The Effect of Race and Ethnicity on Antihypertensive Medication Utilization among Women in the United States: The Study of Women's Health Across the Nation (SWAN)

Running title: *Jackson et al.; Antihypertensive Medication Utilization among Women*

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Article Word Count: 4777

Abstract Word Count: 226

Journal Subject Terms: Hypertension; Health Services; Race and Ethnicity; Women; Epidemiology

Abstract

Background Antihypertensive medication use may vary by race and ethnicity. Longitudinal antihypertensive medication use patterns are not well described in women. **Methods and Results** Participants from the Study of Women's Health Across the Nation (SWAN), a prospective cohort of women (n=3302, ages 42-52), who reported a diagnosis of hypertension (HTN) or antihypertensive medications use at any annual visit were included. Antihypertensive medications were grouped by class and examined by race/ethnicity adjusting for potential confounders in logistic regression models. A total of 1707 (51.7%) women, mean age 50.6 years, reported HTN or used antihypertensive medications at baseline or during follow-up (mean 9.1 years). Compared to Whites, Blacks were almost three times as likely to receive a calcium channel blocker (CCB) (odds ratio [OR] 2.92; confidence interval [CI] 95%, 2.24-3.82) and twice as likely to receive a thiazide diuretic (THZD) (OR 2.38, 95% CI; 1.93-2.94). Blacks also had a

higher probability of reporting use of two or more antihypertensive medications (OR 1.95, 95% CI; 1.55-2.45) compared to Whites. Use of angiotensin converting enzyme inhibitors (ACEi)/angiotensin receptor blockers (ARB) and THZDs increased over time for all racial/ethnic groups. Contrary to our hypothesis, rates of beta blocker usage did not decrease over time.

Conclusions Among this large cohort of multiethnic midlife women, use of antihypertensive medications increased over time, with ACEi/ARBs becoming the most commonly used antihypertensive medication, even for Blacks. THZDs utilization increased over time for all race/ethnic groups as did use of CCBs among Blacks; both patterns are in line with guideline recommendations for the management of HTN.

Key words: women, hypertension, medication, race/ethnicity, disparities

Introduction

An estimated 76 million adults have hypertension (HTN); which translates into 1 out of 3 adults.[1] After age 55, women have equal or greater prevalence of HTN compared to men.[2] Life expectancy for women with HTN is on average 4.9 years shorter than women with normal blood pressure (BP) at the age of 50.[3] The prevalence of HTN among Black women in the United States (US) is one of the highest in the world at over 40%.[1] Furthermore, Blacks develop HTN at younger ages than other racial/ethnic groups and are at higher risk for adverse outcomes including stroke and renal failure.[4, 5]

Effective management of HTN results in reduction of cardiovascular events including stroke and heart disease.[6-8] In 2002, the Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack Trial (ALLHAT), a randomized, double-blind, multicenter trial, compared four classes of antihypertensive medications; angiotensin-converting enzyme-inhibitors [ACEi]: represented by Lisinopril; calcium channel blockers [CCB], represented by Amlodipine, alpha-blockers, represented by Doxazosin, and thiazide diuretics [THZD]: represented by Chlorthalidone.[8] The Doxazosin arm was terminated early due to increased risk for stroke, combined cardiovascular disease (CVD) and heart failure (HF) compared to Chlorthalidone.[9] Among both Blacks and non-Blacks, compared to Lisinopril, Chlorthalidone was associated with significantly lower rates of HF, combined CHD and combined CVD. In addition, for Blacks chlorthalidone was

associated with significantly lower rates of stroke. Compared to Amlodipine, Chlorthalidone was associated with significantly lower risk for HF, in both Blacks and non-Blacks.[8] The ALLHAT investigators recommended THZDs as first-step therapy for HTN given equivalency between the treatment groups for the primary outcome and the superiority of Chlorthalidone compared to Amlodipine for HF, and compared to Lisinopril for combined cardiovascular disease (CVD), stroke, and HF, in addition to the lower expense of Chlorthalidone compared to the Lisinopril or Amlodipine.[8]

In the following year, the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) recommended use of THZD diuretics as initial pharmacologic therapy for HTN management.[10] More recently, the 2014 Evidence-Based Guidelines for the Management of High Blood Pressure in Adults recommended initiation of THZDs, or ACEi/ARB or CCB, alone or in combination for non-Black patients with HTN.[11] For Blacks with HTN, the writing committee recommended THZDs or CCBs, alone or in combination.

To date, little is known about patterns of antihypertensive medication utilization among midlife women, particularly variations by race/ethnicity. We sought to describe patterns of antihypertensive medication classes among women by race/ethnicity, over time using data from the Study of Women's Health Across the Nation (SWAN), a prospective cohort study of women transitioning through menopause. We hypothesize that THZDs would increase over time with a greater increase around the time of ALLHAT and JNC VII publication, and that among Blacks both THZDs and CCBs would increase in use while ACEi/ARB would decline. We also hypothesized that use of beta blockers (BBs) would decline for all women irrespective of race or ethnicity.

