infrequent contact with health care was the strongest correlate.

Keywords: hypertension; undiagnosed diseases; awareness; NHANES; cross-sectional studies; health services accessibility; complex survey analysis

1. Introduction

Hypertension is the most prevalent modifiable risk factor for cardiovascular disease and premature death, and its management depends on a cascade in which the condition must first be detected, then treated and

finally controlled [1]. Surveillance based on measured blood pressure in the National Health and Nutrition Examination Survey (NHANES) has documented that the proportion of United States (US) adults with controlled hypertension rose from the late 1990s to the early 2010s and then declined, falling from 53.8% in 2013–2014 to 43.7% in 2017–2018 [2]. Decompositions of this reversal attribute part of it to a stalling of hypertension awareness after 2010, with the largest deficits among younger adults and adults with few contacts with the health-care system [3,4].

Adults who do not know that they have hypertension cannot be treated, and undiagnosed hypertension therefore represents the portion of the population burden that is invisible to clinical care. National Center for Health Statistics (NCHS) reports have described adults who were unaware of their hypertension in 2011–2014: 15.9% of adults with hypertension were unaware, and unawareness was more common among men, adults aged 18–39 years, adults without health insurance and adults with fewer health-care visits [5]. Analyses of electronic health records suggest that a substantial share of undiagnosed hypertension occurs among adults who already receive regular care, so that missed diagnosis, not only missed contact, contributes to the problem [6,7]. Among young adults, more frequent health-care visits explained a substantial part of the sex difference in awareness [8].

Several gaps remain. The most recent NCHS description of unawareness used pooled cycles from 2011–2014 and reported bivariate contrasts only [5]; the 2017–2018 prevalence report did not address awareness [9]; and cascade analyses that cover 2017–2018 pooled it with earlier cycles and treated awareness as a proportion of hypertensive adults without health-care-access covariates [2,3,10]. Modelled state-level estimates of undiagnosed hypertension were derived from 2011–2014 data and were designed for small-area estimation rather than for describing correlates [11]. The 2017–2018 cycle is the last complete NHANES cycle before the pandemic-related interruption of field operations and therefore constitutes the natural baseline against which post-2020 changes in detection can be judged [12].

We estimated survey-weighted prevalence of undiagnosed hypertension among all adults and among adults with hypertension in NHANES 2017–2018, examined associations with demographic, socioeconomic, clinical and health-care-access factors, and repeated the analyses using the 2017 ACC/AHA 130/80 mmHg threshold [1]. We hypothesised that undiagnosed hypertension would be more common among younger adults, men and people with less health-care contact.

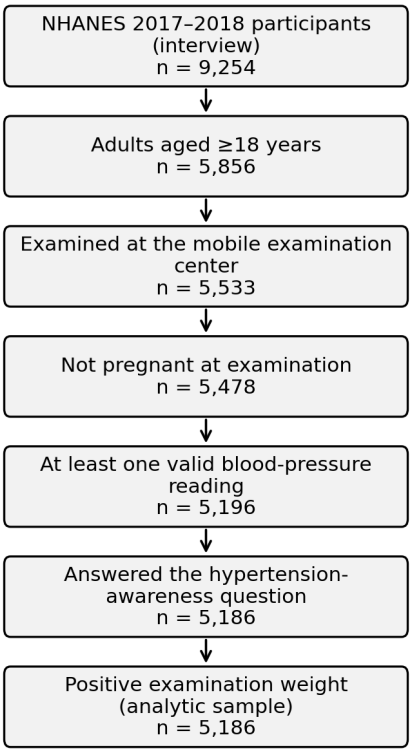
2. Materials and Methods

2.1. Study Design and Data Source

We conducted a cross-sectional analysis of the 2017–2018 cycle of NHANES, a continuous, nationally representative survey of the civilian non-institutionalised US population conducted by the NCHS [13]. NHANES uses a stratified, multistage probability design with oversampling of selected demographic groups; participants complete a household interview followed by a standardised examination in a mobile examination center [14]. The 2017–2018 examination sample was designed to represent the US population over the two-year period, and examination weights account for the unequal probabilities of selection, non-response and post-stratification to population totals [14]. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cross-sectional studies, and the primary and planned sensitivity analyses were specified in a statistical analysis plan before the primary analysis was run.

2.2. Participants

Participants were eligible if they were aged 18 years or older, were interviewed and examined, were not pregnant at the examination, had at least one valid seated systolic blood-pressure reading and answered the interview question on whether a doctor or other health professional had ever told them that they had hypertension. Pregnant women were excluded because gestational blood-pressure disorders have distinct definitions, in line with other NHANES analyses of cardiometabolic conditions [15]. Participants who refused or did not know the answer to the awareness question were excluded. The correlate analysis was restricted to adults with hypertension, defined below, who had complete data on all covariates. The numbers of participants at each stage are shown in Figure 1.



Abbreviations and symbols: NCHS, National Center for Health Statistics; NHANES, National Health and Nutrition Examination Survey; US, United States.

Figure 1. Selection of the analytic sample from NHANES 2017–2018.

NHANES, National Health and Nutrition Examination Survey. Counts are unweighted numbers of participants at each step.

2.3. Variables

Blood pressure was measured by trained physicians with a mercury sphygmomanometer after five minutes of seated rest, with three consecutive readings obtained on the right arm using a cuff selected according to arm circumference [16]. We used the mean of the available readings, treating readings recorded as zero as missing, consistent with contemporary measurement guidance [17]. Measured hypertension was defined as a mean systolic pressure of at least 140 mmHg or a mean diastolic pressure of at least 90 mmHg. Awareness was defined as an affirmative answer to the question on having been told of hypertension; current treatment as reporting having been told to take prescribed medication and currently taking it. Any hypertension was defined as measured hypertension, awareness or current antihypertensive medication. Undiagnosed hypertension, the primary outcome, was defined as measured hypertension without awareness; because medication use was only asked of adults who reported a diagnosis, undiagnosed

adults were by construction untreated. Diagnosed hypertension comprised all other adults with any hypertension. For the sensitivity analysis, the same definitions were applied with the 2017 ACC/AHA threshold of 130/80 mmHg [1].

Covariates were selected a priori using an assumed causal diagram (Figure S3). Age, sex, race or Hispanic origin, socioeconomic position, body-mass index, diabetes, smoking and health-care contact may jointly influence diagnosis and blood pressure. Age was grouped as 18–39, 40–59 and ≥60 years; race/Hispanic origin used six NCHS categories; education was less than high school, high school, some college or college graduate; income-to-poverty ratio was <1.30, 1.30–3.49 or ≥3.50; and body-mass index was <25, 25–29.9 or ≥30 kg/m². Health-care access comprised insurance, a routine place for care and visits in the past 12 months (0, 1, 2–3 or ≥4). Smoking was classified as never, former or current; diabetes was self-reported. Self-rated health was not modelled because it could follow diagnosis.

