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Examining the Association Between Marital Status and Cardiovascular Disease Risk in Early Middle Aged African-American Women

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Examining the Association Between Marital Status and Cardiovascular Disease Risk in Early Middle Aged African-American Women

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2012

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Abstract

Examining the Association Between Marital Status and Cardiovascular Disease Risk in Early Middle Aged African-American Women

By Ojoyi Agbo

African-American women are disproportionately burdened by cardiovascular disease (CVD) morbidity and mortality when compared to other race-gender groups. Common health-related factors such as obesity or socioeconomic status do not explain the excess risk of CVD in this group. So, social influences may be at play. Being married is a social factor that has been linked to lower cardiovascular disease risk; however, this association has been understudied for African-American women, especially in early midlife, when elevated CVD risk is most pronounced. Utilizing data from 414 African-American women aged 30-46, we examined associations between marital status and CVD risk. CVD risk was assessed by averaged ambulatory blood pressure (ABP) measurements. For exploratory purposes, we also assessed cohabitation status and CVD risk.

Results indicated that unmarried African-American women did not have significantly different CVD risk (as measured by ABP outcomes) when compared to married African-American women. In linear regression models adjusted for age, unmarried women had slightly higher levels of daytime systolic BP (β =1.3, SE=1.3, p=0.33) and nighttime systolic BP (β =1.9, SE=1.3, p=0.13) compared to married women, but these results were not significant. Even after adjusting for education, employment, family income and size, BMI, smoking, anti-hypertensive medication, and depressive symptoms, this trend of nonsignificant results persisted. This pattern also occurred for daytime and nighttime DBP throughout all models.

Findings also suggested that cohabiting African-American women tended to have higher BP measurements than married African-American women, and this was especially true for those who were college-educated. In linear regression models, associations for college-educated cohabiting women and daytime diastolic BP were significant throughout all models even after adjusting for age, employment, family income and size, BMI, smoking, anti-hypertensive medication, and depressive symptoms (β = 6.4, SE=2.6, p=0.02). Similar results occurred after these adjustments for daytime systolic BP (β = 7.5, SE=3.7, p=0.04) and nighttime diastolic BP (β = 5.3, SE=2.5, p=0.03). Therefore, in this group of early middle-aged African-American women, cohabitation status but not marital status was associated with CVD risk.

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Introduction

Cardiovascular disease (CVD) is the number one cause of death for women in the United States (Centers for Disease Control and Prevention, 2020). When compared to women from other racial/ethnic groups, African-American women are disproportionately burdened by CVD morbidity and mortality (Go et al., 2014). Furthermore, African-American women aged 35-44 have higher rates of coronary heart disease (CHD) and stroke than African-American men, White men, and White women in the same age group (Jolly et al., 2010). Factors such as obesity, hypertension, and socioeconomic status do not paint the full picture of this high disease burden and excess risk in African-American women when compared to White men and women (Frierson et al., 2013; Farmer & Ferraro, 2005). Thus, it is critical to focus on African-American women to explore what unique factors might be contributing to their high CVD rates.

Research suggests that marital status may have an impact on CVD. Marriage is a central relationship for many adults and has positive effects for health (Robels & Kielcot-Glaser, 2003). Studies have noted that people who are unmarried have an increased risk of adverse cardiovascular health outcomes when compared to married individuals (Dhindsa et al. 2020; Schultz et al., 2017). This is especially relevant for African-American women because national data indicates that since the 1970's African-American women have been getting married and staying married at lower rates than White women and men (Tucker & Mitchell-Kernan, 1995). African-American women, 15 years or older, are also marrying at lower rates than African-American men, 15 years or older, at 13.2 per 1,000 and 17.3 per 1,000 respectively (Mayol-Garcia et al., 2021). This has left African-American women with a higher likelihood of maintaining families alone, with over 50% of all African-American children residing in single-parent, female-headed homes (Tucker & Mitchell-Kernan, 1995).

Current research indicates that African-American women continue to marry later in life, are less likely to get married, and face higher rates of marital instability when compared to both White and Hispanic women (Raley et al., 2015). Furthermore, African-American women have the lowest rates of outmarriage (marrying someone of a different race) when compared to other race-gender groups including African-American men (Tucker & Mitchell-Kernan, 1990). In fact, African-American men are more than twice as likely as African-American women to marry someone of a different race (Raley et al., 2015). These statistics suggest that African-American women may have a lower likelihood of gaining the potential health benefits of marriage due to lower marriage rates when compared to African-American men as well as lower rates of marriage and later time of first marriage when compared to other race-gender groups.

