ALCOHOL CONSUMPTION AMONG WOMEN LIVING IN THE UNITED STATES

by

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ABSTRACT

CORLISS ALLEN SOLOMON. Alcohol consumption among women living in the U.S. (Under the direction of DR ELIZABETH RACINE)

The problem of heavy alcohol consumption is now a woman's issue but there is limited data on the prevalence of and factors associated with heavy alcohol consumption among women living in the United States. Three manuscripts were developed to study differences among women based on demographic factors, race and ethnicity, and trends in alcohol consumption over the past 25 years. First, the association between demographics and heavy alcohol consumption was explored among women living in the United States. Secondly, alcohol consumption behavior among women age 50 and older using national guidelines was examined to uncover alcohol consumption patterns of older women. Thirdly, changes in alcohol consumption trends among African American and White women from 1990 to 2015 were examined. Data for this study comes from the 1990 through 2016 National Survey on Drug Use and Health (NSDUH) public use files. Univariate analysis consisted of weighted percentages and frequencies of alcohol consumption and sociodemographic characteristics. Bivariate analysis included chi square and logistic regressions. Multivariate logistic regressions were used to examine the relationship between predictors and alcohol consumption patterns. Lastly, Cochran-Armitage tests were conducted to determine the significance of trends in alcohol consumption over time. While the largest significant differences in alcohol consumption were by age, marital status and education, the most interesting findings were related to women from minority groups. This study found high prevalence rates of problematic

alcohol consumption among women in minority groups. Additionally, there has been significant increase in alcohol consumption in binge drinking among African American women over the past 25 years and the racial disparity in problematic alcohol consumption between African American and White women has narrowed between 1995 and 2015. This study contributes to the limited literature on alcohol consumption among women, especially older women and African American women. The results of this study can provide the field of public health a better understanding of patterns and predictors of heavy alcohol consumption among women living in the United States.

DEDICATION

In dedication to my grandmother, Mattie Mosely Allen, whose dreams I am living. May I take advantage of every opportunity you did not have. May I motivate the next generation like you have motivated and inspired me. May I continue to be life's student with the grace and resiliency you have shown. May I allow this achievement to remind our family and community alike, that there are no limitations for people who look like us and come from the communities we were raised.

ACKNOWLEDGEMENTS

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Lastly, nothing has meant more to me than the love and support of my husband, Reginald Solomon Jr. I'm so grateful for your sacrifices. I would like to thank my parents (James and Leslie), Cara Fergeils, Kristin Williams, Dr. Yarbrah Peeples, Kenitra Fokwa, Marissa Beard and countless other friends and loved ones whose unconditional support

has not gone unnoticed. Last but not least, I must acknowledge God, whose spirit has kept me through it all.

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CHAPTER 1: Introduction

Historically, heavy alcohol consumption was more common among men, college students, Whites, and persons with higher household incomes (Han, Moore, Sherman, Keyes, & Palamar, 2017). However, recent assessments of heavy alcohol consumption have noted a significant increase among women. Using data from the 2009 Behavioral Risk Factor Surveillance System (BRFSS), Kanny and colleagues reported an increase in the number of women binge drinking from 10% in 2009 to 12% in 2011 (Kanny, Liu, Brewer, & Lu, 2013). Similarly, using National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) data from 2001-2002 and 2012-2013, Grant and colleagues found that high risk drinking (4 or more standard drinks on any day) among women has increased by 58% (Grant et al., 2017). Alcohol use disorders among women have also increased by 84% during this time period (2001-2002 to 2012-2013) (Grant et al., 2017).

As the effects of heavy alcohol use have increased, so has the prevalence of adverse effects impacting them. Heavy alcohol consumption accounted for almost 23,000 deaths and 633,000 years of potential life lost among women and girls in the U.S., each year during 2001 to 2005 (Kanny et al., 2013). While men tend to consume more alcohol and be binge drinkers, women who engage in high levels of alcohol consumption are at a greater health risk than men (Wilsnack, Wilsnack, & Kantor, 2013). Compared to men, women are more susceptible to negative cognitive effects, experience more motor impairment and have a greater number of blackouts due to alcohol (Hughes, Wilsnack, & Kantor, 2014). Women who drink heavily are more susceptible to diseases such as liver

cirrhosis and strokes than men and have an increased risk for breast cancer and adverse pregnancy outcomes compared to women who do not drink heavily (Patra et al., 2010; Rehm et al., 2010). Also, women who drink heavily are at higher risk of sexual assault and intimate partner violence compared to men (Klostermann & Fals-Stewart, 2006; McCrady, Epstein, Cook, Jensen, & Ladd, 2011). Overall, gender related differences in alcohol related consequences are decreasing in the U.S., suggesting that women are now experiencing more social, psychological, and health consequences due to alcohol (Corbin, Farmer, & Nolen-Hoekesma, 2013; Keyes, Hatzenbuehler, & Hasin, 2011; Nolen-Hoeksema & Hilt, 2006).

Life Course Development Theory

The Life Course Development Theory (Figure 1), developed by Elder (1998) provides an approach to studying the interactions between demographics and heavy alcohol consumption among women. Elder argued that the course of life is shaped by pathways and trajectories (Elder, 1998). Elder identified four essential principles of life course development. The principles are historical time and place, timing, linked lives, and human agency. There is evidence that heavy alcohol consumption is related to the theory's essential principles.

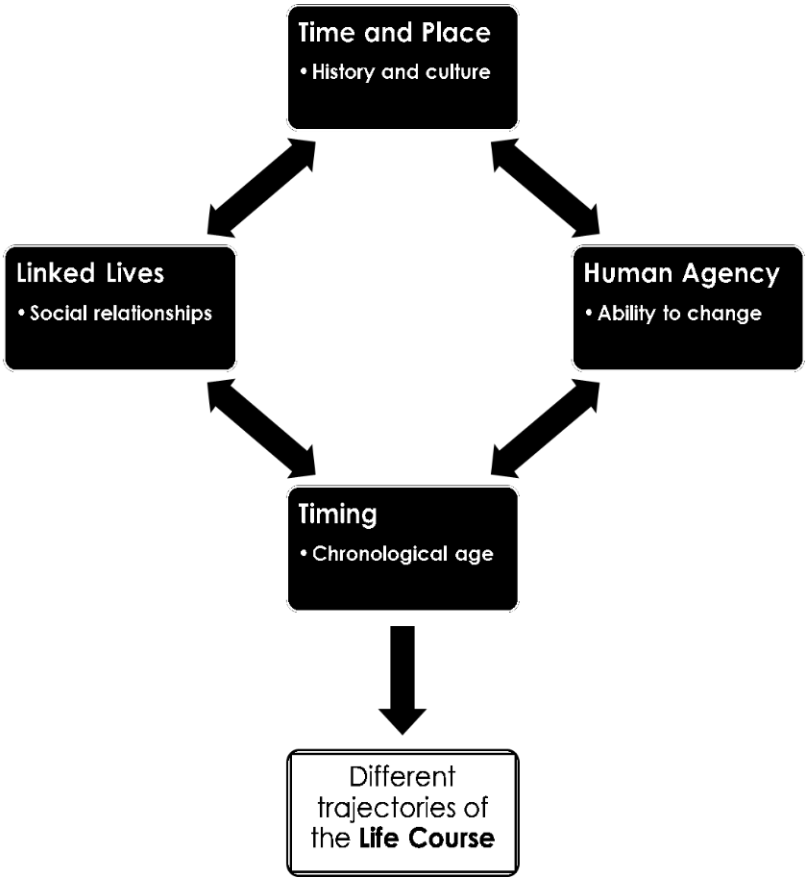

Figure 1. Life Course Development Theory

Historical time and place. Historical time and place refer to the impact of events occurring during historical times and specific geographical locations. For example, Stahre and colleagues studied heavy alcohol consumption among U.S. active-duty military personnel stationed on military campuses in the U.S., overseas and onboard ships. Among female drinkers, 84% engaged in heavy alcohol intake (Stahre, Brewer, Fonseca, & Naimi, 2009). More specifically two-thirds of binge drinking episodes among women occurred among youth and young adults (Stahre et al., 2009). This is a contrast to the lower rates of binge drinking among the civilian population during this time and suggest that military life factors may be associated with binge drinking among youth and young

adults. Additionally, Bor and colleagues assessed the change in alcohol use in the U.S. during the Great Recession (2008-2009) and found a large rise in the prevalence of frequent binge drinking (Bor, Basu, Coutts, McKee, & Stuckler, 2013). These examples highlight how an individual's pathway may be altered by the conditions and events occurring during a historical period or geographical location in which the person lives. Historical periods can have cultural implications. For example, the experiences of an African American woman born a decade earlier and younger white women will be different, even if the location is the same. Historically, the life patterns are different for African American women and white women living in the U.S. and because of historical times their experiences will be different over their lifetime. An understanding of the location of an individual with respect to historical contexts and culture may help researchers identify factors that have affected the lives of women differently.