Methods

Study Population

SWAN is an ongoing community-based longitudinal study with seven clinical sites. The overall aim of SWAN is to examine a wide variety of health-related characteristics among women transitioning through menopause. The full study design and procedures, including recruitment and enrollment, have been described in detail elsewhere.[12, 13] Between November 1995 and October 1997, 3,302 women were enrolled from seven

geographically distinct sites across the United States. Sites used various sampling frameworks and recruitment strategies to enroll representative groups of women from the surrounding communities. All sites enrolled non-Hispanic Whites in addition to a specific minority racial/ethnic group. For the Boston, MA, Chicago, IL, Pittsburgh, PA and Detroit, MI sites, Black women were enrolled, while Chinese and Hispanic and Japanese women were enrolled at the Oakland, CA, Hudson County, NJ, and Los Angeles, CA, sites respectively. Eligibility requirements for SWAN included, age between 42 and 52 years upon entry, menses within the three months prior to enrollment and women must still possess their uterus and at least one ovary at time of enrollment. Of note, women who had their uterus and/or ovaries removed after enrollment were not excluded, but defined as menopausal status unknown. Women who reported taking oral contraceptives or hormonal therapy in the prior three months to a screening visit were also excluded from enrollment. Each participant read and signed an informed consent document, and all methods used in SWAN were approved by the Institutional Review Boards at each study site.

For our analysis, we included women who were classified as having HTN at any visit from the date of enrollment through visit 12 (January 1996 to April 2013). A woman was considered to have HTN if she reported use of one or more medications to control BP and/or reported that her health care provider told her she had HTN. Women with a diagnosis of coronary artery disease or cardiovascular disease (CVD) at baseline were excluded (n=72) as they may use antihypertensive medications without a prior diagnosis of HTN. Of the 3302 women in SWAN, 1523 women without HTN, and 72 with a diagnosis of CVD at baseline were excluded from this analysis. A total of 1707 participants who reported use of antihypertensives and/or reported that their provider told them they had HTN, were included in the current analysis. Of these, 126 women were on antihypertensive medications but did not report HTN, and 250 women reported HTN without being on antihypertensive medications. (Figure 1).

Use of Antihypertensive Medications

The primary aim of this study was to examine antihypertensive medication utilization patterns over time by medication class for each of the racial/ethnic groups enrolled in

SWAN. Each participant was asked at each annual visit if she has been told by a health care provider that she has high BP or a diagnosis of HTN since her last study visit. Participants also report on the use of all medications in the last 30 days in the context of a detailed medication inventory and review by a trained study interviewer at each annual visit.

Antihypertensive drugs were grouped by class and included the following ACEi/ARBs, BBs, CCBs, THZDs, alpha-blockers, loop diuretics, potassium sparing diuretic. If a woman reported using 2 or more antihypertensives we counted these separately. For the multivariate models, use of 2 or more antihypertensives were catagorized a combination. We examined prevalence of antihypertensive medication use over time. SWAN did not collect data on specific doses for the majority of visits; therefore dose was not considered in this analysis.

Other Measures

Information on demographic characteristics was collected at the baseline SWAN visit and included age at entry, race/ethnicity, socioeconomic characteristics (highest education level attained, income, occupation), calendar year, and SWAN site. Information on medical history was assessed by self-report at baseline and each subsequent annual visit, and included newly diagnosed CVD, diabetes and renal disease. Participants were free of known CVD (prior myocardial infarction, stroke, revascularization, angina) at baseline; these outcomes were assessed at each annual visit. Income was included in models as a categorical variable (< 20K, 20 to <50K, 50 to <100K, 100 to <150K and 150K+). Information on a number of additional risk factors for HTN was collected at baseline and during follow-up, including BMI (kg/m^2), and smoking status.

Menopausal status was defined as pre, early peri, late peri and post menopausal according to predefined definitions.[12, 13] Premenopausal status was defined as a menstrual period within the past three months with no change in regularity. Early perimenopause was defined as a menses within the past 3 months with a change in regularity. For these analyses, premenopausal and early perimenopausal were combined. Late perimenopause was defined as no menses for 3 or more months but at

least one period within the last 12 months. Postmenopause was defined as no menses for 12 or more consecutive months with no other reason for the amenorrhea. Menopausal status was categorized as unknown if a woman had used hormonal therapy, had a hysterectomy, or had bilateral salpingo oophorectomy prior to becoming post-menopausal. Menopausal status was added to models as a time-varying covariate. Race/ethnicity and menopausal status were examined separately as independent variables.