2.4. Statistical Analysis

All estimates used the two-year examination weights with the masked variance strata and primary sampling units, and standard errors were obtained by Taylor-series linearisation [14,18]. The primary estimand was the population prevalence of undiagnosed hypertension among all eligible adults, reported with a 95% confidence interval (CI) computed on the logit scale and back-transformed. Secondary estimands were the prevalence of any hypertension, the proportion undiagnosed among adults with hypertension (a domain estimate), and both quantities within categories of each covariate. Weighted counts of affected adults were obtained by summing the examination weights.

To identify characteristics independently associated with being undiagnosed, we fitted a survey-weighted logistic regression among adults with hypertension with undiagnosed versus diagnosed status as the outcome and all covariates entered simultaneously; the design was specified on the full sample so that variance estimation accounted for subpopulation membership. Odds ratios (OR) with 95% CI and p-values are reported; because the prevalence of the outcome among hypertensive adults exceeded 10%, odds ratios overstate prevalence ratios and are interpreted as measures of association only. Reference categories were age 18–39 years, women, non-Hispanic White, college graduate, income-to-poverty ratio 3.50 or above, body-mass index below 25 kg/m², insured, having a routine place for care, four or more visits, never smoker and no diabetes. Model diagnostics comprised convergence, the number of design degrees of freedom, the ratio of the largest to the smallest weight, pairwise associations among covariates (Cramér's V), a Hosmer–Lemeshow test and the area under the receiver operating characteristic curve.

Prespecified sensitivity analyses examined (i) a 130/80 mmHg threshold, (ii) prevalence among participants with three valid systolic readings, (iii) a model omitting income-to-poverty ratio to assess complete-case exclusions and (iv) an unweighted model. A survey-weighted Poisson model with a log link was added post hoc to estimate adjusted prevalence ratios for principal contrasts. Prevalence analyses used all eligible adults; adjusted models used complete cases. Missing-data counts are tabulated in Table S2. Descriptive subgroup comparisons were not multiplicity-adjusted. Python 3.11 (pandas 2.x, statsmodels and a design-based survey module) was used, with pivotal estimates recalculated in R 4.3 using survey [18] and an independent implementation.

2.5. Reporting and Ethics

The study is reported using STROBE guidance for cross-sectional studies [19] (Table S1). The original NHANES 2017–2018 data collection was approved by the National Center for Health Statistics Research

Ethics Review Board: continuation of protocol #2011-17 through 26 October 2017 and protocol #2018-01 effective 26 October 2017 (https://www.cdc.gov/nchs/nhanes/about/erb.html). NCHS obtained documented informed consent for NHANES participation. The present study analysed publicly available, de-identified survey data; it recruited no new participants and obtained no new consent.

3. Results

3.1. Participants

Of 9,254 NHANES 2017–2018 participants, 5,856 were adults aged 18 years or older, 5,533 were examined, 5,478 were not pregnant, 5,196 had at least one valid blood-pressure reading and 5,186 answered the awareness question and formed the analytic sample, representing 234.0 million adults (Figure 1). The weighted mean age was 47.6 (95% CI 46.3–48.9) years and the weighted mean systolic blood pressure was 123.5 (95% CI 122.5–124.5) mmHg. Any hypertension was present in 2,376 participants, a weighted prevalence of 39.8% (95% CI 36.2–43.6) corresponding to 93.2 million adults. Characteristics of adults with hypertension by diagnosis status are shown in Table 1: compared with diagnosed adults, undiagnosed adults had a similar mean age, a lower mean body-mass index, a higher mean systolic pressure, less often reported diabetes, and less often reported four or more health-care visits in the past year.

Table 1. Characteristics of US adults with hypertension by diagnosis status, NHANES 2017–2018.

Characteristic	Overall (n = 2,376)	Diagnosed (n = 1,927)	Undiagnosed (n = 449)
Age, years, mean (SD)	57.7 (15.3)	57.9 (15.3)	56.8 (15.4)
Sex, n (%)			
Women	1,169 (48.1)	964 (48.4)	205 (46.8)
Men	1,207 (51.9)	963 (51.6)	244 (53.2)
Race/Hispanic origin, n (%)			
Non-Hispanic White	860 (65.0)	709 (65.3)	151 (63.6)
Non-Hispanic Black	692 (13.7)	575 (14.1)	117 (12.2)
Non-Hispanic Asian	281 (5.1)	218 (4.9)	63 (5.7)
Mexican American	230 (5.8)	173 (5.0)	57 (9.2)
Other Hispanic	194 (5.7)	153 (5.5)	41 (6.2)
Other/multiracial	119 (4.8)	99 (5.1)	20 (3.2)
Education, n (%)			
Less than high school	492 (12.0)	384 (11.9)	108 (12.1)
High school or equivalent	590 (29.4)	477 (28.8)	113 (31.8)
Some college	772 (32.5)	645 (34.3)	127 (24.7)

Characteristic	Overall (n = 2,376)	Diagnosed (n = 1,927)	Undiagnosed (n = 449)
College graduate or above	502 (26.2)	405 (24.9)	97 (31.4)
Income-to-poverty ratio, n (%)			
<1.30	583 (19.5)	466 (18.9)	117 (21.9)
1.30–3.49	874 (37.8)	708 (38.8)	166 (33.4)
≥3.50	604 (42.7)	500 (42.3)	104 (44.6)
Body-mass index, kg/m², mean (SD)	31.7 (7.4)	32.0 (7.2)	30.3 (8.0)
Health insurance, n (%)			
Insured	2,132 (90.2)	1,743 (90.7)	389 (88.1)
Uninsured	240 (9.8)	180 (9.3)	60 (11.9)
Routine place for care, n (%)			
Yes	2,114 (88.4)	1,755 (89.5)	359 (83.4)
No	262 (11.6)	172 (10.5)	90 (16.6)
Visits in past year, n (%)			
No visits	225 (8.4)	126 (6.2)	99 (17.8)
1	283 (12.7)	191 (10.7)	92 (21.1)
2–3	733 (33.2)	593 (33.3)	140 (33.0)
≥4	1,129 (45.7)	1,012 (49.8)	117 (28.2)
Smoking status, n (%)			
Never	1,240 (52.0)	990 (50.8)	250 (57.4)
Former	728 (31.9)	607 (32.7)	121 (28.6)
Current	408 (16.1)	330 (16.5)	78 (14.0)
Diagnosed diabetes, n (%)			
No	1,778 (78.3)	1,378 (75.0)	400 (92.2)
Yes	597 (21.7)	549 (25.0)	48 (7.8)
Systolic blood pressure, mmHg, mean (SD)	136.0 (19.5)	133.2 (19.6)	148.0 (13.2)

Abbreviations and symbols: n, unweighted number of participants; US, United States; ≥, greater than or equal to.