This present study focused on marital status (married vs. unmarried) as a social factor that may contribute to the risk of CVD in African-American women, aged 30-46. Research on CVD risk in African-American women in this age group is limited; however, authors have found that for African-American women aged 45 and older, marital status was not associated with cardiovascular mortality risk (Johnson et al., 2000). Additionally, marital status was not associated with incident CHD in African-American women aged 45-64 (Schwandt et al., 2010). These findings suggest that marriage may not be protective for CVD risk in African-American women aged 45 and older. Thus, this study aims to see if these results hold true for women aged 30 to 45 since African-American women have higher rates of heart disease in this age group than other race-gender groups in the same age range (Jolly et al., 2010).

This research also examined how the relationship between marital status and CVD risk is impacted by education level since higher education attainment is associated with better health when compared to those who are less educated (Zajacova & Lawrence, 2019). Furthermore, African-American college-educated women experience less marital instability and higher likelihood of being married at midlife when compared to their less educated peers (Raley et al., 2015). Therefore, in this sample, we hypothesized that the married women with a higher level of education may have lower CVD risk than their unmarried counterparts.

In addition to marital status, we also explored the relationship between cohabitation and CVD risk. Marital delay and high divorce rates have prolonged the amount of time individuals search for intimate partnerships and time spent outside of marriage. Therefore, research on romantic partnering now include situations such as cohabitation, marriage after childbirth, and "hooking up" (Sassler, 2012). One study, performed in Finland, noted that cohabiting in midlife may be associated with greater fatality risk after myocardial infarction (Kilpi et al., 2015). Another Finnish study found that cohabitation was associated with greater coronary heart disease risk when compared to marriage, and this association widened over time among women (Silventoinen et al., 2022). However, in contrast to studies of marriage and CVD risk, few researchers have assessed how cohabitation impacts health, particularly in African-American women. In one of the few studies on this topic that included African-American women, findings indicated that for African-American women, there were no significant mortality differences when comparing married women to their cohabiting counterparts (Liu and Reczek, 2012).

The outcome, CVD risk, was measured through ambulatory blood pressure (ABP) readings. ABP was utilized because multiple researchers have found that 24-hour and nighttime blood pressure (BP) measurements are more strongly associated with cardiovascular outcomes than BP taken in a doctor's office or clinic (Huang et al., 2021; Dolan et al., 2005; Banegas et al., 2018). Moreover, the strength of the association between ABP and CVD outcomes may be most pronounced for women (Boggia et al., 2005).

Literature Review

Marriage and Health/CVD Risk

Multiple studies have observed the association between marital status and the risk or presence of CVD (along with its adverse effects). It has been noted that unmarried individuals have a higher rate of cardiovascular events compared to their married counterparts (Dhindsa et al., 2020). Researchers have also explained that marriage as a protective factor for adverse health outcomes may be more present for men than women. In an analysis of approximately 2 million participants across 34 studies, being unmarried (which included divorced, never-married, or widowed groups) was associated with a higher likelihood of CVD and CHD death (Wong et al., 2018). Similarly, Schultz et al. (2017) found higher rates of CVD death and myocardial infarction among those who are divorced, separated, widowed, or never married compared to married individuals in a population of 6,051 patients with suspected or definite coronary artery disease. Both studies did not see a significant difference between men and women. Conversely, Floud et al. (2014) studied 734,626 British women and found that unmarried women, married women, and women who were living with a romantic partner faced similar risks of developing CVD. However, there was a significantly increased risk of CVD mortality for unmarried women when compared to married or cohabiting women.

Marriage and Health/CVD Risk for African-American Women

While these associations are evident for majority White populations, it is vital to see if these trends persist for African-American women as well. Since African-American women are less likely to be married than White women, Thomas Tobin et al. (2019) studied how marital status may impact racial differences in allostatic load (AL), an indicator of physiological dysregulation, in a population of approximately 660 women (50% white and 50% African-

American) aged 18-69. Even though African-American women did have greater allostatic load levels than White women, marital status did not explain these differences. Moreover, among African-American women, marital status was not a significant predictor of AL: AL rates were similar for married and never married African-American women. Therefore, marital status was not protective.

Regarding marital status and mortality, Johnson et al. (2000) studied a cohort of 281,460 African-American and White persons aged 45 and older. Non-married groups showed increased risk of mortality compared to married counterparts for all race-gender subgroups. This differed for older age groups who showed smaller risk ratios compared to younger groups. For cardiovascular disease mortality specifically, never-married White men and women had an increased risk when compared to their married counterparts for age groups 45-64 and 65 and older (Johnson et al., 2000). Also, never-married African-American men had increased risk when compared to their married counterparts for ages 45-64 (not for 65 and older). However, for African-American women, marital status was not significantly associated with elevated cardiovascular disease mortality rates for ages 45-64 or 65 and older. Thus, compared to White women, White men, and African-American men, African-American women were the only group for which no significant associations were observed between marital status (never-married vs married) and cardiovascular morality (Johnson et al., 2000).