Timing. Timing refers to the age of the individual. Recent studies have expanded the definition of timing to refer to group experiences based on age cohorts such as Baby Boomers (generational timing) and societal changes such as technology innovation (historical timing)(Price & Price, 2010). For instance, Johnson and Gerstein (1998) studied the use of alcohol by U.S. birth cohorts (generational timing) using the National Household Surveys on Drug Abuse and found that women born to cohorts after World War 2 (1951-1955) had a higher prevalence of alcohol use than women born before World War 2 (1930-1940) (Johnson & Gerstein, 1998). Another study compared the binge drinking behavior of the Baby Boomers Cohort (born 1946 to 1964) with their older counterparts and found that baby boomers were more likely to seek treatment for

binge drinking behaviors as opposed to their older counterparts (Choi, 2015). These findings illustrate how behavior, transitions, and pathways may be age related.

Linked lives. Linked lives refer to the experiences of individuals that are shaped by their interaction with others through family and other relationships. This principle underlines the influence of family dynamics (i.e. death, poverty, violence) on life experiences. In a cross sectional study, women with childhood experiences of living with parents who abused substances or identified as mentally ill had an increased likelihood of engaging in heavy alcohol consumption (Haynes et al., 2005). Moreover, a study by Kasen and colleagues found women involved in domestic violence cope with traumatic symptoms (i.e. depression, anger-irritability, anxious arousal) with heavy alcohol consumption (Kasen, 2007). These findings emphasize how family members can share negative behaviors and generate conflicts that result in binge drinking.

Human agency. Lastly, human agency refers to an individual's ability to shape social structure. This principle highlights an individual's ability to pursue opportunities in the face of adversity. A longitudinal study examining the alcohol consumption behavior of adolescents with an alcoholic parent(s) found perceived control and cognitive coping decreased the risk associated with parent alcoholism for substance abuse (Husson, 1997). Additionally, working during young adulthood may also serve as a protective factor against heavy alcohol consumption, as Osterle and colleagues (2008) found that working was protective against alcohol disorders in young adulthood. Lastly, youth that choose friends that are abstinent from alcohol may be less likely to belong to an early heavy drinking trajectory into young adulthood and have a decreased risk of alcohol dependence

(Stone, 2012). These studies illustrate how individuals are active agents that can make decisions, shape their social structure, and change their life course.

Elder's life course theory has been described as universal. Yet, one of the theory's criticisms is that the theory leads to results that are too general and does not address the primary objective of uncovering specifics. For example, when studying linking and its impact on social relationships the theory does not specify a life stage or historical context. Secondly, there is great debate over the life transition construct. One may argue that life transition is a result of choice. If this assumption is true, does the theory address transition independently of the choice? Despite these concerns, this theory's individual time construct provides a framework that allows for an exploration of issues pertinent to age patterns and excessive drinking among American women.

Conceptual Model

This conceptual theory will guide the three manuscripts of this dissertation. As seen in Figure 1, the location in time and place, timing of life, social relations (linked lives), human agency or individual goal orientation contribute to the complex interactions of heavy alcohol consumption among women living in the U.S over the life course. While the literature supports the examination between human agency and linked lives with heavy alcohol consumption among this population, this dissertation is limited to exploring historical time and place and timing (Figure 2). Guided by this model, the overall objective of this dissertation is to provide insight into the interactions of age, culture, location and other evidence-based factors on patterns and predictors of heavy alcohol consumption among women.

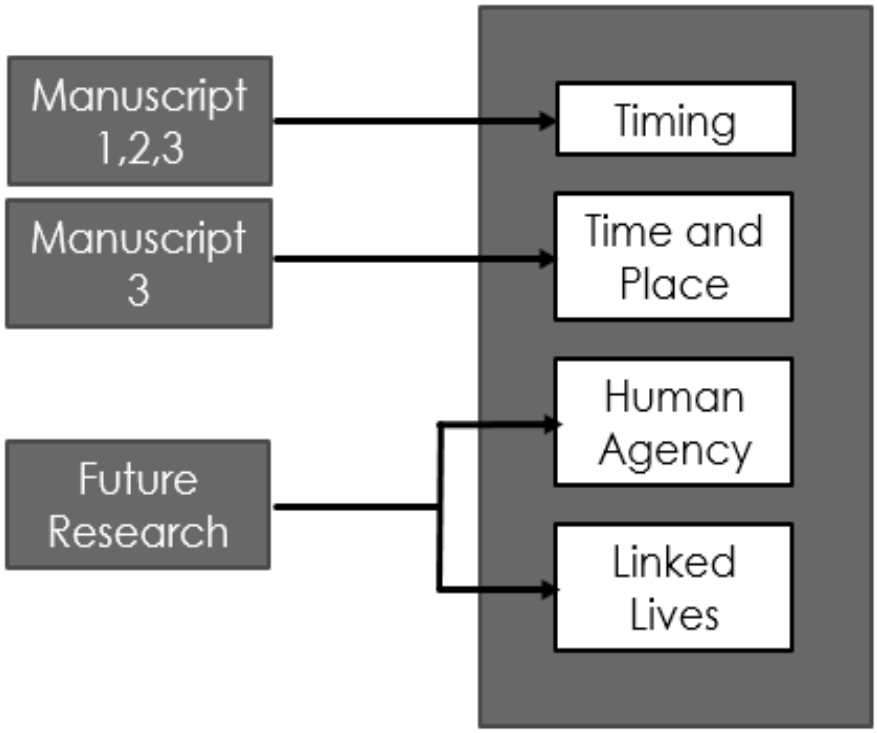

Figure 2. Conceptual Model: Using the Life Course Framework to study Heavy Alcohol Use among Women

Study Objectives and Specific Aims

Empirical research into the demographic patterns and trends of alcohol consumption among women living in the U.S., reflects the aim of this dissertation. Data from 10 datasets of the National Survey on Drug Use and Health (NSDUH) public use files (https://datafiles.samhsa.gov) from 1990 to 2016 were used. Manuscript 1 addressed Specific Aims 1, manuscript 2 addressed Specific Aim 2 and manuscript 3 addressed Specific Aim 3.

Specific Aim 1: Describe characteristics of women living in the United States that are associated with heavy alcohol consumption (HAC) using the 2012 – 2016 NSDUH dataset (Manuscript 1; Chapter 2). Characteristics of women who engaged in HAC and

those who did not were compared. To identify significant differences between HAC and non-HAC drinkers, chi-square statistic was used. Calculations provided the percent of the population identified as HAC. Binary logistic regression estimated unadjusted odds ratios. Multivariable logistic regression estimated adjusted odds ratios. In this descriptive study, demographic, social, economic, and other factors such as rural or urban residence that have been associated with heavy alcohol use among women living in the U.S. were identified.

Specific Aim 2: Describe alcohol consumption behavior among women age 50 and older using age specific guidelines to examine alcohol consumption patterns of older women (Manuscript 2; Chapter 3). I used the 2012-2016 NSDUH dataset focusing on the association of alcohol consumption patterns and various sociodemographic predictors. I calculated prevalence rates by alcohol consumption pattern, age group, race/ethnicity, household income level, education, residential environment, marital status and health status. I used the chi-square statistic to identify significant differences among each variable and multivariate logistic regression to estimate the differences in the various subsamples of older women. Based on the existing literature, I expected older women who adhere to the National Institute on Alcohol Abuse and Alcoholism (NIAAA) guidelines and are moderate alcohol consumers to be older, White, married, in good health, with a higher household income and education.