Statistical Analysis

We described the baseline participant characteristics in each ethnic group using descriptive statistics (mean, median and range). Continuous variables were analyzed using ANOVA and Kruskal-Wallis tests, whereas categorical variables were analyzed using Chi-Square tests. All variables assessed at baseline and each annual visit were included in the models as time-varying covariates. After grouping the most common antihypertensive meds by class, we examined racial differences over time using generalized estimation equations (GEE), starting from SWAN baseline in 1996. The autoregressive covariance structure[14] was used in each model. This structure has homogeneous variances and correlations that decline exponentially with distance.

Factors selected *a priori,* for inclusion in the base models included several covariates known to be possible correlates of HTN: race/ethnicity (White, Black, Chinese, Japanese, and Hispanic), age, BMI, diabetes, and menopause transition stage. CVD events, which occurred during follow-up, were also added to the models. Other covariates of interest included educational level, income, smoking status, and BP (systolic and diastolic as time-varying covariates). Interaction terms for ethnicity and diabetes and ethnicity and CVD were also included in the models. Ethnicity included all race/ethnicity groups (White, Black, Chinese, Japanese and Hispanic) when used as an interaction term. We examined the data two ways, by calendar year and by time relative to the final menstrual period (FMP). We did not find any association of medication use around FMP, thus we chose to present the data by calendar year in relation to publication of major clinical treatment guidelines and clinical trials. Subgroup analysis excluding the 126 women who reported use of antihypertensive medications

but did not report HTN. We also examined use of antihypertensives by study site. Results are expressed as Odds Ratio's (OR) and 95% confidence interval (CI).

Since women with specific comorbidities may be prescribed a particular class of antihypertensive medications, we performed a subgroup analysis for women with diabetes. Due to the low prevalence of vascular disease in this cohort, medication class by stroke or TIA was not examined. All analyses were performed using SAS 9.3.

Results

At enrollment, 46.7%, 28.3%, 8.5%, 7.8% and 8.7% of the 3302 participants were White, Black, Japanese, Chinese and Hispanic, respectively. A total of 1,707 women reported having been diagnosed with HTN and/or using antihypertensive medications between January 1996 and April 2012. Characteristics of these women at the visit where HTN was identified are shown in Table 1. Among women with HTN, 42.2%, 37.9%, 5.6%, 5.6% and 7.8% were White, Black, Chinese, Japanese and Hispanic, respectively. Mean follow-up was 9.1 years (standard deviation [SD] 5.8 years). The mean age when HTN was first reported was 50.6 ± 5.5 (SD) years. The majority (73.1%) had completed some years of college or greater. Approximately 30% of SWAN participants with HTN were late perimenopausal or postmenopausal at the time of first reported diagnosis of HTN. Mean body mass index (BMI) was 31.3 kg/m^2 consistent with obesity. In terms of comorbidities, approximately 15% of women reported current smoking with the highest rates for Blacks (21.0%) and the lowest rates for Chinese women (1.1%). Percentage of diabetes ranged from 4.5% in Japanese women to 13.3% in Black women. Among these women, those reporting a diagnosis of heart disease or stroke during follow-up were low.

A total of 250 women (14.6% of all women with HTN) in the SWAN cohort reported being diagnosed with HTN but not being on antihypertensive medications; Black and Chinese women were less likely to report a diagnosis of HTN without being on pharmacotherapy as compared to White, Japanese or Hispanic women.

The most common classes of antihypertensive medications used by SWAN women were THZDs (22.3%) and ACEi/ARBs (21.4%) followed by BBs (16.1%) and CCBs

(13.4%) (see Table 1). Japanese reported the highest rate (38.6%) of ACEi/ARBs use, followed by Hispanics (27.8%) and Blacks (26.6%). BB use was more common among Chinese (21.1%) and Japanese (22.3%) compared to the other racial/ethnic groups. Almost one third of Blacks (30.4%) were on a THZD compared to 19.2% of Whites and 18.9% of Chinese. The lowest rates of THZD use were observed among Hispanics (9.0%). The number of women who reported being on two or more antihypertensive medications was 12.9%. Blacks reported the highest rates of CCB use (18.4%), followed by Hispanics (15%). Less commonly, used antihypertensive medications (data not shown) included non-THZD diuretics such as loop diuretics and potassium sparing diuretics (14.5%), and alpha-blockers (0.5%).