Schwandt el al. (2010) analyzed 3,425 African-American adults aged 45-64, and women made up 63% of the study sample. They looked at outcomes such as hypertension, coronary heart disease (CHD), diabetes, and death. For African-American women, being unmarried was significantly associated with hypertension, but this association was explained by demographic and health covariates. For diabetes, marriage was protective specifically among African-

American women. For mortality, marriage was protective for both African-American men and African-American women. Contrary to their hypothesis, incident CHD was not associated with marital status in this cohort of African-American adults.

Cohabitation and Health/CVD Risk

Silventoinen et al. (2022) studied how cohabitation and marital history are associated with coronary heart disease (CHD) in the entire Finnish population aged 35 and over (N= 4,415,590). They found that cohabitation and divorce were associated with higher rates of CHD incidence while married Finnish men and women had lower rates of CHD incidence. Even after adjusting for other social covariates such as education, social class, and economic activity, these association patterns persisted. These associations were stronger for those aged 35-64 compared to older persons, 65 years and older. The differences in CHD incidence increased over time, especially for women in the younger age category.

Similarly, in a separate population of Finnish men and women aged 40-60 (N= 302,885), they found that for men, living with a spouse was associated with lower risk of myocardial infarction (MI) incidence after adjusting for socioeconomic factors when compared to men living alone (18% higher risk) and cohabiting men (16% higher risk) (Kilpi et al., 2015). This was not seen in Finnish women after adjusting for socioeconomic elements. However, in reference to MI fatality risk, the findings suggested that cohabitation (living with non-marital partner) in midlife may be associated with higher MI fatality risk levels for women (82% higher odds than the married group). In men, they only found 35% greater odds for cohabiting men in comparison to married men. Also, for men, living alone was associated with more than twice the odds of MI death when compared to men who were married. Women who were living alone saw 35% higher odds of death compared to women who were married.

Cohabitation and Health/CVD Risk for African-American Women

Research on the health outcomes associated with cohabitation has shown that those who cohabit have greater risk of mortality than married couples (Defahl, 2012; Lund et al, 2002; Koskinen et al., 2007). Liu and Reczek (2012) examined this connection between cohabitation and mortality risk in the US by analyzing a nationally representative sample of African-American and White men and women. Utilizing data from the National Health Interview Survey (N= 193,851), they discovered that White men with a live-in partner had lower mortality rates than those who were divorced, widowed, and never-married. For African-American men, those who cohabited had lower mortality rates than those who were never-married. However, this did not ring true for women. The mortality rates for unmarried African-American and White women were similar to those who cohabited. For individuals who were married, White men and women had lower mortality rates than their cohabiting counterparts whereas African-American men and women did not have mortality rates that diverged from their cohabiting counterparts (Liu & Reczek, 2012).

Methods

Participants

Participants included 414 African-American women, aged 30-46, who were involved in the Mechanisms Underlying the impact of Stress and Emotions on African-American Women's Health (MUSE) study. The women were enrolled using voter registration and residential lists from greater than 200 census tracts across the greater metropolitan Atlanta, GA area between 2016-2019. After flyer distribution and follow-up phone calls, interested women were prescreened by phone to ascertain eligibility. If deemed eligible, study staff called and scheduled them for an in-person visit.

The inclusion criteria included: self-identification as an African-American woman, aged 30-46, and premenopausal with ≥1 ovary because reproductive status is correlated with vascular aging. Exclusion criteria were pregnant/lactating, history of clinical CVD (e.g., myocardial infarction, angina, and cerebral ischemia/revascularization), diabetes, and any illnesses known to impact CVD such as autoimmune disease, HIV/AIDS, liver disease, and lupus/rheumatoid arthritis. Ineligibility criteria also included: current treatment for psychiatric illnesses, illicit drug abuse (e.g. marijuana, cocaine), alcohol abuse, and/or report of working overnight shifts because shift-working can alter circadian rhythms which can impact heart health.

Previous studies have found that African-American women do not obtain significant health gains from higher (versus lower) SES (Lewis et al., 2005; Din-Dzietham & Hertz-Picciotto, 1998; Assari, 2020; Thomas-Tobin, 2019). Therefore, the study design included recruiting half of the participants below and half above the median income of $50,000 in GA which allowed us to assess differences in CVD risk across SES levels.

At the initial visit, participants' height, weight, two measures of resting BP, a fasted blood draw, and vascular testing to look at arterial stiffness were obtained. Also, the women were interviewed face-to-face to acquire detailed demographic and psychosocial information. This face-to-face, conversational method also allowed for study staff to gain rapport with the women, reduce literacy concerns, and increase likelihood of complete data. Following the in-person visit, ambulatory blood pressure (ABP) was monitored for 48-hours. Participants were encouraged to wear the monitor as much as possible to reach at least an 80% completion rate. All participants provided written, informed consent, and all study procedures were approved by the Institutional Review Board at Emory University.