Values are unweighted numbers with survey-weighted percentages, or survey-weighted means (SD). Hypertension defined as mean systolic ≥140 mmHg or diastolic ≥90 mmHg, a reported diagnosis, or current antihypertensive medication; undiagnosed = measured hypertension without diagnosis or medication. NHANES, National Health and Nutrition Examination Survey; SD, standard deviation.

3.2. Prevalence of Undiagnosed Hypertension

Undiagnosed hypertension was present in 449 participants, a weighted prevalence of 7.6% (95% CI 6.3–9.2) of all adults, corresponding to 17.8 million people. Among adults with hypertension, 19.1% (95% CI 16.2–22.4) were undiagnosed. Table 2 and Figure 2 show both quantities by subgroup. Among all adults, the prevalence rose with age, from 3.4% (95% CI 2.3–4.9) among adults aged 18–39 years to 9.2% (95% CI 6.5–12.8) among adults aged 40–59 years and 11.3% (95% CI 8.9–14.3) among adults aged 60 years or older, and was similar in men (8.3% (95% CI 6.4–10.6)) and women (7.0% (95% CI 5.4–9.1)), across race and Hispanic-origin groups, and across categories of education, income, insurance and routine place for care, with widely overlapping confidence intervals.

Table 2. Weighted prevalence of undiagnosed hypertension among all US adults and proportion undiagnosed among adults with hypertension, by subgroup, NHANES 2017–2018.

Characteristic	Category	Unweighted n	Prevalence among all adults, % (95% CI)	Undiagnosed among hypertensive adults, % (95% CI)
Age group	18–39	1,696	3.4% (95% CI 2.3–4.9)	20.9% (95% CI 14.9–28.5)
	40–59	1,573	9.2% (95% CI 6.5–12.8)	21.8% (95% CI 16.4–28.4)
	≥60	1,917	11.3% (95% CI 8.9–14.3)	16.6% (95% CI 12.9–21.0)
Sex	Women	2,645	7.0% (95% CI 5.4–9.1)	18.6% (95% CI 14.6–23.4)
	Men	2,541	8.3% (95% CI 6.4–10.6)	19.6% (95% CI 15.7–24.1)
Race/Hispanic origin	Non-Hispanic White	1,800	7.7% (95% CI 5.8–10.1)	18.7% (95% CI 14.7–23.4)
	Non-Hispanic Black	1,206	8.3% (95% CI 6.7–10.2)	17.0% (95% CI 13.5–21.3)
	Non-Hispanic Asian	735	7.6% (95% CI 5.3–10.6)	21.3% (95% CI 15.9–27.9)
	Mexican American	698	7.8% (95% CI 5.6–10.9)	30.2% (95% CI 23.9–37.4)
	Other Hispanic	469	7.0% (95% CI 5.1–9.6)	20.9% (95% CI 13.9–30.2)
	Other/multiracial	278	5.1% (95% CI 2.7–9.1)	13.0% (95% CI 8.2–19.8)
Education	Less than high school	955	8.8% (95% CI 7.1–10.7)	19.3% (95% CI 15.7–23.4)
	High school or equivalent	1,182	9.1% (95% CI 6.3–12.9)	20.7% (95% CI 15.0–27.9)

Characteristic	Category	Unweighted n	Prevalence among all adults, % (95% CI)	Undiagnosed among hypertensive adults, % (95% CI)
	Some college	1,597	6.3% (95% CI 4.7–8.5)	14.6% (95% CI 11.1–18.8)
	College graduate or above	1,193	7.9% (95% CI 5.7–11.0)	22.9% (95% CI 17.8–29.0)
Income-to-poverty ratio	<1.30	1,319	7.8% (95% CI 5.4–11.3)	20.9% (95% CI 15.2–28.0)
	1.30–3.49	1,852	6.8% (95% CI 5.7–8.3)	16.4% (95% CI 13.3–20.1)
	≥3.50	1,356	7.5% (95% CI 5.1–10.9)	19.4% (95% CI 14.6–25.2)
Body-mass index, kg/m²	<25	1,429	6.8% (95% CI 5.2–8.9)	30.3% (95% CI 24.8–36.4)
	25–29.9	1,615	8.1% (95% CI 6.0–10.7)	19.9% (95% CI 15.6–24.9)
	≥30	2,071	7.8% (95% CI 6.0–10.1)	15.4% (95% CI 12.4–19.0)
Health insurance	Insured	4,404	7.8% (95% CI 6.3–9.6)	18.7% (95% CI 15.4–22.4)
	Uninsured	767	6.7% (95% CI 4.1–10.7)	23.3% (95% CI 15.1–34.2)
Routine place for care	Yes	4,205	7.8% (95% CI 6.2–9.7)	18.0% (95% CI 14.7–21.9)
	No	980	6.8% (95% CI 5.1–9.0)	27.3% (95% CI 18.5–38.2)
Visits in past year	No visits	848	8.6% (95% CI 6.9–10.8)	40.2% (95% CI 32.2–48.9)
	1	901	8.9% (95% CI 6.1–13.0)	31.8% (95% CI 22.6–42.6)
	2–3	1,551	8.1% (95% CI 5.8–11.3)	19.0% (95% CI 14.0–25.2)
	≥4	1,874	6.0% (95% CI 4.4–8.3)	11.8% (95% CI 8.7–15.8)

Abbreviations and symbols: n, unweighted number of participants; NHANES, National Health and Nutrition Examination Survey; US, United States; ≥, greater than or equal to.

Survey-weighted estimates with Taylor-series 95% confidence intervals (logit-transformed for proportions). CI, confidence interval.