We also examined the probability of being on a specific antihypertensive medication class, by race/ethnicity after adjusting for age, BMI, menopausal status, systolic BP, diabetes, education and income levels (see Table 2). Among women with HTN, Blacks were more likely than Whites to report using CCBs (odds ratio [OR] 2.92, 95% confidence interval [CI]; 2.24-3.82), THZDs (OR 2.38, 95% CI; 1.93-2.94) and two or more antihypertensive medications (OR 1.95, 95% CI; 1.55-2.45). Use of ACEi/ARBs and BBs were not statistically significantly different between Blacks and Whites. Hispanic women were more likely to report using ACEi/ARBs (OR 2.03, 95% CI; 1.36-3.02) and CCBs (OR 1.81, 95% CI; 1.13-2.89), compared to Whites; while use of BBs, THZDs and two or more antihypertensive medications were similar. Chinese reported similar use of all antihypertensive medications compared to Whites with the exception of CCBs which were used less often (OR 0.47, 95% CI; 0.19-0.89). Among Chinese THZDs were used more often as compared to Whites (OR 1.68, 95% CI; 1.12-2.52). No differences in antihypertensive medication classes were observed between Japanese and Whites. We observed no significant differences after further adjusting for study site (data not shown). We also stratified by study site and found patterns of use were similar between sites (data not shown). In sensitivity analyses, we observed no significant differences when women of unknown menopausal status were removed from the models.

Since women with diabetes may be more likely to be prescribed ACEi/ARBs, we examined use of antihypertensive medications by race/ethnicity, comparing diabetics to

non-diabetics (see Table 3). Among White, Black and Japanese women, those with diabetes were more likely to use ACEi/ARBs compared to non-diabetic women (OR 1.70, 95% CI, 1.28-2.24 for Whites, OR 2.33, 95% CI, 1.84-2.95 for Blacks, and OR 2.1, 95% CI 1.22-3.64 for Japanese women). Black women with diabetes were also more likely to be using two or more anti-hypertensive medications (OR 1.53, CI 95% CI 1.12-2.0) and less likely to be on a THZD (OR 0.74, 95% CI 0.56-0.98) compared to Black non-diabetic women. We also excluded women who reported use of antihypertensive medications but did not report having HTN and observed no significant differences, compared to the main analysis (Table 2) with the exception of greater CCB use among Japanese women (OR 1.69, 95% CI 1.05-2.70) (see Table 4).

We next examined antihypertensive medications patterns of use over time. (Figure 2) At the beginning of data collection in 1996, use of ACEi/ARBs, BBs, CCBs and THZDs were similar. By 2012, the most common antihypertensive medication class reported was ACEi/ARBs followed by THZDs for Whites, Blacks and Japanese race/ethnic groups. The greatest increase over time was observed for ACEi/ARBs (20.0% to 47.8%) followed by THZDs (18.8% to 35.7%). As the cohort aged, greater use of two or more antihypertensive medications were reported(p=<0.0001). In Chinese, THZD use increased from 17.7% to 46% (p=0.01), and ACEi/ARB use increased from 5.9% to 33.3% (p=0.0008); while BBs use remained essentially unchanged (23.5% to 27%) (p=0.52). By 2012, the most common antihypertensive medication reported by Chinese was THZDs followed by ACEi/ARB. BB use did not decline significantly over time among any of the groups, and increased among the following groups: Whites (p=0.0001), Blacks (p=0.0001) and Hispanics (p=0.03). Lastly, although use of THZDs increased over time, we did not observe a significant increased use around the time of ALLHAT or JNC VII publication (2002-2003) or shortly thereafter (p=0.40).

Discussion

In this large, multiethnic cohort of midlife women, we observed use of antihypertensive medications increased over time as participants aged. During follow-up, THZDs and ACEi/ARBs utilization increased for most racial/ethnic groups; however no clear uptake in THZDs was noted around the time of publication for ALLHAT or JNC

VII. Furthermore, ACEi/ARBs were more commonly reported compared to THZDs for most racial/ethnic groups by 2012 and BB use did not appear to decline over time as was expected. We also noted use of CCBs was higher in Black women than other groups.

The number of SWAN women who reported antihypertensive medication use increased as participants aged. Ample evidence exists demonstrating increases in HTN with age;[10, 15] thus an increase in antihypertensive medications was expected. Among participants of the Framingham Heart Study, the probability of receiving antihypertensive medications over a lifetime was 60%. Similar rates of antihypertensive use has been observed in data from the National Health and Nutrition Examination Surveys (NHANES).[16] These findings are comparable rates of antihypertensive medication reported by SWAN women.