Marital Status

The relationship status of each participant was assessed through the question: “Are you currently married, living with a partner, separated, divorced, widowed, or have you never been married?” The participants were instructed to choose one option that most applied to their status. In this analysis, the exposure variable, marital status has three levels: married, cohabiting, and unmarried. Women were considered married if they chose “married” when answering the question above. They were considered cohabiting if they responded, “living with a partner” and unmarried if they answered with any of the remaining options, “separated,” “divorced,” “widowed,” or “have never been married” to describe their relationship status.

Education Level as a Modifying Factor

Education level was examined as a factor that may impact the relationship between marital status and CVD risk, as measured by ABP monitoring values. Education level was asked through the following question: “what is your highest level of education?” The answer choices were: less than or some high school, high school graduate/GED, some college/technical school degree, college degree, master’s degree, M.D./PhD/J.D./other doctoral degree, other, or don’t know. These categories were collapsed to create three composite levels: HS or less, some college, and college or higher. We further created a two-category education level variable: some college or less and college or higher, for use in moderation analyses.

Ambulatory Blood Pressure Monitoring

At the initial and 24-month visits, ABP was monitored over 2 days using SpaceLab’s OnTrak model 90227 monitor (Issaquah, WA). This device was small and non-invasive, and the women were told to only removed it to shower or bathe over the 48-hour period. Participants were trained on how to apply and remove the monitoring instrument. Prior to fitting, the monitoring system was programmed to record systolic blood pressure (SBP) and diastolic blood pressure (DBP) every 30-minutes during the day (8am to 10pm) and every hour during the night. Daytime SBP and DBP and nighttime SBP and DBP are the main outcomes being used. After the 48-hour period, study staff collected the device, and the data were retrieved with Sentinel Software from Spacelabs.

Collecting ABP measurements were important because it gave us a broader understanding of the person's day-to day BP. ABP can detect abnormal changes in BP that would not be detected by only in-clinic BP readings that may be impacted by "white coat" hypertension (Grossman, 2013). Thus, ABP potentially allows for a more accurate and detailed inventory of each woman's BP.

BP Outcomes

The 48-hour ABP completion rates ranged from 9% to 150% on average. Because some of the participants wore the device past 48-hours, there are some with completion rates over 100%. The large majority of the women, 88%, achieved a completion rate of at least 80%. The coded outcome variables were the average of all systolic BP (SBP) and diastolic BP (DBP) for daytime and nighttime across the 48-hour period. Therefore, there were four continuous BP outcomes - daytime SBP, nighttime SBP, daytime DBP, nighttime DBP.

Covariates

Various covariates were included in the analyses based on previous literature (Liu & Waite, 2014; Thomas-Tobin et al., 2019; Jolly et al., 2010). These covariates included sociodemographic variables such as age (measured continuously in years), education (≤ high school, some college, and ≥college), annual family income (<$35,000, $35,000-$49,999, $50,000-$74,999, ≥ $75,000), and family size (number of people in household). They were all self-reported.

Health-behavior-related covariates were also modeled: these included Body Mass Index (BMI), a significant predictor of CVD as an indicator of obesity (Izzo & Black, 2003). Body mass index (BMI) was calculated as weight/height (kg/m^2) and modeled continuously. Also, current smoking and anti-hypertensive use were self-reported and modeled as yes/no categorical variables.

Lastly, we included depressive symptoms. This is critical because depression has been noted as a potential risk factor for CVD (Dhar & Barton, 2016). Depressive symptoms were evaluated using the self-report rating scale, 21-item Beck Depression Inventory, and measured continuously (Beck et al., 2015). This scale has been well validated across many cohorts.

Statistical Analyses

Descriptive statistics such as frequencies, means, and standard deviations were used to summarize data from study participants. Analysis of variance (ANOVAS) for continuous variables and Chi-squared tests for categorical variables were utilized to examine any significant differences between marital status categories.

Multivariate linear regression models were performed using a generalized linear model to assess associations between marital status and continuous ambulatory blood pressure (ABP) outcomes. There were four ABP outcome variables that were assessed. Model 0 was age-adjusted to examine any association between marital status and ABP outcomes before controlling for other covariates. Model 1 adjusted for age, education, employment, family income, and family size. Model 2 adjusted for the Model 1 variables, adding BMI and smoking status. Model

3 adjusted for the Model 2 variables and anti-hypertensive medications usage. Model 4 added depressive symptoms as measured by the Beck Depression Inventory (BDI) assessment.

To assess the association between marital status and ABP outcomes stratified by education (college degree or higher vs. some college or lower), the generalized linear model was also employed, and all Models mentioned above were performed (minus the education variable). $P < 0.05$ was considered statistically significant. All analyses were performed utilizing SAS Version 9.4.