Specific Aim 3: Examine changes in alcohol consumption trends among African American (AA) women from 1990 to 2015 using measures that could be compared across time in 6 National Survey on Drug Use and Health data sets (Manuscript 3; Chapter 4). Since non-Hispanic White (hereafter White) women constitute the largest racial and

ethnic group of women in the U.S., trends in alcohol consumption in this group determine the overall trend in alcohol consumption in the U.S. Thus, I estimated the current temporal alcohol consumption trends among AA women related the majority population of women using Cochrane-Armitage test. To verify differences in alcohol consumption patterns identified by the Cochran-Armitage test, I used multivariable logistic regression to estimate changes in alcohol consumption patterns over the years. I hypothesized that (1) the prevalence of not consuming alcohol decreased across the 25-year period; (2) the prevalence of moderate, binge and heavy consumption increased over the same period; (3) the racial disparity in moderate consumption will decrease among AA and White women during the study period; and (4) differences in the prevalence of heavy and binge alcohol consumption between AA and Whites will decrease during the study period.

Background and Significance

Women and Heavy Alcohol Consumption. There are gender differences in the way alcohol is processed within our bodies. Given that women absorb, metabolize and eliminate alcohol differently than men, it is critical that we understand the influence of heavy drinking on the health of women. The following section examines the literature published regarding heavy alcohol consumption among women. Specifically, this section reviews the biological process of consuming alcohol and the physical and mental impact of heavy alcohol consumption among women.

***Biological Factors*.** The concentration of alcohol in the body is determined by the rate of alcohol absorption into the bloodstream, the volume of distribution in the body and how quickly the alcohol leaves the body (Dawson & Archer, 1992). Women absorb and metabolize alcohol differently than men (Graham, Wilsnack, Dawson, & Vogeltanz,

1998; Hill-Kapturczak et al., 2015). Women's bodies contain less water than men of similar body weight (Kwo et al., 1998). This is significant because alcohol is dispersed in water. The more water available within the body, the easier the alcohol is diluted (Kwo et al., 1998). This results in a higher concentration of alcohol going into the bloodstream of women than men, despite drinking the same amount of alcohol.

Another explanation for sex related differences in alcohol consumption is metabolism (Mann et al., 2005; Pfefferbaum, Rosenbloom, Deshmukh, & Sullivan, 2001; Thomasson, 2002). Simply, how the body breaks down alcohol and release the alcohol molecules within the body differs based on gender. For example, Frezza and colleagues examined gender differences in the metabolism of ethanol and found differences in the stomach's capacity to metabolize ethanol (Frezza et al., 1990). This is significant because these particular women in this study had a higher bioavailability of ethanol, which makes the ethanol more toxic in women than men at similar amounts (Frezza et al., 1990). Consistent with previous works, another study found that women had lower rates of alcohol oxidation due to decreased genetic activity, which increases vulnerability to the effects of alcohol more than men (Baraona et al., 2001). Oxidation is the metabolic process of eliminating alcohol from the body. If the body does not get rid of the alcohol, then the alcohol becomes toxic in the body. Since women absorb and metabolize alcohol differently than men, women are at higher risk when consuming the same levels of alcohol. The severity of this risk increases when engaging in heavy alcohol consumption.

Genetics also play a role in the desire to consume alcohol. More specifically, genes contribute to the vulnerability of the adverse effects of alcohol consumption (Kendler et. al., 1992; NIAA, 1998; Ducci & Goldman, 2008). A study of 1030 female

twins revealed greater similarity between identical twins compared with fraternal twins on measures of alcohol consumption, illustrating a genetic association (Kendler et. al., 1992). This finding is similar to a study done by Heath and colleagues (1997), which confirmed genetic associations with alcoholism using a sample of adopted women and their biological parents. While it is known that genetic factors play a role in alcoholism, understanding how genes operate is still a challenge.

Physical Impact of Heavy Alcohol Use. The physical effects of heavy alcohol consumption include both chronic disease and violence. Heavy alcohol use can deteriorate different systems within the body resulting in diseases that are often chronic including alcohol-related liver diseases, cardiovascular diseases, and breast cancer. Alcohol-related liver diseases are caused by heavy alcohol consumption and include fatty liver, alcoholic hepatitis and cirrhosis. The liver is used to filter harmful substances from the body, in that moment alcohol prevents the liver from functioning properly and results in fatty liver. It is common for women to have more severe forms of liver disease, develop alcoholic hepatitis and die of cirrhosis than men (Becker et al., 1996; Lucey, Mathurin, & Morgan, 2009; Raynard et al., 2002; Vernon, Baranova, & Younossi, 2011). O'Shea, Dasarathy and McCullough found that women are twice as likely to develop alcohol-mediated liver toxicity than men (O'Shea, Dasarathy, & McCullough, 2010). Additionally, women develop more severe alcoholic liver disease despite engaging in fewer binge drinking occasions than men (O'Shea et al., 2010). This is consistent with the meta-analyses done by Rehm and colleagues which found liver cirrhosis morbidity and mortality to be significantly associated with women who engage in heavy alcohol consumption (Rehm, Taylor, et al., 2010).

Alcohol consumption has been found to both increase and decrease cardiovascular risk. Ronksley and colleagues completed a meta analyses using 84 studies and found that low and moderate levels of alcohol intake decreased the likelihood of cardiovascular disease, while heavy alcohol consumption increased the risk of cardiovascular disease (Ronksley, Brien, Turner, Mukamal, & Ghali, 2011). This finding was consistent with a previous meta-analyses that found the relationship between alcohol consumption and heart disease to be J-shaped (Corrao, Rubbiati, Bagnardi, Zambon, & Poikolainen, 2000). The J-shape illustrates the positive benefits to heart disease with low to moderate alcohol intake, and then the negative benefits with heavy alcohol consumption. However, among African American women, there are no significant positive benefits associated with alcohol intake at any level (Sempos, Rehm, Wu, Crespo, & Trevisan, 2003).

Lastly, heavy alcohol consumption has been found to increase the risk of breast cancer among women (Ali et al., 2014; S. Graham, 1987; Liu, Nguyen, & Colditz, 2015; Singletary et al., 2001). In a study by Tseng and colleagues, 2% of breast cancer cases among U.S. women were attributed to heavy alcohol consumption (Tseng, Weinberg, Umbach, & Longnecker, 1999). There is a 10% increased risk of breast cancer with each additional 10 grams of alcohol per day, regardless of the type of alcohol consumed (Ellison, Zhang, McLennan, & Rothman, 2001; Key et al., 2006). Many researchers believe ethanol is the main factor (Scoccianti, Lauby-Secretan, Bello, Chajes, & Romieu, 2014) driving the association, since research to date has not found a significant relationship between type of alcoholic beverage or age at first alcoholic drink and risk of breast cancer (Allen et al., 2009; Kisková et al., 2012; Newcomb et al., 2009; Terry et al., 2006; Zhu et al., 2012). However, the specific evidence on the biological mechanisms of

ethanol and its influence on breast cancer is unclear (Scoccianti et al., 2014). To better understand the biological pathways of alcohol leading to breast cancer, researchers are beginning to focus on estrogen. Recent studies have found that heavy alcohol consumption in women causes an increase in specified estrogens that contribute to the development of breast cancer (Newcomb et al., 2013; Park et al., 2014; Romieu et al., 2015).