We had expected to see a significant increase in THZDs during, or shortly after, the years in which ALLHAT and JNC VII were published, which was 2002-2003. THZDs have long been recommended for controlling BP, with reductions in CVD outcomes, and are low cost which can promote adherence.[11, 17-19] In 2003, the JNC VII report, recommended THZDs for treatment of Stage I HTN.[10] Although we observed no specific point of increase in THZD use during those years, an increase in THZDs and ACEi/ARBs was observed over the time period examined. Use of ACEi/ARB increased among all groups over time with the exception of the Chinese women who reported THZD as the most commonly used antihypertensive medication class by 2012. Among the SWAN women, THZDs were the second most commonly used antihypertensive medication class after ACEi/ARBs. Gu et al, using data from NHANES observed diuretics to be the most commonly used antihypertensive medications as of 2009-2010, of which THZDs were the most common diuretic used.[16] Of note ACEi were the second most commonly used antihypertensive drug class. When individual antihypertensive medications were examined, Lisinopril was the most commonly reported antihypertensive medication used.[16]

In contrast, the National Disease and Therapeutic Index which surveyed a national sample of US physicians between 1998 and 2004 noted ACEi to be the leading antihypertensive prescribed,[20] which is similar to the utilization patterns observed in the

SWAN cohort. Data from the National Disease and Therapeutic Index did note an increase in THZD prescriptions after publication of ALLHAT, in 2002, which we did not observe in the SWAN data.

We also expected to see a decline in the use of BBs for BP management, given the recommendation of JNC VII. Although there was no significant increase in BB use in general, there was an increase among Whites and Blacks. In contrast to our hypothesis, we did not see a significant decline in use with the exception of a decline in BB use among Japanese. Prior data from NHANES noted reductions in the use of BBs in the late 1990's through 2002.[17] However, recent data from NHANES (2009-2010) observed an increase in BB use from 20.3% to 31.9%.[16] HTN trials using BBs have not demonstrated a reduction in CVD events in comparison to other classes of antihypertensive medications.[21, 22] In the Anglo-Scandinavian Cardiac Outcome Trial-Blood Pressure Lowering (ASCOT-BPLA), adults with HTN randomized to atenolol had higher rates of CVD events compared to those randomized to amlodipine.[22] A meta-analysis examined use of BB for primary HTN and also noted no reduction in heart events with an increase in stroke.[23] Consequently, current recommendations for management of HTN do not recommend BB as first-line agents.[10, 11]

In the SWAN cohort, Blacks were almost three times as likely to report using a CCB compared to Whites. Investigators for the Multi-Ethnic Study of Atherosclerosis (MESA) observed CCBs were the second most common antihypertensive medication class used by Blacks, with ACEi/ARBs being the most common.[18, 24] Among Black participants, ALLHAT investigators observed no significant difference between the CCB amlodipine and the THZD chlorthalidone for the primary outcome of nonfatal MI or CHD mortality, or secondary outcomes including all-cause mortality, stroke, combined CHD or combined CVD.[8] Higher rates of HF were observed among Black participants randomized to amlodipine compared to those randomized to chlorthalidone.[25, 26] In long-term follow-up of ALLHAT participants, investigators observed Black participants had an increased HF risk associated with amlodipine compared to chlorthalidone.[27] However it should be noted that participants were no longer blinded to treatments during the 8 to 10 years of post-trial follow-up and may have had their antihypertensive medication doses and class modified. Furthermore, use of ACEi/ARBs are still the most

commonly reported antihypertensive medication among Blacks in SWAN. ALLHAT observed an increase risk for stroke, combined CHD, combined CVD and HF in Black participants randomized to lisinopril compared to those randomized to chlorthalidone.[8] Given the ALLHAT results, and the recent 2014 guidelines, it is surprising to see no decline in the use of ACEi/ARBs or CBBs among Blacks.

Several strengths and limitations exist in the current study. First, data on dosage of medication was not collected for most years of the study. This limits our ability to examine the effective control of HTN among these women. Second, recruitment of minorities was completed at specific sites; therefore, differences observed in medication use patterns may reflect geographic patterns in use as opposed to differences by race/ethnicity. However, when we stratified by site, patterns in medication use appear similar by race suggesting a lack of significant geographic variation. Lastly, data collection was interrupted for one site, which included enrollment of Hispanic women; thus, data between 2003 and 2010 is missing for Hispanics, which introduces potential for biases when examining longitudinal trends in antihypertensive classes for Hispanic women. We conducted a subgroup analysis with and without these women in our models to examine potential implications of this missing data and did not observe differences in our results.

Conclusion

Among this large cohort of multiethnic midlife women, use of antihypertensive medications increased over time, with ACEi/ARBs becoming the most commonly used antihypertensive medication, even for Blacks. THZDs utilization increased over time for all race/ethnic groups as did use of CCBs among Blacks; both patterns are in line with guideline recommendations for the management of HTN.