Results

Participant Characteristics

As displayed in Table 1, on average, participants (N=414) were 37.4 years of age with various family income and education levels. Thirty-two percent (N=133) of the women were married, 9% (n=38) reported living with a partner, and 59% (N=243) were unmarried. Married women were more likely to be older (38.4 years old on average), have higher family incomes, larger family size, more educated (higher percentage of women with at least a college degree), and were less likely to smoke when compared to cohabiting and unmarried women (Table 1).

Marital Status, Cohabiting Status, and Continuous ABP Outcomes

In age-adjusted analyses, model 0, when compared to married women, cohabiting women had higher DT SBP measurements (β =4.6, SE=2.2, p=0.04). While unmarried women also had higher DT SPB levels in this age-adjusted model, this association was not significant (β =1.3, SE=1.3, p=0.33). Associations between cohabiting status and DT SBP when compared to married status were no longer statistically significant after adjusting for education, employment, family income, family size although the effect size remained larger than that observed for married status (Model 1: β = 2.7, SE=2.3, p=0.25). Findings were similar after additional adjustments for BMI, smoking, anti-hypertensive medication usage, and depressive symptoms (Model 2: β = 3.0, SE=2.3, p=0.19; Model 3: β = 2.7, SE=2.2, p=0.23; Model 4: β = 2.8, SE=2.2, p=0.21, Table 2).

For DT DBP, the association trends were similar for Models 1-4 but did not reach statistical significance. In age-adjusted analyses, model 0, when compared to married women, cohabiting women had higher DT DBP measurements (β =3.2, SE=1.6, p=0.05). Also, except for the age-adjusted model (Model 0), unmarried women had lower DT DBP when compared to married women (Table 2).

For NT SBP, in Models 0-4, the associations were not significant (Table 2). Unmarried women had higher NT SBP levels in the age-adjusted model (β =1.9, SE=1.3, p=0.13). However, when we account for age, education, employment, family income and size, BMI, smoking, anti-hypertensive medication, and depressive symptoms, unmarried women tended to show lower NT SBP levels when compared to married women (Models 3 and 4, Table 2). When compared to married women, cohabiting women show higher NT SBP levels.

For NT DBP, in Models 0-4, the associations were not significant (Table 2). Still, cohabiting women exhibited higher NT DBP levels as compared to married women.

Marital Status, Cohabiting Status, and Continuous ABP Outcomes by Education Level

For those with a college degree or higher, age-adjusted analyses (Model 0) indicated that unmarried women had lower DT SBP but this association was not significant (β = -0.1, SE=1.7, p=0.96). These trends continued for Models 1-4. This trend also continued for DT DBP, NT SBP, and DBP for all models.

For women with a college degree or higher, in age-adjusted analyses (Model 0) cohabiting women had meaningfully higher DT SBP when compared to married women, but this association was not statistically significant (β = 6.9, SE=3.8, p=0.07). These trends continued for Models 1-3. Model 4 showed significantly higher DT SBP levels for cohabiting women (β = 7.5, SE=3.7, p=0.04), after adding an adjustment for depressive symptoms. Associations for cohabiting women and DT DBP were significant throughout the models (Model 0: β = 6.0, SE=2.6, p=0.02; Model 1: β = 5.7, SE=2.7, p=0.03; Model 2: β = 6.0, SE=2.7, p=0.03; Model 3: β = 6.2, SE=2.6, p=0.02; Model 4: β = 6.4, SE=2.6, p=0.02).

For NT SBP and DBP, Models 0 - 4 showed similar trends with higher measurements for cohabiting women when compared to married women, and significant associations for NT DBP for Model 3 (β = 5.1, SE=2.5, p=0.04) and Model 4 (β = 5.3, SE=2.5, p=0.03, Table 3a).

For women with some college or lower level of education, no significant associations were found between marital status and the ABP outcome variables for cohabiting women or unmarried women when compared to the married group (Table 3b).

Discussion

To our knowledge, this is one of the only studies to measure associations between marital status, cohabiting status, and CVD risk in a cohort of solely African-American women. In this group, we did not see any significant difference in associations between marital status and ABP outcomes for unmarried women when compared to married women regardless of education level. Conversely, we found that African-American women with a live-in partner had higher blood pressure measurements when compared to married women, and this was particularly evident among higher-educated women. For example, college-educated African-American women who reported “living with a partner” had DT DBP levels that were about 6.4 mm/Hg higher than those who are married, even after adjusting for sociodemographic, health-behavior-related, and depressive symptoms.

The finding that unmarried and married women do not have significant differences in BP levels is important because it highlights that marriage may not be protective for CVD risk in African-American women. This was also found in studies that examined marital status and allostatic load (Thomas Tobin et al., 2019), cardiovascular disease mortality (Johnson et al., 2000), and incident CHD (Schwandt el al., 2010) in African-American women: among African-American women specifically, marital status did not have an impact on these outcomes. Therefore, this study's findings are consistent with previous research on African-American women over the age of 45 (Johnson et al., 2000; Schwandt et al., 2010) and women between 18 and 69 (Thomas Tobin et al., 2019).