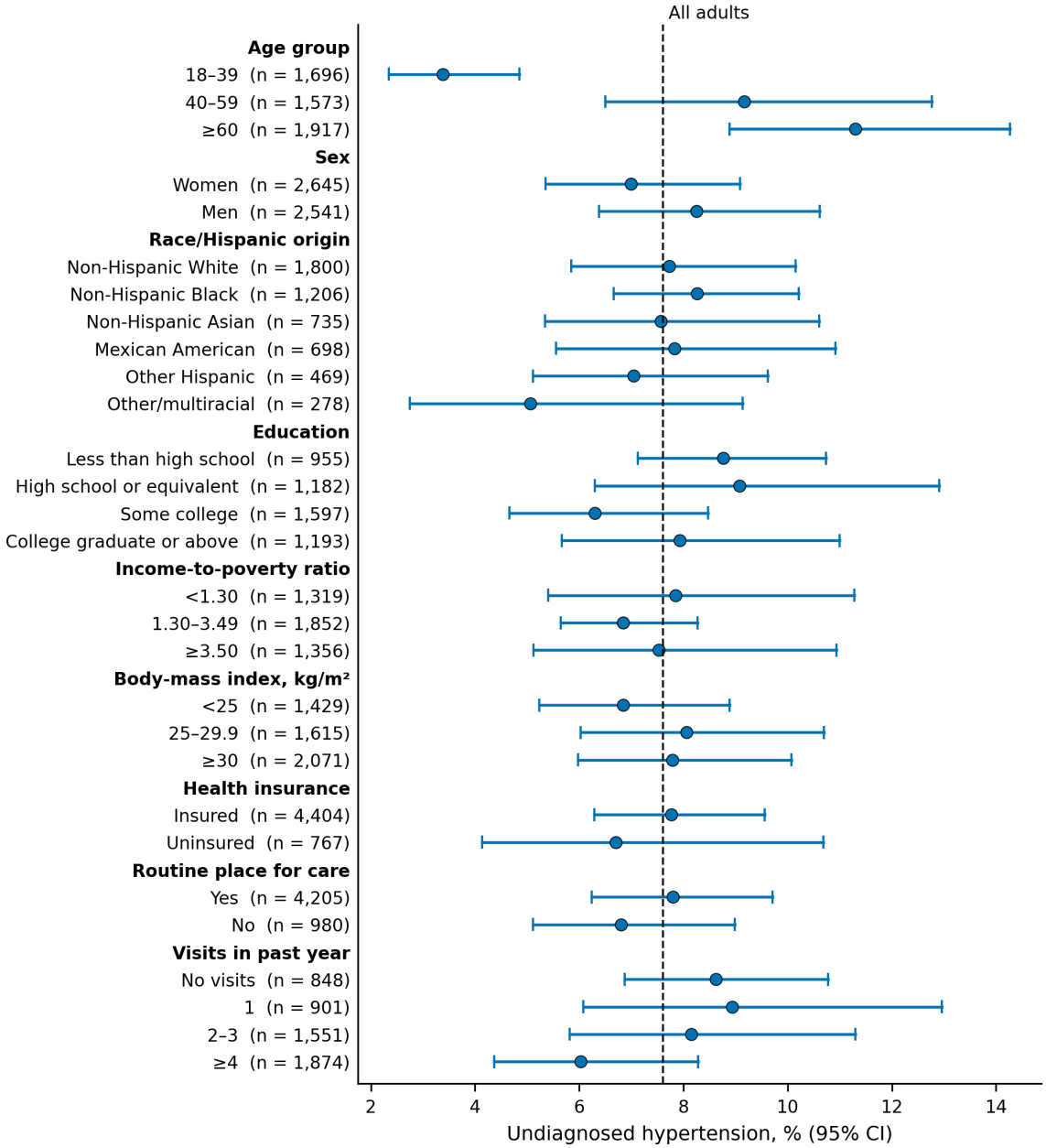


Figure 2. Weighted prevalence of undiagnosed hypertension among US adults by demographic, socioeconomic and health-care access characteristics, NHANES 2017–2018.

Points show survey-weighted prevalence (%) with 95% confidence intervals from Taylor-series linearisation; the dashed line marks the overall prevalence; undiagnosed hypertension defined as mean systolic ≥140 mmHg or diastolic ≥90 mmHg without a reported diagnosis and without antihypertensive medication.

Among hypertensive adults (Figure S2), 40.2% (95% CI 32.2–48.9) of those with no health-care visits and 31.8% (95% CI 22.6–42.6) of those with one visit were undiagnosed, versus 11.8% (95% CI 8.7–15.8) with ≥4 visits. The proportions were 27.3% (95% CI 18.5–38.2) without a routine place for care versus 18.0% (95% CI 14.7–21.9) with one; and 23.3% (95% CI 15.1–34.2) among uninsured adults versus 18.7% (95% CI 15.4–22.4) among insured adults, although confidence intervals overlapped. The proportion was 30.3% among adults with BMI <25 versus 15.4% with obesity, and 30.2% among Mexican American adults versus 18.7% among non-Hispanic White adults.

3.3. Correlates of Being Undiagnosed

The adjusted model included 2,001 hypertensive adults with complete covariate data; 15.8% of hypertensive adults were excluded for missing covariates, and the income-to-poverty ratio, missing for 13.3%, accounted for most exclusions. Adjusted odds ratios are shown in Table 3 and Figure 3. Frequency of health-care visits was the dominant independent correlate: compared with four or more visits in the past year, the adjusted odds of being undiagnosed were 5.20 (95% CI 2.80–9.68) ($p < 0.001$) for no visit, 3.42 (95% CI 2.06–5.69) ($p < 0.001$) for one visit and 1.53 (95% CI 0.96–2.45) ($p = 0.07$) for two or three visits. After adjustment for visit frequency, neither lacking insurance (OR 0.82 (95% CI 0.39–1.71), $p = 0.59$) nor lacking a routine place for care (OR 0.89 (95% CI 0.54–1.46), $p = 0.63$) was associated with being undiagnosed.

Table 3. Adjusted odds ratios for undiagnosed versus diagnosed hypertension among US adults with hypertension, NHANES 2017–2018.

Characteristic	Category	Adjusted OR (95% CI)	p-value
Age group	18–39	1.00 (reference)	
Age group	40–59	1.30 (95% CI 0.64–2.65)	p = 0.46
	≥60	1.02 (95% CI 0.64–1.64)	p = 0.93
Sex	Women	1.00 (reference)	
Sex	Men	1.05 (95% CI 0.73–1.51)	p = 0.80
Race/Hispanic origin	Non-Hispanic White	1.00 (reference)	
Race/Hispanic origin	Non-Hispanic Black	0.85 (95% CI 0.54–1.34)	p = 0.49
	Non-Hispanic Asian	0.76 (95% CI 0.41–1.42)	p = 0.39
	Mexican American	1.65 (95% CI 1.10–2.45)	p = 0.014
	Other Hispanic	0.96 (95% CI 0.52–1.78)	p = 0.90
	Other/multiracial	0.70 (95% CI 0.33–1.48)	p = 0.35
Education	College graduate or above	1.00 (reference)	
Education	Less than high school	0.75 (95% CI 0.51–1.10)	p = 0.14
	High school or equivalent	0.83 (95% CI 0.53–1.29)	p = 0.40
	Some college	0.58 (95% CI 0.37–0.89)	p = 0.013
Income-to-poverty ratio	≥3.50	1.00 (reference)	
Income-to-poverty ratio	<1.30	1.34 (95% CI 0.77–2.32)	p = 0.30
	1.30–3.49	0.92 (95% CI 0.57–1.48)	p = 0.73