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Figure Legends:

Figure 1. Consort diagram (HTN = hypertension; CVD = cardiovascular disease)

Figure 2. Antihypertensive Medications over time by race/ethnicity (ACE = angiotensin converting enzyme inhibitor; ARB = angiotensin receptor blocker; BB = beta blocker; CCB = calcium channel blocker; Thiazide = thiazide diuretic)

Table 1. Demographic information of study participants at time of first reported HTN diagnosis

Characteristic n (%)	Total N= 1707	White N = 720	Black N = 647	Chinese N = 95	Japanese N = 112	Hispanic N = 133	P-value
Age, mean (SD)	50.6 (5.5)	50.8 (5.5)	49.7 (5.1)	52.4 (6.0)	52.2 (5.8)	50.1 (5.9)	0.0001
Education Level Obtained							0.0001
High School or Less	440 (25.8)	128 (17.8)	181 (28.0)	28 (29.5)	19.0 (17.0)	84 (63.2)	
Some College or greater	1248 (73.1)	586 (81.4)	457 (70.6)	67 (70.5)	93 (83.0)	45 (33.8)	
Menopausal Status							0.02
Pre-menopause/Early Perimenopause	1064 (62.8)	434 (60.7)	441 (68.5)	47 (50.1)	61 (54.4)	81 (63.3)	
Late Perimenopause	89 (5.3)	39 (5.5)	30 (4.7)	7 (7.5)	6 (5.4)	7 (5.5)	
Postmenopause	421 (24.8)	187 (26.1)	129 (20.1)	32 (34.0)	35 (31.3)	38 (29.7)	
Menopausal status unknown[†]	120 (7.1)	56 (7.8)	44 (6.8)	8 (8.5)	10 (9.0)	2 (1.6)	
Body Mass Index, kg/m^2, mean (SD)	31.3 (7.7)	30.8 (7.5)	33.8 (7.7)	25.2 (4.9)	24.6 (4.0)	31.6 (6.5)	0.0001
Systolic Blood Pressure mean(SD)	127 (18)	123 (15)	133 (20)	125 (15)	121 (13)	130 (13)	0.0001
Diastolic Blood Pressure mean (SD)	79 (11)	77 (6)	81 (12)	79 (11)	79 (10)	83 (9)	0.0001
Smoking (current yes, no)	263 (15.4)	97 (13.5)	136 (21)	1 (1.1)	10 (8.9)	19 (14.3)	0.0001
History of Diabetes	174 (10.2)	60 (8.3)	89 (13.3)	6 (6.3)	5 (4.5)	16 (12.0)	0.006
History of CHD	12 (0.7)	3 (0.4)	7 (1.1)	2 (2.1)	0 (0.0)	0 (0.0)	0.16
History of Stroke/TIA (yes, no)	12 (0.7)	7 (1.0)	1 (0.2)	2 (2.1)	1 (0.9)	1 (0.8)	0.15
Self-reported diagnosis of HTN – not on medication	250 (14.6)	124 (17.2)	70 (10.8)	12 (12.6)	19 (17.0)	25 (18.8)	0.007
Antihypertensive medication classes							
ACEi/ARB	365 (21.4)	151 (21.0)	133 (26.6)	12 (12.6)	32 (38.6)	37 (27.8)	0.02
Beta blocker	274 (16.1)	119 (16.5)	96 (14.8)	20 (21.1)	25 (22.3)	14 (10.5)	0.06

Calcium channel blocker	229 (13.4)	70 (9.7)	119 (18.4)	5 (5.3)	15 (13.4)	20 (15.0)	0.0001
Thiazide diuretic	381 (22.3)	138 (19.2)	197 (30.4)	18 (18.9)	15 (13.4)	12 (9.0)	0.0001
Use of 2 or more antihypertensive medications	220 (12.9)	77 (10.7)	107 (16.5)	4 (4.2)	18 (16.1)	14 (10.5)	0.0001
Other antihypertensive medications*	250 (14.7)	99 (39.6)	133 (53.2)	4 (1.6)	9 (3.6)	5 (2.0)	0.0001

SD=standard deviation; CHD=coronary heart disease, HTN=hypertension, TIA=transient ischemia attack, ACEi=angiotensin-converting enzyme inhibitor, ARB= angiotensin receptor blocker, [†]Menopausal status was categorized as unknown if a woman had used hormonal therapy or had a hysterectomy (with or without bilateral oophorectomy prior to their final menstrual period [FMP]). * Other antihypertensive medications include alpha blockers, non-thiazide diuretics, clonidine, hydralazine, methylodopa, minoxidil, and reserpine

Table 2. The odds ratio of being on antihypertensives by medication class and racial/ethnic group

	Adjusted Odds Ratio (95% Confidence Intervals)				
	ACEi/ARB	Beta Blockers	Calcium Channel Blockers	Thiazide Diuretics	Combination
Black vs. White	1.13 (0.91 – 1.40)	0.92 (0.72 – 1.19)	2.92 (2.24 – 3.82), p<0.0001	2.38 (1.93 – 2.94), p<0.0001	1.95 (1.55 – 2.45), p<0.0001
Hispanic vs. White	2.03 (1.36 – 3.02), p=0.005	0.80 (0.49 – 1.31)	1.81 (1.13 – 2.89), p=0.01	0.66 (0.42 – 1.05)	1.31 (0.86 – 2.00)
Chinese vs. White	0.79 (0.52 – 1.20)	1.20 (0.76 – 1.90)	0.47 (0.19 – 0.89), p=0.03	1.68 (1.12 – 2.52), p=0.01	0.83 (0.54 – 1.28)
Japanese vs. White	1.25 (0.85 – 1.86)	1.22 (0.79 – 1.87)	1.54 (0.97 – 2.45)	0.98 (0.67 – 1.43)	1.46 (0.96 – 2.23)