Mental Impact of Heavy Alcohol Use. Heavy alcohol consumption does not only cause adverse effects to the physical health of the woman but also to her mental health and stability. The literature on the relationship between mental health and heavy alcohol consumption is relatively recent, despite the increase in alcohol dependence in women over the past two decades (Schuckit, 2009). Gender bias played an integral role in the gap of literature on the relationship between mental health and heavy alcohol use, with most studies using male samples and generalizing findings to women (Brady, Grice, Dustan, & Randall, 1993; Greenfield, 2002). The latest literature on the relationship between heavy alcohol consumption and mental health focuses on alcohol use disorders and other psychiatric disorders. Given the distinct clinical treatment plans and standard diagnosis procedures, the focus on such topics is understandable.

***Alcohol Use Disorder*.** Heavy alcohol consumption over time can result in the medical diagnosis of alcohol use disorder. Alcohol use disorder occurs when an individual's consumption of alcohol causes them harm. Such a disorder consists of compulsive alcohol use, lack of control over alcohol intake and being in a negative emotional state when not consuming alcohol (National Institute on Alcohol Abuse and Alcoholism, 2017a). To be diagnosed with alcohol use disorder, warning signs such as

tolerance, withdrawal, impaired control and the inability to decrease alcohol intake are assessed (American Psychiatric Association, 2013). Although it is unlikely for women who binge drink to be diagnosed with alcohol use disorder, it is estimated that 2.5 % of women meet the diagnostic criteria for alcohol dependence (Esser et al., 2014).

Among women with alcohol use disorders, binge drinking and age of onset of alcohol consumption are significant predictors. For example, in a study of women aged 50 years and older, women who were occasional binge drinkers and women who were frequent binge drinkers were significantly more likely than women who engaged in low and moderate drinking to have alcohol use disorder (Chou, Liang, & Mackenzie, 2011). Moreover, in a study by Jenkins and colleagues, women who initiated alcohol consumption before the age of 16 were 3.6 times more likely than women who were later onset users to develop an alcohol use disorder (Jenkins et al., 2011). Additionally, women who experience trauma, physical abuse, suicidal, depression, and panic attacks were more likely to be an early onset user with an alcohol use disorder (Jenkins et al., 2011).

***Other psychiatric disorders*.** Heavy alcohol consumption is not only related to alcohol use disorders, but also has a significant association with other psychiatric disorders (Sinclair, Latifi, & Latifi, 2008). Huntley and colleagues found that in the U.S. 30% of psychiatric inpatients with a clinical diagnosis also has a diagnosis of alcohol misuse and dependence (Huntley, Cho, Christman, & Csernansky, 1998). There is a higher risk of psychiatric disorders such as panic and posttraumatic stress disorder among American women who engage in heavy alcohol consumption as compared to women who do not engage in heavy alcohol consumption (Chou et al., 2011). Women with high levels of alcohol intake are more likely to struggle with agoraphobia as opposed to women with

low and moderate drinking levels (Cox, Swinson, Shulman, Kuch, & Reichman, 1993). Agoraphobia is a type of anxiety disorder in which the individual has severe social fear.

Summary and Gaps in the Current Literature. Given that women absorb, metabolize and eliminate alcohol differently, it is important that we understand the influence of heavy drinking on physical and mental health. While the relationship exists between adverse physical and mental health outcomes and heavy alcohol consumption, it is complex and dynamic. The relationship between women who drink heavily and adverse health outcomes (physical and mental) is bidirectional (Devries et al., 2014). Simply, literature exists for both adverse health outcomes (physical and mental) predicting heavy alcohol consumption and adverse health outcomes being a result of heavy alcohol consumption. This will be a challenge for the field of public health as they decide which factor(s) should be highlighted in prevention and promotion efforts to decrease heavy alcohol consumption among women.

Determinants of Heavy Alcohol Consumption among Women. A variety of factors likely influence the drinking behavior of women; including alcohol drinking-related beliefs, cultural norms, access to alcohol, psychosocial and physical health (Jonas, Dobson, & Brown, 2000). Alcohol consumption patterns among women tend to vary by demographics factors (Plant, 2008). There is a lack of research, both quantitative and qualitative, on American women's heavy alcohol consumption behavior within the general population (Vourakis, 2017). The field of public health could benefit from research that addresses subgroup differences in patterns of heavy alcohol consumption by age, race, and income. The following review examines the literature published regarding the determinants of heavy alcohol consumption among women. Specially, this section

reviews women's heavy alcohol use at different points in the life course, racial differences in heavy alcohol use, the role in income in heavy alcohol use, and other commonly studied contributing factors such as history of trauma, and culture.

Age. The majority of women's heavy alcohol use research has focused on specific age groups (Delker, Brown, & Hasin, 2016; Eigenbrodt et al., 2001; Grant & Dawson, 1997), often younger women and women of childbearing age (Chen & Jacobson, 2012; Jenkins et al., 2011; Tan, Denny, Cheal, Sniezek, & Kanny, 2015; Tsai, Floyd, Green, & Boyle, 2007). Yet, heavy alcohol use may continue throughout life and research suggests that the health consequences increase with age (Blazer & Wu, 2009; Epstein, Fischer-Elber, & Al-Otaiba, 2007). Therefore, it is important to understand the patterns of heavy alcohol use at each age to better understand the health benefits or consequences of alcohol use.

Adolescence. While it is illegal to drink before the age of 21, 12%-14% of American girls in high school reported binge drinking in 2016 (Miech et al., 2017; National Institute on Alcohol Abuse and Alcoholism, 2017b). Most of the research in this age group looks at single occasions of binge drinking as opposed to heavy alcohol consumption. The prevalence of binge drinking among high school girls has slightly decreased from 20% in 2011 and 17% in 2015 (Centers for Disease Control and Prevention, 2013; Kann et al., 2016). Since 1980 to 2005, adolescent girls arrest rates for underage drinking has increased, while their male counterparts rates are declining (Zhong & Schwartz, 2010). In a study using the 2003 National Youth Risk Behavior Survey, women who were binge drinkers were likely to be White and juniors or seniors (Miller, Naimi, Brewer, & Jones, 2007). This is consistent with earlier findings from the National

Survey on Drug Use and Health, which found the highest rate of binge drinking among White women and juniors or seniors (Hingson & White, 2014).

Relationship between adolescent alcohol use and health. Along with infancy, adolescent years are a critical time for brain development (Squeglia et al., 2012). As the adolescent brain develops, it is highly vulnerable and sensitive to the effects of alcohol consumption (Bourque et al., 2016). Since the brain is developing in areas such as impulse control and executive functioning, heavy alcohol consumption or multiple occasions of binge drinking can do more brain damage to in young people (Bourque et al., 2016). Binge drinking during adolescent brain development has short- and long-term health implications. In the short term, binge drinking may cause an adolescent to have lapses in judgment as they are learning the roles and responsibilities of being an adult (Grant & Dawson, 1997; McQueeny et al., 2009). In the long term, binge drinking may cause irreversible brain damage and cognitive deficits (i.e. memory challenges) (Bourque et al., 2016).

Adolescent girls' experiences with binge drinking may be unique to their gender. An experimental study by Pascual and colleagues found adolescent females to be more vulnerable than male adolescents to inflammation in the organs as a result of binge drinking (Pascual, Montesinos, Marcos, Laso, & Guerri, 2017). Consequently, several studies have been done among adolescent girls to further describe the biological effects of binge drinking. A longitudinal study comparing drinking and non-drinking adolescent girls found decreased spatial functioning among those who initiated heavy drinking by the 3-year follow-up, compared to those who did not consume alcohol (Squeglia, Spadoni, Infante, Myers, & Tapert, 2009). Decreased spatial functioning relates to non-

verbal productive memory (Squeglia et al., 2009). Similarly, in a cross-sectional study of adolescents, adolescent girls who recently engaged in binge drinking had 8% thicker cortices in the left frontal regions of the brain than demographically similar girls who were non-drinkers (Squeglia et al., 2012). The thicker cortices are associated with worse attention performances and inhibition (Squeglia et al., 2012).

Childbearing age. In the heavy alcohol consumption literature, women between the ages of 18-44 are categorized often as college age (18-25) or childbearing age (18-44). For this age group, it is common for the literature to use the term excessive alcohol consumption. Excessive alcohol consumption includes heavy alcohol consumption, binge drinking and/or any alcohol intake if the woman is pregnant. In this section of the literature review I will use the terms used by the literature authors with the understanding that the meaning of terms across research articles may not be consistent.