Also, there may not have been significant associations between marital status and ABP because in contrast to emphasizing marital status only, marital or relationship quality may be the better indicator of heart health. Researchers have studied the impact of marital or relationship quality on cardiovascular risk and largely found that women who reported being satisfied in their relationship with their romantic partner have lower CVD risk levels (Ford et al., 2019; Dhindsa et al., 2020) especially for women at older ages (Liu & Waite, 2014). Thus, marital or relationship quality may be more indicative of cardiovascular outcomes than marital status alone.

Furthermore, these data reveal that cohabiting African-American women may be at greater CVD risk when compared to married women. This may indicate that there are unique stressors in cohabiting relationships that do not exist or manifest in the same way in marriage. For example, cohabiting persons may be more exposed to jealous conflict than married couples potentially due to lower trust in the relationship since live-in partnership may signify less of a commitment than marriage (Gatzeva & Paik, 2011). Additionally, cohabiting relationships face more instability than married relationships (Kennedy & Bumpass, 2008; Thomson et al., 2019) and one author suggests cohabiting couples are more likely to separate when they perceive fewer benefits from the relationship when compared to married couples (Joyner, 2009). Furthermore, researchers have found that cohabiting mothers value marriage as a personal goal (Lichter et al., 2004) with approximately 75% of cohabiting women expecting to marry their partners (Manning & Smock, 2002). Therefore, cohabiting women in this sample may have felt elevated stress if they were not headed towards marriage as expected. This could have resulted in heightened blood pressure which may partially explain the trend of cohabiting women having higher BP when compared to married women.

Limitations

Limitations of the study include study design, small sample size for cohabiting group, social desirability bias, and potential lack of generalizability. Since this study is cross-sectional, we can only assess associations but cannot assess causation. Also, the number of women in the cohabiting group (N=38) when compared to the married (N=133) and unmarried (N=243) groups was somewhat small. This became even more obvious in the stratified models. This is limiting because the associations observed may be due to the lower number of participants in that category and may not reflect a true association. Also, due to social desirability bias, women may not report their relationship status accurately; we did not utilize any methods to verify what they reported.

Additionally, due to the nature of the study design, this sample of young and middle-aged African-American women were from a southeastern city only, so the findings may not be generalizable to other regions. However, the proportion of those who reported being married in this sample (32%) is comparable to national data indicating that 32.7% of African-American women over the age of 15 are married compared to 54% of White women, 48.95% of Hispanic women, and 62% of Asian women (U.S. Census, 2019). Lastly, this study was unable to discern marital or relationship quality; those data may have added a more nuanced perspective to how marital status and marital quality may impact CVD risk.

Strengths

Despite the limitations, this study offers very important insight into an understudied group in CVD research. By focusing on African-American women, this research adds to the understanding of how marital and cohabiting status (social factors) may impact cardiovascular health. The finding that married and unmarried women have similar BP outcomes indicates that marriage may not be as beneficial for African-American women as is it for other race-gender groups. However, since only 32.7% of African-American women are married in the United States, it is positive news that being unmarried may not be harmful for African-American women since many face challenges when looking for a marriageable romantic partner (Raley et al., 2015).

Conclusion

The findings indicate that unmarried African-American women do not have significantly different CVD risk (as measured by ABP outcomes) when compared to married African-American women. Findings also suggest that cohabiting African-American women tend to have higher BP measurements than married African-American women, and this is especially true for those who are college-educated. This discovery highlights the need for more research on cohabiting status for African-American women to elucidate a better understanding of why these results occurred. Furthermore, with the changing landscape of relationships and lower marriage rates for African-American women, this group is engaging with other forms of romantic partnership like cohabitation which may be an important factor to study when thinking through forms of romantic partnership. Lastly, this study highlights the potential need for more support for those in cohabiting relationships. This could include encouragement towards the goal of marriage or support to reduce stressful elements in the relationship.