Adjusted for age, BMI, menopausal status, systolic blood pressure, diabetes, education, income, CVD, ethnicity x CVD, and ethnicity x DiabetesACEi=angiotensin-converting enzyme inhibitor, ARB=angiotensin receptor blocker, CVD=cardiovascular disease; Combination defined reported use of 2 or more antihypertensive medications by a participant

Table 3. The odds ratio of being on antihypertensives by medication class and racial/ethnic group comparing diabetics to non-diabetics

Diabetics vs. nondiabetics	Odds Ratio (95% Confidence Intervals)				
	ACEi/ARB	Beta Blockers	Calcium Channel Blockers	Thiazide Diuretics	Combination
Total	1.93 (1.47 – 2.53)	0.90 (0.71 – 1.14)	0.94 (0.66 – 1.35)	1.11 (0.86 – 1.44)	1.22 (0.93 – 1.60)
White	**1.70 (1.28 – 2.24) P=0.0002**	0.93 (0.73 – 1.18)	0.96 (0.66 – 1.40)	1.00 (0.78 – 1.31)	1.17 (0.88 – 1.54)
Black	**2.33 (1.84 – 2.95) P=0.0001**	1.19 (0.92 – 1.52)	1.02 (0.82 – 1.28)	**0.74 (0.56 – 0.98) P=0.03**	**1.53 (1.12 – 2.0) P=0.001**
Chinese	2.11 (0.98 – 4.56)	0.97 (0.54 – 1.70)	1.37 (0.63 – 3.01)	0.84 (0.62 – 1.12)	1.43 (0.73 – 2.79)
Japanese	**2.10 (1.22 – 3.64) P=0.008**	0.89 (0.63 – 1.26)	0.54 (0.16 – 1.80)	1.04 (0.34 – 3.20)	0.78 (0.38 – 1.60)
Hispanic	1.67 (0.85 – 3.27)	0.63 (0.26 – 1.52)	0.62 (0.27 – 1.40)	0.68 (0.29 – 1.58)	0.92 (0.44 – 1.92)

Non-diabetics are the reference groups, Adjusted for age, BMI, menopausal status, systolic blood pressure, diabetes, education, income, CVD, ethnicity*CVD, and ethnicity*Diabetes

ACEi=angiotensin-converting enzyme inhibitor, ARB= angiotensin receptor blocker, CVD=cardiovascular disease; Combination defined reported use of 2 or more antihypertensive medications by a participant

Table 4. The odds ratio of being on antihypertensives by medication class and racial/ethnic group excluding women who report antihypertensive medications but do not report a diagnosis of hypertension

	Odds Ratio (95% Confidence Intervals)				
	ACEi/ARB	Beta Blockers	Calcium Channel Blockers	Thiazide Diuretics	Combination
Black vs. White	1.09 (0.87 – 1.35)	0.99 (0.76 – 1.28)	**3.12 (2.37 – 4.12), p<0.0001**	**2.35 (1.89 – 2.92), p<0.0001**	**1.91 (1.51 – 2.40), p<0.0001**
Hispanic vs. White	**1.86 (1.24 – 2.77), p=0.003**	0.84 (0.51 – 1.38)	**1.90 (1.17 – 3.06), p=0.01**	0.65 (0.41 – 1.04)	1.24 (0.81 – 1.89)
Chinese vs. White	0.74 (0.48 – 1.13)	1.13 (0.70 – 1.85)	**0.43 (0.20 – 0.96), p=0.04**	**1.70 (1.12 – 2.57), p=0.01**	0.78 (0.51 – 1.21)
Japanese vs. White	1.18 (0.79 – 1.76)	1.25 (0.79 – 1.96)	**1.69 (1.05 – 2.70), P=0.03**	0.96 (0.66 – 1.41)	1.42 (0.93 – 2.12)

Adjusted for age, BMI, menopausal status, systolic blood pressure, diabetes, education, income, CVD, ethnicity*CVD, and ethnicity*Diabetes