Characteristic	Category	Adjusted OR (95% CI)	p-value
Body-mass index, kg/m²	<25	1.00 (reference)	
Body-mass index, kg/m²	25–29.9	0.57 (95% CI 0.39–0.84)	p = 0.004
	≥30	0.43 (95% CI 0.26–0.71)	p < 0.001
Health insurance	Insured	1.00 (reference)	
Health insurance	Uninsured	0.82 (95% CI 0.39–1.71)	p = 0.59
Routine place for care	Yes	1.00 (reference)	
Routine place for care	No	0.89 (95% CI 0.54–1.46)	p = 0.63
Visits in past year	≥4	1.00 (reference)	
Visits in past year	No visits	5.20 (95% CI 2.80–9.68)	p < 0.001
	1	3.42 (95% CI 2.06–5.69)	p < 0.001
	2–3	1.53 (95% CI 0.96–2.45)	p = 0.07
Smoking status	Never	1.00 (reference)	
Smoking status	Former	0.88 (95% CI 0.54–1.42)	p = 0.59
	Current	0.56 (95% CI 0.26–1.17)	p = 0.12
Diagnosed diabetes	No	1.00 (reference)	
Diagnosed diabetes	Yes	0.37 (95% CI 0.20–0.68)	p = 0.001

Abbreviations and symbols: n, unweighted number of participants; NHANES, National Health and Nutrition Examination Survey; p, p value; US, United States; ≥, greater than or equal to.

Survey-weighted logistic regression including all listed variables simultaneously (complete cases, n = 2,001). OR, odds ratio; CI, confidence interval.

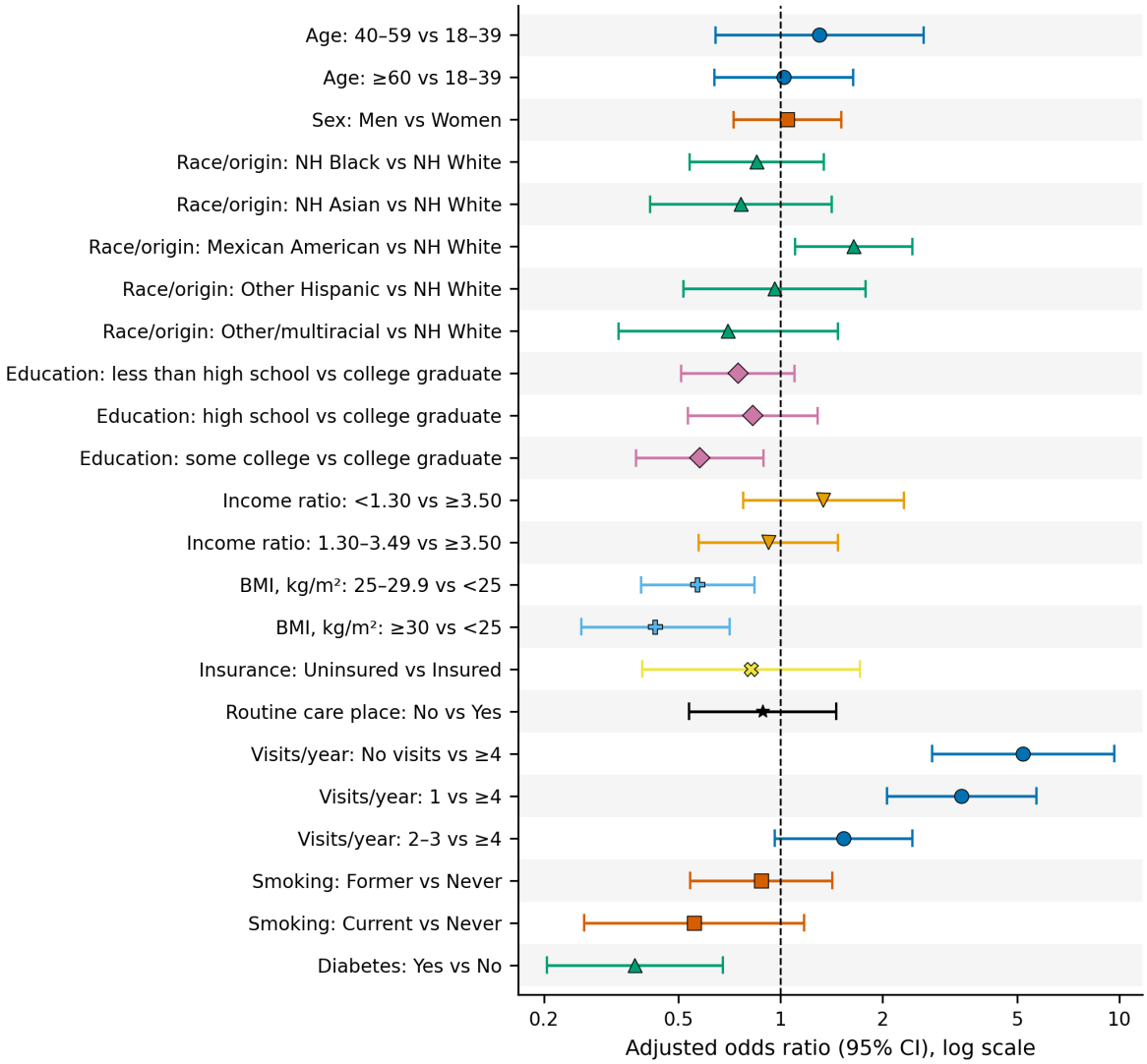


Figure 3. Adjusted odds ratios for being undiagnosed rather than diagnosed among US adults with hypertension, NHANES 2017–2018.

Survey-weighted logistic regression with design-based standard errors; reference categories: age 18–39 years, women, non-Hispanic White, college graduate, income-to-poverty ratio ≥3.50, body-mass index <25 kg/m², insured, routine place for care, ≥4 visits, never smoker, no diabetes. OR, odds ratio; CI, confidence interval.

Obesity (OR 0.43, 95% CI 0.26–0.71) and diagnosed diabetes (OR 0.37, 95% CI 0.20–0.68) were associated with lower odds of being undiagnosed, as was overweight (OR 0.57, 95% CI 0.39–0.84). Mexican American adults had higher odds than non-Hispanic White adults (OR 1.65, 95% CI 1.10–2.45); no other race/Hispanic-origin contrast reached conventional significance. Some college was associated with lower odds than college graduation (OR 0.58, 95% CI 0.37–0.89), but the isolated contrast may be due to chance. Age and sex were not independently associated with the outcome. The model converged; it had 15 design degrees of freedom and no single-PSU stratum. The largest pairwise Cramér's V was 0.48 (routine care versus visit frequency), the Hosmer–Lemeshow p-value was 0.77, and the ROC area was 0.72.