Table 1. Participant Characteristics by Marital Status

	OVERALL N=414	**MARRIED** N=133 (32%)	**COHABITING** N=38 (9%)	**UNMARRIED** N= 243 (59%)	P-value
Age, M (SD)	37.4 (4.2)	38.4 (3.9)	36.9 (4.3)	36.9 (4.3)	0.005
Education, % (*N*)					
HS or less	31.5% (130)	18.1% (24)	42.1% (16)	37.2% (90)	0.0002
Some College	21.1% (87)	22.6% (30)	31.6% (12)	18.6% (45)	
College or higher	47.5% (196)	59.4% (79)	26.3% (10)	44.2% (107)	
Family Income, % (*N*)					
$<35K USD	25.0% (101)	6.1% (8)	23.7% (9)	35.7% (84)	<.0001
$35K-$49,999K	21.3% (86)	15.3% (20)	23.7% (9)	24.3% (57)	
$50K-$74,999K	22.8% (92)	19.9% (26)	21.1% (8)	24.7% (58)	
≥$75K	30.9% (125)	58.8% (77)	31.6% (12)	15.3% (36)	
Family Size, M (SD)	3.6 (1.8)	4.5 (1.8)	4.2 (2.0)	3.0 (1.5)	<.0001
Current Smoker, % (*N*)	10.2% (42)	1.5% (2)	18.4% (7)	13.6% (33)	0.0002
BMI, kg/m^2 M, (SD)	32.6 (8.1)	33.4 (8.1)	32.6 (7.8)	32.3 (8.1)	0.45
Ambulatory Blood Pressure, M (SD)					
DT SBP	121.4 (12.2)	120.5 (12.2)	124.6 (11.2)	121.3 (12.3)	0.19
NT SBP	111.3 (11.7)	110.2 (11.6)	112.8 (9.7)	111.7 (12.0)	0.35
DT DBP	77.6 (8.8)	77.3 (8.6)	80.3 (8.7)	77.3 (8.9)	0.14
NT DBP	68.5 (8.6)	68.2 (8.7)	69.9 (8.8)	68.5 (8.5)	0.55
Sustained Hypertension, % (N)	31.4% (130)	27.8% (37)	39.5% (15)	32.1% (78)	0.37
Anti-HTN use, % (*N*)	16.9% (70)	15.0% (20)	15.8% (6)	18.1% (44)	0.74
Full-Time Employment, % (N)	64.2% (264)	61.4% (81)	68.4% (26)	65.2% (157)	0.42
Depressive Symptoms, M (SD)	5.9 (6.8)	5.3 (6.5)	6.1 (6.4)	6.3 (7.1)	0.39

Abbreviations: DT=Daytime; NT=Nighttime; SBP=Systolic Blood pressure; DBP=Diastolic blood pressure

Table 2. Marital Status and ABP in Early Middle-Aged African-American Women, N=414, including women on anti-hypertensive medications

	Daytime ABP				Nighttime ABP			
	SBP		*DBP*		*SBP*		*DBP*	
	β (S.E.)	p-value	β (S.E.)	p-value	β (S.E.)	p-value	β (S.E.)	p-value
Model 0								
Unmarried	1.29 (1.33)	0.33	0.20 (0.96)	0.83	1.92 (1.28)	0.13	0.64 (0.94)	0.50
Cohabiting	4.59 (2.24)	0.04	3.18 (1.62)	0.05	3.05 (2.15)	0.16	2.00 (1.59)	0.21
Married	--	--	--	--	--	--	--	--
Model 1								
Unmarried	-1.41 (1.70)	0.41	-1.20 (1.22)	0.33	0.18 (1.63)	0.91	-0.39 (1.20)	0.74
Cohabiting	2.69 (2.32)	0.25	2.161 (1.67)	0.20	1.67 (2.23)	0.45	1.25 (1.64)	0.45
Married	--	--	--	--	--	--	--	--
Model 2								
Unmarried	-1.33 (1.67)	0.43	-1.26 (1.23)	0.31	0.26 (1.57)	0.87	-0.46 (1.19)	0.70
Cohabiting	2.98 (2.29)	0.19	2.10 (1.69)	0.21	1.97 (2.15)	0.36	1.19 (1.63)	0.47
Married	--	--	--	--	--	--	--	--
Model 3								

Unmarried	-1.78 (1.63)	0.28	-1.63 (1.19)	0.17	-0.21 (1.64)	0.90	-0.79 (1.16)	0.50
Cohabiting	2.70 (2.23)	0.23	1.87 (1.63)	0.25	1.67 (2.09)	0.43	0.96 (1.58)	0.55
Married	--	--	--	--	--	--	--	--
Model 4								
Unmarried	-1.73 (1.62)	0.29	-1.60 (1.19)	0.18	-0.12 (1.53)	0.94	-0.76 (1.15)	0.51
Cohabiting	2.79 (2.22)	0.21	1.92 (1.62)	0.24	1.73 (2.09)	0.41	1.00 (1.58)	0.53
Married	--	--	--	--	--	--	--	--

Model 0: Age-adjusted only
Model 1: Adjusted for age, education, employment, family income and family size
Model 2: Model 1 covariates + BMI, smoking
Model 3: Model 2 covariates + anti-hypertensive medication
Model 4: Model 3 covariates + depressive symptoms.