ACEi=angiotensin-converting enzyme inhibitor, ARB= angiotensin receptor blocker, CVD= cardiovascular disease
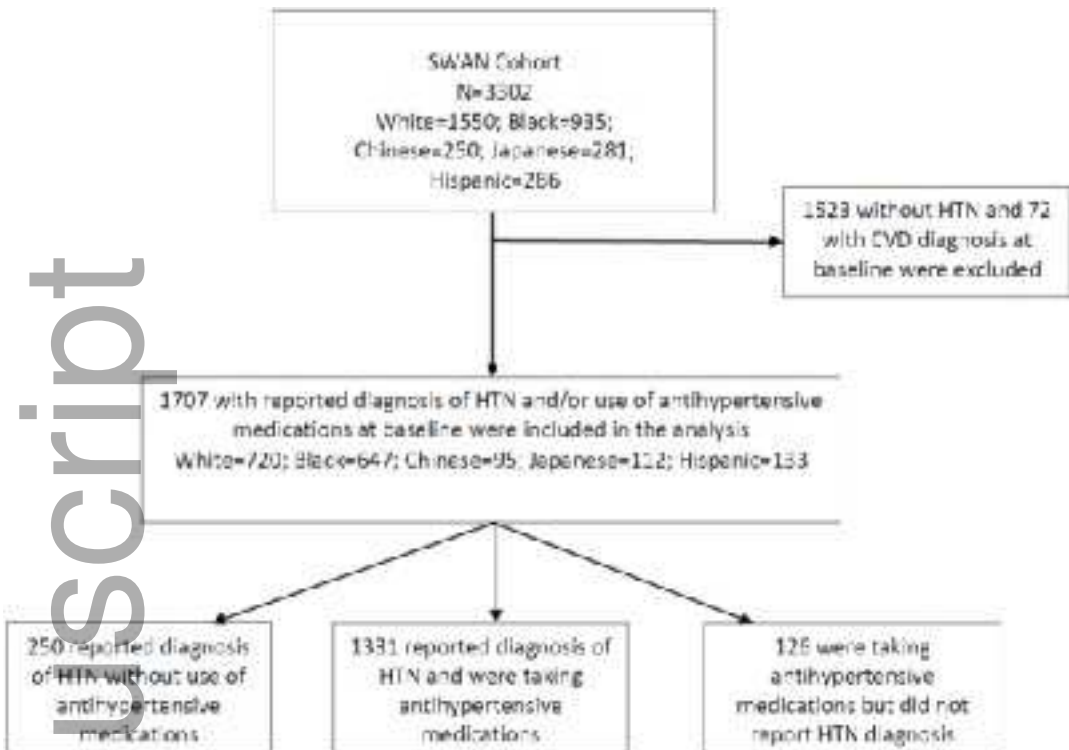
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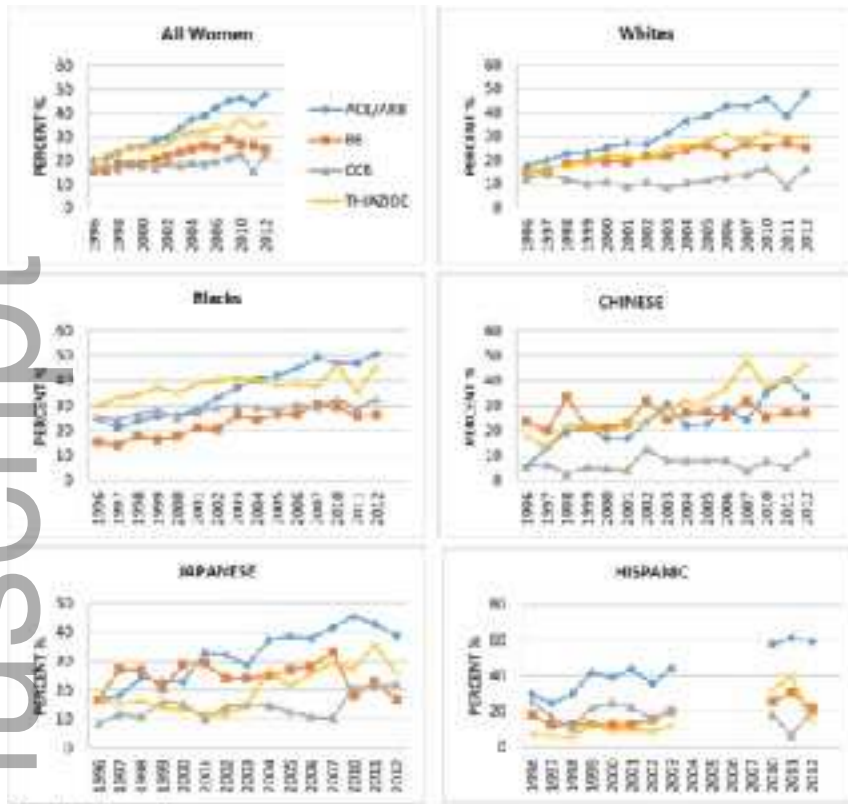
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