3.4. Sensitivity Analyses

Under the lower threshold of 130 mmHg systolic or 80 mmHg diastolic (Table 4), the prevalence of undiagnosed hypertension among all adults was 19.4% (95% CI 17.8–21.1), corresponding to 45.5 million adults. In the correlate model refitted with this definition, no visit in the past year remained strongly

associated with being undiagnosed (OR 4.33 (95% CI 2.89–6.49)), lacking insurance (OR 0.92 (95% CI 0.56–1.52)) and lacking a routine place for care (OR 0.91 (95% CI 0.64–1.28)) remained unassociated, and adults aged 60 years or older had lower odds of being undiagnosed than adults aged 18–39 years (OR 0.42 (95% CI 0.27–0.67), $p < 0.001$). Restricting the primary definition to participants with three valid systolic readings gave a prevalence of 6.5% (95% CI 5.3–8.0). Omitting the income-to-poverty ratio increased the model sample to 2,302 hypertensive adults and left the estimates for no visit (OR 5.54 (95% CI 2.76–11.08)), lacking insurance (OR 0.69 (95% CI 0.35–1.36)), lacking a routine place for care (OR 0.91 (95% CI 0.54–1.55)) and age 60 years or older (OR 1.07 (95% CI 0.69–1.64)) essentially unchanged. The unweighted model gave the same direction and a similar magnitude for no visit (OR 5.80 (95% CI 3.76–8.95)) and for lacking insurance (OR 0.69 (95% CI 0.45–1.06)). In the post hoc Poisson model, the adjusted prevalence ratios were 3.26 (95% CI 2.13–4.99) for no visit and 2.53 (95% CI 1.73–3.68) for one visit versus four or more, 0.54 (95% CI 0.37–0.78) for obesity, 0.43 (95% CI 0.25–0.73) for diagnosed diabetes and 1.39 (95% CI 1.05–1.83) for Mexican American versus non-Hispanic White adults, with lacking insurance (0.87 (95% CI 0.53–1.41)) and lacking a routine place for care (0.92 (95% CI 0.65–1.29)) again compatible with no association; as expected, the prevalence ratios were closer to the null than the corresponding odds ratios. The distribution of systolic blood pressure by diagnosis status is shown in Figure S1: undiagnosed adults clustered just above the systolic threshold of 140 mmHg, whereas diagnosed adults spanned a wider range that included controlled values.

Table 4. Sensitivity analyses.

Analysis	Estimate (95% CI)
Prevalence of undiagnosed hypertension, ≥130/80 mmHg threshold	19.4% (95% CI 17.8–21.1)
Prevalence restricted to three valid readings	6.5% (95% CI 5.3–8.0)
Adjusted OR, no routine place for care (130/80 definition)	0.91 (95% CI 0.64–1.28)
Adjusted OR, uninsured (130/80 definition)	0.92 (95% CI 0.56–1.52)
Adjusted OR, age ≥60 vs 18–39 (130/80 definition)	0.42 (95% CI 0.27–0.67)
Adjusted OR, no visits vs ≥4 (130/80 definition)	4.33 (95% CI 2.89–6.49)
Adjusted OR, no routine place for care (model omitting income)	0.91 (95% CI 0.54–1.55)
Adjusted OR, uninsured (model omitting income)	0.69 (95% CI 0.35–1.36)
Adjusted OR, age ≥60 vs 18–39 (model omitting income)	1.07 (95% CI 0.69–1.64)
Adjusted OR, no visits vs ≥4 (model omitting income)	5.54 (95% CI 2.76–11.08)
Adjusted OR, no routine place for care (unweighted model)	1.29 (95% CI 0.87–1.92)
Adjusted OR, uninsured (unweighted model)	0.69 (95% CI 0.45–1.06)
Adjusted OR, age ≥60 vs 18–39 (unweighted model)	1.28 (95% CI 0.84–1.95)
Adjusted OR, no visits vs ≥4 (unweighted model)	5.80 (95% CI 3.76–8.95)
Adjusted prevalence ratio, no visits vs ≥4 (Poisson model)	3.26 (95% CI 2.13–4.99)

Analysis	Estimate (95% CI)
Adjusted prevalence ratio, 1 visit vs ≥4 (Poisson model)	2.53 (95% CI 1.73–3.68)
Adjusted prevalence ratio, uninsured (Poisson model)	0.87 (95% CI 0.53–1.41)
Adjusted prevalence ratio, no routine place for care (Poisson model)	0.92 (95% CI 0.65–1.29)
Adjusted prevalence ratio, BMI ≥30 vs <25 (Poisson model)	0.54 (95% CI 0.37–0.78)
Adjusted prevalence ratio, diabetes (Poisson model)	0.43 (95% CI 0.25–0.73)
Adjusted prevalence ratio, Mexican American vs non-Hispanic White (Poisson model)	1.39 (95% CI 1.05–1.83)

Abbreviations and symbols: kg/m², kilograms per square metre; mmHg, millimetres of mercury; n, number of hypertensive adults in the stated regression model; NHANES, National Health and Nutrition Examination Survey; US, United States; <, less than; ≥, greater than or equal to.

Percentages are survey-weighted with 95% confidence intervals; odds ratios from logistic regression and prevalence ratios from survey-weighted Poisson regression (log link) adjusted for the Table 3 covariates; the 130/80 model includes n = 2,529 and the model omitting income-to-poverty ratio n = 2,302 hypertensive adults. BMI, body-mass index; OR, odds ratio; CI, confidence interval.

4. Discussion

In the last complete NHANES cycle before the pandemic, 7.6% of US adults, about 17.8 million people, had measured hypertension at or above 140/90 mmHg without a diagnosis, and roughly one in five adults with hypertension was undiagnosed. After adjustment for demographic, socioeconomic and clinical characteristics, the frequency of health-care visits in the past year was the strongest correlate of being undiagnosed, whereas insurance coverage and having a routine place for care were not independently associated once visit frequency was accounted for. Adults with obesity or diagnosed diabetes were less likely to be undiagnosed, and Mexican American adults were more likely to be undiagnosed than non-Hispanic White adults.

The 19.1% undiagnosed share is above the 15.9% estimated for 2011–2014 [5], although the two estimates use different definitions of hypertension and are not strictly comparable, and aligns with earlier declines in hypertension awareness and control [2–4]. Unlike earlier bivariate comparisons, the adjusted analysis found that insurance and a routine place for care were not independently associated with diagnosis once visit frequency was included. This pattern is consistent with studies of visit frequency and awareness [8], but access indicators and utilization are interrelated [20]. Prior health-system studies also found patients who received care without being diagnosed [6,7,23]. Here, one visit still corresponded to higher odds of undiagnosed hypertension than four or more visits, suggesting missed opportunities within existing care.