Table 3a. Marital Status and ABP in Early Middle-Aged African-American Women by Education Level – College Degree or Higher

	Daytime ABP				**Nighttime ABP**			
	SBP		*DBP*		*SBP*		*DBP*	
	β (S.E.)	p-value	β (S.E.)	p-value	β (S.E.)	p-value	β (S.E.)	p-value
Model 0 *N = 196*								
Unmarried N= 107	-0.08 (1.67)	0.96	-1.61 (1.15)	0.16	-0.07 (1.54)	0.96	-1.09 (1.11)	0.33
Cohabiting N= 10	6.92 (3.76)	0.07	5.95 (2.60)	0.02	5.25 (3.47)	0.13	4.43 (2.50)	0.08
Married N= 79	--	--	--	--	--	--	--	--
Model 1 *N = 192*								
Unmarried	-1.35 (2.25)	0.55	-2.09 (1.53)	0.17	-0.64 (2.05)	0.76	-1.24 (1.46)	0.40
Cohabiting	5.93 (3.89)	0.13	5.74 (2.66)	0.03	4.64 (3.56)	0.19	4.56 (2.53)	0.07
Married	--	--	--	--	--	--	--	--
Model 2 *N = 191*								
Unmarried	-1.33 (2.19)	0.54	-2.06 (1.54)	0.18	-0.59 (1.93)	0.76	-1.20 (1.45)	0.41
Cohabiting	6.72 (3.78)	0.08	5.97 (2.66)	0.03	5.64 (3.32)	0.09	4.92 (2.49)	0.05

Married	--	--	--	--	--	--	--	--
Model 3 *N = 191*								
Unmarried	-1.16 (2.15)	0.59	-1.95 (1.52)	0.20	-0.43 (1.89)	0.82	-1.10 (1.43)	0.44
Cohabiting	7.01 (3.71)	0.06	6.16 (2.62)	0.02	5.91 (3.25)	0.07	5.09 (2.46)	0.04
Married	--	--	--	--	--	--	--	--
Model 4 *N = 191*								
Unmarried	-1.19 (2.14)	0.58	-1.97 (1.52)	0.20	-0.46 (1.88)	0.81	-1.11 (1.43)	0.44
Cohabiting	7.48 (3.70)	0.04	6.41 (2.62)	0.02	6.23 (3.25)	0.06	5.27 (2.47)	0.03
Married	--	--	--	--	--	--	--	--

Model 0: Age-adjusted only
Model 1: Adjusted for age, employment, family income and family size
Model 2: Model 1 covariates + BMI, smoking
Model 3: Model 2 covariates + anti-hypertensive medication
Model 4: Model 3 covariates + depressive symptoms.

Table 3b. Marital Status and ABP in Early Middle-Aged African-American Women by Education Level – High School + Some College

	Daytime ABP				Nighttime ABP			
	SBP		*DBP*		*SBP*		*DBP*	
	β (S.E.)	p-value	β (S.E.)	p-value	β (S.E.)	p-value	β (S.E.)	p-value
Model 0 *N = 217*								
Unmarried N=135	2.16 (2.10)	0.30	1.97 (1.55)	0.20	3.73 (2.09)	0.08	2.48 (1.56)	0.11
Cohabiting N=28	3.16 (3.01)	0.30	2.53 (2.22)	0.26	2.46 (2.97)	0.41	1.77 (2.21)	0.43
Married N=54	--	--	--	--	--	--	--	--
Model 1 *N =211*								
Unmarried	-0.55 (2.61)	0.83	0.64 (1.92)	0.74	2.24 (2.55)	0.38	1.44 (1.88)	0.45
Cohabiting	2.28 (3.12)	0.47	2.28 (2.29)	0.32	2.28 (3.06)	0.46	1.76 (2.25)	0.44
Married	--	--	--	--	--	--	--	--
Model 2 *N = 210*								
Unmarried	-0.42 (2.60)	0.87	0.51 (1.94)	0.79	2.28 (2.50)	0.36	1.24 (1.88)	0.51
Cohabiting	2.52 (3.12)	0.42	2.10 (2.33)	0.37	2.38 (3.01)	0.43	1.49 (2.26)	0.51

Married	--	--	--	--	--	--	--	--
Model 3 *N =210*								
Unmarried	-1.70 (2.55)	0.51	-0.64 (1.87)	0.73	1.07 (2.47)	0.66	0.20 (1.83)	0.91
Cohabiting	1.47 (3.05)	0.63	1.15 (2.24)	0.61	1.32 (2.95)	0.65	0.59 (2.19)	0.79
Married	--	--	--	--	--	--	--	--
Model 4 *N =210*								
Unmarried	-1.54 (2.55)	0.55	-0.54 (1.88)	0.78	1.21 (2.46)	0.62	0.31 (1.83)	0.87
Cohabiting	1.56 (3.04)	0.61	1.21 (2.24)	0.59	1.36(2.94)	0.65	0.61 (2.19)	0.78
Married	--	--	--	--	--	--	--	--

Model 0: Age-adjusted only
Model 1: Adjusted for age, employment, family income and family size
Model 2: Model 1 covariates + BMI, smoking
Model 3: Model 2 covariates + anti-hypertensive medication
Model 4: Model 3 covariates + depressive symptoms.

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