It is common for women in young adulthood to engage in binge drinking more than women in middle and late adulthood (CDC, 2012; Chavez, Nelson, Naimi, & Brewer, 2011; Naimi, Lipscomb, Brewer, & Gilbert, 2003). Data from the College Alcohol Study (CAS) spanning from 1993 to 2001 indicates a significant increase in college women's binge drinking behavior (Wechsler et al., 2002). For example, the number of women who engaged in frequent binge drinking (defined as binge drinking three or more times in the past two weeks) increased from 17% in 1993 to 21% in 2001. From 2011 to 2013 among women 18-44 years old, using data from the Behavioral Risk Factor Surveillance System (BRFSS), 18% of nonpregnant women and 3% of pregnant women engaged in binge drinking (Tan et al., 2015).

Relationship between alcohol use among women of child bearing age and health. In the U.S., abstinence from alcohol is a high public health priority for women of childbearing age (ages 18-44), since there are no safe levels of alcohol use for women who are or may have reason to believe they are pregnant (US Department of Health and Human Services, 2005). Furthermore, it is a Healthy People 2020 objective to increase the percentage of pregnant women reporting abstinence from any alcohol use from 89% to 98% (MCH 11.1), and to increase the percentage reporting abstinence from binge drinking from 95% to 100% (MCH 11.2) (U.S. Department of Health and Human Services, 2011). In the U.S., half of all pregnancies are unplanned and alcohol-related fetal harm can occur before pregnancy is confirmed (Tan et al., 2015). Thus, the CDC advises that alcohol consumption stops when contraception use stops.

Alcohol use during pregnancy may result in an assortment of problems including preterm birth and fetal alcohol spectrum disorders (FASDs). In some instances, alcohol use during pregnancy can be fatal through sudden infant death syndrome (SIDS), miscarriage, or stillbirth. In 2010, pregnancy-related costs (i.e. healthcare, lost productivity) and special education for children with FASDs cost the U.S. $5.5 billion (Green, McKnight-Eily, Tan, Mejia, & Denny, 2016). In the U.S., it is estimated that 2% - 5% of school age children are living with fetal alcohol syndrome (May et al., 2014). Children living with FASDs may experience poor coordination, hyperactive behavior, difficulty with attention, and learning disabilities (Centers for Disease Control and Prevention, 2016). Nevertheless, the consequences of FASDs extend beyond childhood. A study describing adults with FASDs found that 80% of participants were not raised by their biological mother, 60% had trouble with the law (i.e. ever charged, arrested,

convicted), 49% had inappropriate sexual behaviors (i.e. promiscuous behavior) and 35% had alcohol and drug problems (Streissguth et al., 2004).

Middle and Older Adulthood. While women aged 45 to 64 are often referred to as *middle aged* women, and women age 65 and older are referred to as *older women,* the literature on this group is often collapsed into a single category (adult women). In 2003, Naimi and colleagues conducted a study focused on the binge drinking prevalence of Americans (Naimi et al., 2003). Using the BRFSS, the results showed that 14% of women ages 35 – 54 and 5% of women older than 55 engaged in binge drinking in the past month (Naimi et al., 2003). This is consistent with a study by Blazer and colleagues that used National Survey on Drug Use and Health [NSDUH] and found 9% of women aged 50 to 64 and 3% of women aged 65 years or older engage in heavy alcohol consumption (Blazer & Wu, 2009). Research studying binge drinking among middle-aged and older women is growing. This includes studies examining the role of binge drinking screening procedures (Goldstein, Hodgson, Savage, & Walton-Moss, 2015), health consequences (Wilsnack et al., 2013), binge drinking intensity (Naimi, Nelson, & Brewer, 2010), and prevalence among female Medicare recipients (Merrick et al., 2008). Yet, there remains a lack of research that focus on heavy alcohol consumption of middle-aged and older women as distinct groups.

Relationship between alcohol use among middle-aged and older women of and health. As people age they may become more sensitive to alcohol's effects (Blow, 2000). For example, older people's livers metabolize alcohol more slowly than younger people (Redgrave, Swartz, & Romanoski, 2003). A study by Sorocco and Ferrell has shown that heavy alcohol consumption is more likely among older adults with prescribed medication

than older adults without any prescriptions (Sorocco & Ferrell, 2006). This is important because alcohol may affect the body's ability to metabolize and respond to such medication (Sorocco & Ferrell, 2006). Secondly, women are more likely to develop alcohol problems in middle and older adulthood compared to men (Merrick et al., 2008). Third, middle and older women may feel the impact of alcohol more quickly than men, due to the decreasing amount of water in the body (Blow & Barry, 2002).

Race. Alcohol consumption varies across ethnic groups (Caetano, Clark, & Tam, 1998; Haynes et al., 2005; McCabe et al., 2007). Surveys of nationally represented samples generally report that White women have the highest levels of alcohol use, followed by Hispanic women and African American women, while Asian women report substantially lower levels of alcohol use than other racial/ethnic groups (Caetano et al., 1998; Chen & Jacobson, 2012; Collins & McNair, 2002). Considerable evidence suggests that some women in minority groups in the U.S. may be particularly prone to experiencing problems and mortality associated with heavy drinking (Chartier & Caetano, 2010). For instance, African American women and Hispanic women compared to White women, have elevated rates of alcohol-related morbidity and mortality, including motor vehicle crashes, homicide, cirrhosis and general injury (Wilsnack et al., 2013). A few studies that have highlighted the greater risk for negative consequences among minority women, at the same levels of consumption among white women (Herd & Grube, 1993; Jones-Webb, 1998).

Ethnic differences in alcohol consumption among women may be the result of social, historical cultural and psychological factors (Caetano, 1994). Nevertheless, it is important to understand the similarities and differences in alcohol consumption that exist

among women of different ethnic groups. These differences can guide the development of alcoholism prevention and treatment programs to meet the needs of different ethnic groups.

African American women. African American women tend to consume less alcohol and have a higher percentage of abstention from alcohol than White women (Barthwell, 1995; Chartier & Caetano, 2010; Jones-Webb, 1998). According to the 2014 National Survey on Drug Use and Health, 44% of African American women consumed alcohol within the past month compared to 58% of White women (Center for Behavioral Health Statistics, 2016). This trend is the same for lifetime and past year alcohol consumption rates. About 75% of African American women reported ever drinking alcohol in their lifetime and of those drinkers and 59% reported drinking in the past year (Center for Behavioral Health Statistics, 2016). On the other hand, 87% of White women reported ever drinking and of those drinkers 71% reported drinking in the past year (Center for Behavioral Health Statistics, 2016). While African American women are less likely to consume alcohol, it is important to note that binge drinking and heavy alcohol use (as defined in an earlier section) patterns are similar among African American and White women. For example, in 2014, binge drinking in the past month was reported among 24% of White women and 22% of African American women (Center for Behavioral Health Statistics, 2016). Meanwhile, heavy alcohol use among women in the past year was reported among 7% of Whites and 5% of African Americans (Center for Behavioral Health Statistics, 2016).

African American women drinkers tend to have more alcohol related problems than White women. For instance, mortality rates for alcohol related diseases and

disorders were 10% higher among African American women than their counterparts of different ethnicities (Xu, Kochanek, & Murphy, 2010). Similarly, this trend was found in earlier studies in which African American women were more likely to develop and die of liver cirrhosis and other alcohol-related causes than Whites (Galvan & Caetano, 2003; Parrish, Dufour, Stinson, & Harford, 1993). A study by Singh and Hoyart (2000) revealed that African American women are 1.8 times more at risk for developing liver cirrhosis than White women of a similar socioeconomic status (Singh & Hoyert, 2000). Compared with White women with similar drinking patterns, African American women were 5 times more likely to report alcohol dependence symptoms and three times more likely to report having arguments, injury, and occupational, legal and health related problems (Mulia, Ye, Greenfield, & Zemore, 2009).