The inverse associations with obesity and diabetes may reflect closer clinical surveillance and more opportunities for blood-pressure detection. The higher adjusted odds among Mexican American adults are consistent with reports of awareness disparities [4,10,24–26], although this dataset cannot distinguish explanations involving language or care experiences. Age was not independently associated under the primary threshold, in contrast with earlier crude patterns [5,8]; under the 130/80 mmHg threshold, older adults were less likely to be undiagnosed. These patterns may arise partly from differences in care contact, comorbidity and the additional mild elevations captured by the lower threshold. None establishes a causal effect of visits or patient characteristics on diagnosis.

At 130/80 mmHg, undiagnosed prevalence increased to 19.4%, or approximately 45.5 million adults, consistent with the population impact of the 2017 guideline [21,22,28,29]. Many adults meeting this lower threshold may initially need lifestyle counselling rather than medication. The findings support expanding screening opportunities outside clinics while improving recognition and follow-up of elevated readings during existing visits [6,7].

This study has limitations. First, hypertension was defined from measurements at a single examination visit, whereas clinical diagnosis requires elevated readings on two or more occasions; single-visit prevalence overestimates sustained hypertension, and some undiagnosed adults would not have met clinical criteria on repeat measurement. The clustering of undiagnosed adults just above the threshold (Figure S1) is consistent with this. Second, awareness was self-reported; adults who had been told of hypertension in the past but had forgotten, or who understood the term differently, would be misclassified as undiagnosed, which would bias the prevalence upward and could attenuate the associations with health-care contact if forgetting is unrelated to visit frequency. Third, response rates in 2017–2018 were lower than in earlier cycles of the continuous survey [14]; the examination weights adjust for non-response, but residual selection related to both health-care use and blood pressure cannot be excluded. Fourth, the correlate model used complete cases and excluded about one in six hypertensive adults, mainly for missing income data; the sensitivity model omitting income reproduced the main estimates, but multiple imputation under the survey design was not performed. Fifth, the cross-sectional design supports associations only: visit frequency and diagnosis are measured at the same time, and diagnosis itself generates visits, so part of the association reflects reverse causation, which would exaggerate the estimated odds ratios for infrequent visits. Sixth, several subgroup estimates rest on fewer than fifty undiagnosed adults and are imprecise. Finally, odds ratios from a model in which the outcome is common overstate prevalence ratios and should not be read as relative risks; the post hoc Poisson model confirmed the same pattern with prevalence ratios closer to the null.

The strengths of the study include a nationally representative sample with standardised measured blood pressure, explicit prespecification of the estimands, covariates and sensitivity analyses, reporting of both the population prevalence and the proportion undiagnosed among hypertensive adults, and independent recomputation of every pivotal estimate. The estimates apply to the civilian non-institutionalised US adult population in 2017–2018; they do not describe institutionalised adults or the period after 2020, when the survey design and field operations changed [12]. The same definitions can be applied to the 2021–2023 cycle to quantify pandemic-era changes in detection.

5. Conclusions

In 2017–2018, about one in thirteen US adults and one in five adults with hypertension had undiagnosed hypertension under the 140/90 mmHg definition, and about one in five adults under the 130/80 mmHg definition. Infrequent contact with health care in the past year was the strongest independent correlate of remaining undiagnosed, whereas insurance coverage and a routine place for care were not associated once visit frequency was considered, and adults with obesity or diabetes were less likely to be undiagnosed. These associations point to both the absence of contact and missed opportunities within contact as targets for improving detection, and they provide a pre-pandemic baseline for monitoring hypertension awareness in later survey cycles.

Declarations

Supplementary Materials: Table S1, STROBE checklist with manuscript page locations; Table S2, missing-data counts among hypertensive adults; Table S3, adjusted model under the 130/80 mmHg definition; supplementary methods; Figures S1–S3 (blood-pressure distribution, subgroup proportions and the covariate-selection diagram). These files are provided as a separate supplementary document.

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Institutional Review Board Statement: The original NHANES 2017–2018 survey was approved by the National Center for Health Statistics Research Ethics Review Board (continuation of protocol #2011-17 through 26 October 2017; protocol #2018-01 effective 26 October 2017). This secondary analysis used public-use, de-identified data and involved no new participant recruitment or contact.

Informed Consent Statement: The National Center for Health Statistics obtained documented informed consent from NHANES participants for the original survey. No additional consent was sought from participants in this secondary analysis of public-use, de-identified data.

Data Availability Statement: The source data are publicly available in the 2017–2018 NHANES files from the National Center for Health Statistics (https://wwwn.cdc.gov/nchs/nhanes/continuousnhanes/default.aspx?BeginYear=2017). [Pending: code availability statement to be confirmed by the authors]

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Author contributions: [Pending: CRediT author contributions and confirmation that all authors approved the final version — to be supplied by the authors]

References

1. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension. 2018;71(6):e13–e115. doi:10.1161/HYP.0000000000000065.

2. Muntner P, Hardy ST, Fine LJ, Jaeger BC, Wozniak G, Levitan EB, et al. Trends in Blood Pressure Control Among US Adults With Hypertension, 1999-2000 to 2017-2018. JAMA. 2020;324(12):1190-200. doi:10.1001/jama.2020.14545.

3. Egan BM, Li J, Sutherland SE, Rakotz MK, Wozniak GD. Hypertension Control in the United States 2009 to 2018: Factors Underlying Falling Control Rates During 2015 to 2018 Across Age- and Race-Ethnicity Groups. Hypertension. 2021;78(3):578-87. doi:10.1161/HYPERTENSIONAHA.120.16418.

4. Foti K, Wang D, Appel LJ, Selvin E. Hypertension Awareness, Treatment, and Control in US Adults: Trends in the Hypertension Control Cascade by Population Subgroup (National Health and Nutrition Examination Survey, 1999-2016). Am J Epidemiol. 2019;188(12):2165-74. doi:10.1093/aje/kwz177.

5. Paulose-Ram R, Gu Q, Kit BK. Characteristics of U.S. adults with hypertension who are unaware of their hypertension, 2011–2014. NCHS Data Brief [Internet]. 2017 Apr [cited 2026 Nov 1];(278):1–8. Available from: https://www.cdc.gov/nchs/products/databriefs/db278.htm.

6. Wall HK, Hannan JA, Wright JS. Patients with undiagnosed hypertension: hiding in plain sight. JAMA. 2014;312(19):1973-4. doi:10.1001/jama.2014.15388.

7. Ciemins EL, Ritchey MD, Joshi VV, Loustalot F, Hannan J, Cuddeback JK. Application of a Tool to Identify Undiagnosed Hypertension - United States, 2016. MMWR Morb Mortal Wkly Rep. 2018;67(29):798-802. doi:10.15585/mmwr.mm6729a2.

8. Zhang Y, Moran AE. Trends in the Prevalence, Awareness, Treatment, and Control of Hypertension Among Young Adults in the United States, 1999 to 2014. Hypertension. 2017;70(4):736-42. doi:10.1161/HYPERTENSIONAHA.117.09801.

9. Ostchega Y, Fryar CD, Nwankwo T, Nguyen DT. Hypertension prevalence among adults aged 18 and over: United States, 2017–2018. NCHS Data Brief [Internet]. 2020 Apr [cited 2026 Nov 1];(364):1–8. Available from: https://www.cdc.gov/nchs/products/databriefs/db364.htm.

10. Aggarwal R, Chiu N, Wadhera RK, Moran AE, Raber I, Shen C, et al. Racial/Ethnic Disparities in Hypertension Prevalence, Awareness, Treatment, and Control in the United States, 2013 to 2018. Hypertension. 2021;78(6):1719-26. doi:10.1161/HYPERTENSIONAHA.121.17570.

11. Park S, Gillespie C, Baumgardner J, Yang Q, Valderrama AL, Fang J, et al. Modeled state-level estimates of hypertension prevalence and undiagnosed hypertension among US adults during 2013-2015. J Clin Hypertens (Greenwich). 2018;20(10):1395-410. doi:10.1111/jch.13388.

12. Tang R, An J, Bellows BK, Moran AE, Zhang Y. Trends in Hypertension Prevalence, Awareness, Treatment, and Control Among US Young Adults, 2003-2023. Am J Hypertens. 2025;38(8):551-9. doi:10.1093/ajh/hpaf044.

13. National Center for Health Statistics. NHANES 2017–2018: questionnaires, datasets, and related documentation [Internet]. Hyattsville (MD): Centers for Disease Control and Prevention; [cited 2026 Nov 1]. Available from: https://wwwn.cdc.gov/nchs/nhanes/continuousnhanes/default.aspx?BeginYear=2017.

14. Chen TC, Clark J, Riddles MK, Mohadjer LK, Fakhouri THI. National Health and Nutrition Examination Survey, 2015–2018: sample design and estimation procedures. Vital Health Stat 2. 2020 Apr;(184):1–35. PMID:33663649.

15. Wang L, Li X, Wang Z, Bancks MP, Carnethon MR, Greenland P, et al. Trends in Prevalence of Diabetes and Control of Risk Factors in Diabetes Among US Adults, 1999-2018. JAMA. 2021;326(8):704-16. doi:10.1001/jama.2021.9883.

16. National Center for Health Statistics. NHANES 2017–2018 data documentation, codebook, and frequencies: Blood Pressure (BPX_J) [Internet]. Hyattsville (MD): Centers for Disease Control and Prevention; 2020 Feb [cited 2026 Nov 1]. Available from: https://wwwn.cdc.gov/Nchs/Data/Nhanes/Public/2017/DataFiles/BPX_J.htm.

17. Muntner P, Shimbo D, Carey RM, Charleston JB, Gaillard T, Misra S, et al. Measurement of blood pressure in humans: a scientific statement from the American Heart Association. Hypertension. 2019;73(5):e35–e66. doi:10.1161/HYP.0000000000000087.

18. Lumley T. Analysis of complex survey samples. J Stat Softw. 2004;9(8):1-19. doi:10.18637/jss.v009.i08.

19. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet. 2007;370(9596):1453–1457. doi:10.1016/S0140-6736(07)61602-X.

20. Fang J, Yang Q, Ayala C, Loustalot F. Disparities in access to care among US adults with self-reported hypertension. Am J Hypertens. 2014;27(11):1377-86. doi:10.1093/ajh/hpu061.

21. Muntner P, Carey RM, Gidding S, Jones DW, Taler SJ, Wright JT, et al. Potential U.S. Population Impact of the 2017 ACC/AHA High Blood Pressure Guideline. J Am Coll Cardiol. 2018;71(2):109-18. doi:10.1016/j.jacc.2017.10.073.

22. Ritchey MD, Gillespie C, Wozniak G, Shay CM, Thompson-Paul AM, Loustalot F, et al. Potential need for expanded pharmacologic treatment and lifestyle modification services under the 2017 ACC/AHA Hypertension Guideline. J Clin Hypertens (Greenwich). 2018;20(10):1377-91. doi:10.1111/jch.13364.

23. Johnson HM, Thorpe CT, Bartels CM, Schumacher JR, Palta M, Pandhi N, et al. Undiagnosed hypertension among young adults with regular primary care use. J Hypertens. 2014;32(1):65-74. doi:10.1097/HJH.0000000000000008.

24. Gu A, Yue Y, Desai RP, Argulian E. Racial and Ethnic Differences in Antihypertensive Medication Use and Blood Pressure Control Among US Adults With Hypertension: The National Health and Nutrition Examination Survey, 2003 to 2012. Circ Cardiovasc Qual Outcomes. 2017;10(1):e003166. doi:10.1161/CIRCOUTCOMES.116.003166.

25. Ostchega Y, Zhang G, Hughes JP, Nwankwo T. Factors Associated With Hypertension Control in US Adults Using 2017 ACC/AHA Guidelines: National Health and Nutrition Examination Survey 1999-2016. Am J Hypertens. 2018;31(8):886-94. doi:10.1093/ajh/hpy047.

26. Zallman L, Himmelstein DH, Woolhandler S, Bor DH, Ayanian JZ, Wilper AP, et al. Undiagnosed and uncontrolled hypertension and hyperlipidemia among immigrants in the US. J Immigr Minor Health. 2013;15(5):858-65. doi:10.1007/s10903-012-9695-2.

27. Hardy ST, Chen L, Cherrington AL, Moise N, Jaeger BC, Foti K, et al. Racial and Ethnic Differences in Blood Pressure Among US Adults, 1999-2018. Hypertension. 2021;78(6):1730-41. doi:10.1161/HYPERTENSIONAHA.121.18086.

28. Dorans KS, Mills KT, Liu Y, He J. Trends in Prevalence and Control of Hypertension According to the 2017 American College of Cardiology/American Heart Association (ACC/AHA) Guideline. J Am Heart Assoc. 2018;7(11):e008888. doi:10.1161/JAHA.118.008888.

29. Chobufo MD, Gayam V, Soluny J, Rahman EU, Enoru S, Foryoung JB, et al. Prevalence and control rates of hypertension in the USA: 2017-2018. Int J Cardiol Hypertens. 2020;6:100044. doi:10.1016/j.ijchy.2020.100044.

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