Cultural factors relating to heavy alcohol consumption among African American women. There are cultural factors surrounding alcohol consumption that are unique to African Americans, both men and women. African Americans tend to prefer liquor, which has a higher alcohol concentration than other alcoholic beverages such as beer (Kerr, Patterson, & Greenfield, 2009). In addition, it is estimated that one-fourth of people of African descent have the alcohol dehydrogenases gene (ADH) which can modify alcohol metabolism and produce a stronger response to alcohol (Gelernter et al., 2014; Scott & Taylor, 2007). This genetic modification may result in the increased severity of toxic effects on the body after alcohol is consumed such as nausea and rapid heartbeat (Scott & Taylor, 2007).

Within the African American culture, there are also protective factors of alcohol consumption. These include parental influences (Clark, Belgrave, & Abell, 2012), strong

ethnic identity (Klonoff & Landrine, 1999) and religion (Brown, Parks, Zimmerman, & Phillips, 2001). In general, African American parents tend to have negative beliefs about alcohol consumption and enforce a strict restriction of alcohol use among their children (Peterson, Hawkins, Abbott, & Catalano, 1994; Zapolski, Pedersen, McCarthy, & Smith, 2014). These patterns of parent-child interaction and beliefs may decrease the likelihood of female adolescent involvement with alcohol (Johnson & Johnson, 1999). A study by Pugh and Bry examined the relationship between ethnic identity and alcohol consumption. Ethnic identity is defined as the degree to which individuals from minority groups identify with their ethnic heritage. The results revealed a strong protective relationship between ethnic identity and alcohol consumption among African American young adults (Pugh & Bry, 2007). Thus, higher levels of ethnic identity were found to be significantly related to lower alcohol use. This finding is consistent with previous research (Brook, Whiteman, Balka, Win, & Gursen, 1998; Caldwell et al., 2004; Herd & Grube, 1993). Lastly, African American women report higher levels of religiosity (Brechting et al., 2010; Galen & Rogers, 2004). A number of studies have found that religiosity is associated with lower rates of alcohol consumption, higher abstinence and decreased risk of problem behavior related to alcohol use, as compared to Whites (Steinman & Zimmerman, 2004; Taylor, Mattis, & Chatters, 1999). Thus, African American women's level of religious participation may serve a protective function, buffering them from higher rates of alcohol use.

In addition to culturally related protective factors, there are also culturally related risk factors. African American women experience more legal, social and financial consequences due to alcohol (Jones-Webb, 1998). African Americans who reported low

to moderate levels of heavy drinking were three times more likely to experience fights, accidents and workplace problems than their counterparts of other races and ethnicities (Mulia et al., 2009). Furthermore, African American neighborhoods are 8 times more likely to have a liquor store compared to White neighborhoods (LaVeist & Wallace, 2000). Among African American women, a study examining ethnic differences in treatment for alcoholism found that although African American women had a later onset of alcohol consumption and treatment, the onset of alcohol related problems occurred earlier than among White women (Hesselbrock, Hesselbrock, Segal, Schuckit, & Bucholz, 2003). African American women had more frequent and severe alcohol related symptoms than Whites (Hesselbrock et al., 2003). This finding is consistent with an earlier study by Wells and colleagues, which found that African American women have less access to alcoholism care and a greater unmet need for care as compared to Whites (Wells, Klap, Koike, & Sherbourne, 2001) Finally, African American women tend to experience higher rates of discrimination and stress than White women, which are significantly associated with consuming alcohol to cope (Caetano & McGrath, 2005; Cooper et al., 2008; Landrine, Klonoff, Corral, Fernandez, & Roesch, 2006; Scott & Taylor, 2007).

Hispanic women. Similar to African American women, Hispanic women are less likely to consume alcohol than White women (Amaro, Whitaker, Coffman, & Heeren, 1990; Hines & Caetano, 1998). According to the 2014 National Survey on Drug Use and Health, 69% of Hispanic women consumed alcohol within their lifetime, compared to 86% of White women (Center for Behavioral Health Statistics, 2016). Among Hispanic women in 2014, 41% were lifetime abstainers, 9% were infrequent drinkers (consuming

less than 12 drinks in her lifetime and none last year), 4% were regular drinkers (consuming more than 12 drinks in her lifetime and none last year), 17% were current infrequent drinkers (fewer than 12 drinks last year) and 29% are current regular drinkers (consumed more than 12 drinks last year) (Center for Behavioral Health Statistics, 2016). Between 2011 and 2014, 10% of Hispanic women engaged in binge drinking in the past year compared to 19% of White women and 8% of African American women (Center for Behavioral Health Statistics, 2016). While the prevalence rates of alcohol consumption are different among Hispanic and White women, the rates of alcohol dependence among these groups are similar (9.8% of Hispanic and 9.6% of Whites) (Walitzer & Dearing, 2006).

Cultural factors relating to heavy alcohol consumption among Hispanic women. The literature on the relationship between Hispanic cultural factors and heavy alcohol consumption primarily focuses on acculturation. Acculturation is a dynamic process that impacts behavior and health outcomes on multiple levels including individual and cultural (Abraído-Lanza, Armbrister, Flórez, & Aguirre, 2006; Carter-Pokras et al., 2008; Elder, 1998). The acculturation model predicts that disease risk among immigrants will shift gradually to resemble their new country's customs, norms, and values (Abraído-Lanza et al., 2006). Acculturation, as a field of research, stems from mortality research among Hispanic adults living in the U.S. (Palloni & Arias, 2004). Early research showed that Hispanic adults were less disabled and had fewer deaths than their White counterparts living in the U.S., despite lower income, education, and access to health care (Hummer, Rogers, Amit, Forbes, & Frisbie, 2000). These findings were consistent across a number of studies and became known as the "Hispanic Paradox" (De La Rosa, 2002; Li

& Rosenblood, 1994; Makimoto, 1998; Singh & Hoyert, 2000). Acculturation provides one explanation of the Hispanic Paradox (Carter-Pokras et al., 2008; Franzini, Ribble, & Keddie, 2001; Palloni & Arias, 2004; Hummer, 2015).

While acculturation can mediate positive changes for Hispanic women such as improved socioeconomic status, independence, and empowerment, acculturation also may serve as a risk factor for heavier drinking (Collins & McNair, 2002). Among Hispanic women, higher acculturation is consistently associated with a greater likelihood of alcohol use, as well as increased frequency and quantity consumed, binge drinking and problems such as dependence (Galvan & Caetano, 2003; Raffaelli et al., 2007). In a national study of Hispanic women, those who associate with non-Hispanics, used English speaking media and developed American cultural values were less likely to abstain from alcohol (Caetano, 1994; Caetano, Ramisetty-Mikler, Floyd, & McGrath, 2006). A study conducted in New York by Welte and Barnes found that being born in the U.S. or having lived in the U.S. during adolescence increased the likelihood of excessive drinking when compared to Hispanic women who were foreign born, spoke Spanish and visited their country of origin regularly (Welte & Barnes, 1985).

There have been a number of studies exploring the underlying concepts of the relationship between acculturation and heavy alcohol consumption among Hispanic women (Alvarez, Frietze, Ramos, Field, & Zárate, 2017; Caetano, 1987, 1994; Castro, Barrera, Mena, & Aguirre, 2014; Zamboanga, Raffaelli, & Horton, 2006). Williams and colleagues attributed heavy alcohol consumption the result of coping with immigration and cultural differences (Williams et al., 2007). However, Caetano and Clark, believed that the increase in Hispanic women's alcohol use has to do with regulation laws. Their

study found that Hispanic women believed that the norms regulating women's alcohol use is stricter in Latin America than in the U.S. (Caetano & Clark, 2003). Lastly, Colling & McNair's study highlights that with acculturation comes new socioeconomic status that may be different than what was previously experienced in their home country. With this new social status, comes new opportunities to engage in alcohol consumption that otherwise were not available to Hispanic women (Collins & McNair, 2002).

Hispanics and African Americans share similar alcohol related consequences which may be related to their life experience as minorities in the U.S. Hispanics experience an increased risk of legal issues related to heavy alcohol consumption, such as divorce, job loss and driving under the influence compared to Whites (Black & Markides, 1993; Canino, 1994; Chartier & Caetano, 2010; Cunradi, Caetano, Clark, & Schafer, 1999). Similar to African Americans, Hispanics are more likely than Whites to be arrested for drunk driving, despite comparable or even lower rates of driving while drunk (Caetano & Clark, 2000; Herd, 1994). These findings may be the result of closer police monitoring of minority neighborhoods or minority visibility in predominantly white settings (Barr, Farrell, Barnes, & Welte, 1993; Herd, 1994; Jones-Webb, 1998). More specifically among Hispanic women, lower income Hispanic women report more intimate partner violence than women of other races at similar socioeconomic statuses (Cunradi et al., 1999). Compared to White women and Hispanic men alcoholics, Hispanic women alcoholics have shown lower rates of alcoholism treatment utilization (Lara, Gamboa, Kahramanian, Morales, & Hayes Bautista, 2005).

Income. Income plays a role in heavy alcohol consumption by providing direct access to resources, services, and environments that can influence alcohol consumption

and frequency (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006). Research has shown that an individual's income level is related to alcohol abstinence (Anderson, 2006; Knupfer, 1989), risk of excessive drinking (Huckle, You, & Casswell, 2010; Karlamangla, Zhou, Reuben, Greendale, & Moore, 2006), drinking frequency (Batty, Lewars, Emslie, Benzeval, & Hunt, 2008; Peters & Stringham, 2006), and access to alcoholism treatment (Ashley, Marsden, & Brady, 2003; Choi, DiNitto, & Marti, 2015).

Drinking patterns, such as the quantity and frequency of alcohol consumption, can be influenced differentially by income. It has been widely accepted that individuals with higher incomes tend to consume moderate amounts of alcohol more frequently while those with lower incomes drink larger quantities during one time period (Bloomfield, Grittner, Kramer, & Gmel, 2006; Casswell, Pledger, & Hooper, 2003; Dawson et al., 2001; Elgar, Roberts, Parry-Langdon, & Boyce, 2005). For instance, Cerda and colleagues conducted a longitudinal study to examine the effect of past year income on the odds of heavy drinking. The findings showed that lower past year income was associated with higher odds of heavy drinking (3+ drinks per day vs light/moderate drinking <1-2 drinks per day) the following year (Cerdá, Johnson-Lawrence, & Galea, 2011). This finding is similar to an earlier study that found the probability of being a current drinker was positively associated with income and being a heavy drinker was inversely associated with income (Dawson et al., 1993).

While the above trends have been confirmed for adults, there is an inverse relationship experienced among adolescents and college aged young adults. For example, there is evidence that adolescents from higher income families are at a higher risk for developing alcohol use disorders (Miller et al., 2007; Rehm, Greenfield, & Rogers, 2001;

Weitzman, Nelson, & Wechsler, 2003). Although previous studies have shown that cost is a barrier of alcohol consumption among adolescents (Farrell, Manning, & Finch, 2003), for adolescents from high income families there may be greater financial resources available to withstand such price barriers (Haynes et al., 2005). This relationship has continued into young adulthood. Humensky examined alcohol purchasing power among college students in the U.S., and found that college students with lower levels of income and disposable money had lower levels of drinking and getting drunk (Humensky, 2010).

Relationship between negative consequences of heavy alcohol consumption and income. Alcohol related consequences vary by income. A study by Singh & Hoyert found that women with family incomes of less than $10,000 had a 2.2 higher risk of cirrhosis mortality compared to women with family incomes of $25,000 or more; alcoholic liver cirrhosis is the most serious medical consequence of chronic alcohol use (Singh & Hoyert, 2000). Reinherz and colleagues followed 360 respondents from 1977-2000, and found that families that were larger and those that were low income were at increased probability of alcohol abuse disorders in early adulthood compared to other families (Reinherz, Giaconia, Hauf, Wasserman, & Paradis, 2000). In addition, low income women were more at risk of higher alcohol dependence compared to higher income women yet higher income women were more at risk of alcohol abuse (Caetano, Baruah, & Chartier, 2011; Ross, 1995) where alcohol abuse is defined as having one or more of the following indicators: drinking resulting in failure to fulfill major role obligations, recurrent drinking in hazardous situations, drinking-related legal problems and continued drinking despite social and interpersonal problems (Caetano et al., 2011).

A study by Keyes and Hasin revealed that individuals with higher incomes were more likely to drive after and while drinking than individuals with lower income (Keyes & Hasin, 2008). This relationship was also tested by Babor and Caetano, who argued that the positive association with drunk driving and income might reflect a bias to the extent that persons with higher income are more likely to have motor vehicles (Babor & Caetano, 2008). It is important to note that while these findings show the increased likelihood of experiencing adverse legal impacts due to alcohol consumption among high income individuals, income may serve as a moderator and lessen the negative impact on their life.

Other determinants. Many factors combine to affect the heavy alcohol consumption rates of American women. There is growing evidence that a broad range of individual, social and environmental factors shape women's opportunities and barriers to engage in binge drinking. Such determinants can have a significant impact on the adverse health effects of heavy alcohol consumption. As research examining binge alcohol consumption grows and further prevention and treatments targeting American women expand, it is important that addressing social determinants remain at the forefront.

Individual determinants. There are significant associations between individual characteristics and binge drinking. Individual characteristics include personality factors that contribute to binge drinking behavior. One such characteristic is impulsive behavior. According to a study by Benjamin and Wulfert, college women who engage in heavy drinking are most likely to be impulsive and advocate for deviant attitudes and behavior (Benjamin & Wulfert, 2005). This is consistent with previous studies that found women who engage in binge drinking are more likely to not only be impulsive but are sensation

seekers and experience emotional instability (Cooper, Frone, Russell, & Mudar, 1995; Grau & Ortet, 1999; Kuntsche, Knibbe, Kuntsche, & Gmel, 2011).

Depression is another determinant of heavy alcohol use among women. A longitudinal study consisting of 1383 women in the Baltimore, MD area revealed that the risk for heavy drinking in women with a history of depressive disorder was 2.60 times greater than the risk in women with no history of depressive disorder (Dixit, 2000). This is consistent with other studies that have found depressive symptoms increase the risk for heavy alcohol use among women (Gea et al., 2013; Utsey, Bolden, Lanier, & Williams, 2007). Nevertheless, while heavy drinking may increase depression, low and moderate drinking may actually decrease depression symptoms (Gea et al., 2013; Haynes et al., 2005; Wang & Patten, 2001). The relationship between alcohol and depression can exist in both directions. Alcohol intake can influence depression and depression can influence alcohol intake. For example, Helzer and Pryzbeck found that among alcoholic women, major depression usually preceded the onset of alcoholism (Helzer & Pryzbeck, 1988). This is contrary to the study by Wilsnak and colleagues, which found that among women, heavy drinking tended to begin after the problems with depression (Wilsnack, Klassen, & Wilsnack, 1986).

Social Relationships. The heavy drinking trajectory can be influenced over time by social interactions and networks. An individual's family environment and peer relationships have been proven to be significantly associated with heavy drinking patterns. Family influences can serve as a protective factor and may continue through adulthood (Barnes & Welte, 1990; Little, Handley, Leuthe, & Chassin, 2009). For example, in a study by Isohanni and colleagues, girls who lived in a home with both

parents were less likely to drink or engage in heavy drinking compared with girls living in a family with absent parent(s) or parental loss (Isohanni, Oja, Moilanen, & Koiranen, 1994). In addition to having both parents present, having a strong relationship with parents and engaging in family activities also served as a protective factor against binge drinking. For example, a study found that adolescent girls who had parents that disapproved of alcohol consumption had less alcohol use and related problems compared to those whose parents never communicated such expectations (Nash, McQueen, & Bray, 2005). Also, having greater involvement in family activities rather than peer activities, may serve as a protective factor for binge drinking among adolescent girls (Williams & Smith, 1993).

Parenting styles such as showing rejection, having a lack of emotional warmth, being unsupportive and poor parental monitoring all contribute to the likelihood of heavy alcohol consumption among girls and women (Cohen, Richardson, & LaBree, 1994; Hoffmann & Bahr, 2014; Kandel, Yamaguchi, & Chen, 1992; Minaie, Hui, Leung, Toumbourou, & King, 2015). A longitudinal study following 9,942 12 years olds over 20 years, found that children of permissive parents or those with neglectful parenting styles, were more likely to be heavy episodic drinkers by the age of 31 (Clark, Yang, McClernon, & Fuemmeler, 2015).

Peer interaction is another social opportunity that influences heavy drinking levels. While culture and parenting styles may mediate its impact, peer drinking is a primary predictor of heavy alcohol consumption, especially among adolescents (Corbin, Vaughan, & Fromme, 2008; Curran, Stice, & Chassin, 1997). For example, Leonard and colleagues found that among women those with a peer network of heavy drinkers were

more likely to be heavy drinkers themselves (Leonard & Mudar, 2000). Such a relationship is bidirectional, thus individuals are able to influence their peers, as well as, be influenced by their peers (Curran et al., 1997).

Lastly, when a social interaction becomes abusive this can lead to significant associations with heavy drinking. Among women, sexual abuse and domestic violence, are two examples of abuse that have been found to be significantly related to heavy alcohol consumption (Cunradi, Caetano, Clark, & Schafer, 1999; Jasinski, Williams, & Siegel, 2000; Kaysen et al., 2007; Simpson, Westerberg, Little, & Trujillo, 1994). Jasinski and colleagues examined the associations among childhood sexual abuse and heavy drinking among African American women. The study findings showed that multiple incidents of sexual abuse, being able to remember the abuse and age at first assault were significant predictors of binge drinking among African American women (Jasinski et al., 2000). This is consistent with the earlier research of Swett and colleagues, which found that higher levels of alcohol problems were significantly related to sexual abuse histories among women (Swett, Cohen, Surrey, Compaine, & Chavez, 1991). This trend is the same for domestic violence. In a study done by Silverman and colleagues, girls who experience dating violence had an increased risk of heavy alcohol consumption (Silverman, Raj, Mucci, & Hathaway, 2001). Moreover, in a study examining alcohol use among recently battered women, women who experienced greater trauma symptoms were more likely to engage in heavy alcohol consumption (Kaysen et al., 2007). Some researchers have theorized that abuse may increase the risk for heavy alcohol consumption related problems because survivors may use alcohol for self-medication and

coping purposes (Simpson et al., 1994; Timko, Finney, & Moos, 2005; Widom & Hiller-Sturmhöfel, 2001; Young, 1992).

Summary and Gaps in the Current Literature. Emerging from this literature are several themes about income, racial and ethnic, and age differences in heavy alcohol consumption. Income plays a role in heavy alcohol consumption and alcohol-related consequences, both positive and negative. Research has consistently shown that people who have less income carry the greatest burden of heavy alcohol consumption, even though people with more income consume moderate amounts of alcohol more frequently. Having more income may provide more access to alcoholic beverages and the necessary resources to deal with related consequences. A consideration of most studies that have examined the relationship between income and alcohol have used income measures taken at one point in time (Benzeval & Judge, 2001). This point-in-time income measurement limits our understanding of this relationship, as the effect of income on health accumulates over the life course (Lynch & Kaplan, 1997). It would be useful for future studies that look at the relationship between income and alcohol consumption to examine various aspects of income including the amount of change in income over time, instability in income and the duration of time an individual is exposed to a specified income strata (Chen, Martin, & Matthews, 2007; Daly, Duncan, McDonough, & Williams, 2002; McDonough, Duncan, Williams, & House, 1997).

While White women consume more alcohol and consume alcohol more frequently, women in minority groups experience more alcohol related problems. Different predictive factors (i.e., education, employment, marital status, religion) have been examined across numerous studies and have established their usefulness in

explaining racial differences in alcohol consumption and heavier drinking (Caetano et al., 1998; Caldwell et al., 2004; Williams & Mohammed, 2009; Witbrodt, Mulia, & Zemore, 2014). As the numbers of people in minority populations continue to grow in the U.S., it would be useful for research of racial and ethnic differences to explore beyond black and white comparisons and continue to focus on the comparative rates of alcohol consumption and alcohol-related problems among racial and ethnic minorities and their levels of acculturation (Caetano, 1987; De La Rosa, 2002; Makimoto, 1998). Lastly, to develop effective prevention and intervention strategies, further research that examines the various biological, historical, social and cultural factors that influence the drinking patterns of women in minority groups is needed.

Most of the current literature that has examined binge alcohol consumption among women has focused on adolescent girls and women of childbearing age. This is likely due to the critical health consequences on the brain and unborn child during these ages. However, many alcohol related health consequences are experienced later in life (i.e. immune system disorders, cancer, muscle and bone damage) and women are living longer with such complications. To increase prevention and wellness across the lifespan, it is useful to study heavy alcohol consumption among women in midlife and at older ages.

CHAPTER 2: Disparities in Heavy Alcohol Consumption among Women in the United States

Introduction

Excessive alcohol consumption in the United States results in negative public health consequences. Among women, it accounts for almost 23,000 deaths and 633,000 years of potential life lost each year in the U.S. (Kanny, Liu, Brewer, & Lu, 2013). The term excessive drinking encompasses how often an individual drinks (frequency) and how much an individual drink at each occasion or time period (intensity). Women are also classified as drinking in excess if they consume any alcohol quantity when they are pregnant because of its effect on the developing fetus (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2008). Moreover, excessive drinking applies to both men and women who consume alcohol when operating a vehicle or machinery, have a medical condition aggravated by drinking alcohol, or are taking medications that interact with alcohol (NIAAA, 2008). A common type of excessive drinking is heavy alcohol consumption (HAC); defined as binge drinking (consumption of more than 4 drinks in 2 hours for women) more than once a week (NIAAA, 2008). In 2010, HAC cost the U.S. $186 billion dollars (Centers for Disease Control and Prevention [CDC], 2016). While research suggests that the prevalence of lifetime, monthly, weekly, and daily drinking among women have steadily increased over the last decade (Vourakis, 2017), there is limited research examining the factors associated with HAC.

Most of the research examining alcohol use among women focuses on binge drinking (Delker, Brown, & Hasin, 2016; Kanny et al., 2013), pregnant women (CDC, 2012; Tan, Denny, Cheal, Sniezek, & Kanny, 2015) and girls and women between the

ages of 12-25 (Brown & Gregg, 2012; CDC, 2013; Gilmore, Lewis, & George, 2015). Examining only binge drinking among women may neglect to consider women who are at the greatest risk of heavy alcohol consumption. Binge drinking more than once a week, or HAC, is likely to have greater health consequences then periodic binge drinking, including injury, chronic disease development, vehicular fatality, and alcohol dependence (Kuntsche & Labhart, 2013; Scott-Sheldon, Carey, & Carey, 2010; Witbrodt, Mulia, Zemore, & Kerr, 2014). The present study is the first to examine the characteristics of HAC among a large diverse population of women in the United States. Study results may help to inform programs intended to reduce the adverse effects of alcohol on women's health.

Physical and Mental Consequences of HAC. HAC is associated with an increased risk of violence and chronic disease. Women engaging in HAC experience an increased risk of sexual assault (Gilmore et al., 2015; Lorenz & Ullman, 2016; Rhew, Stappenbeck, Bedard-Gilligan, Hughes, & Kaysen, 2017) and spousal violence (Devries et al., 2014; Wilsnack, Wilsnack, & Kantor, 2013) compared to women who do not drink heavily. Some researchers have suggested that abuse also increases the risk for heavy alcohol consumption, whereby survivors may use alcohol for self-medication and coping purposes to manage negative emotions (Kenney, Jones, & Barnett, 2015; Windle & Windle, 2015). Among U.S. women, 5% of breast cancer cases are associated with HAC (Boffetta, Hashibe, La Vecchia, Zatonski, & Rehm, 2006). Additionally, in a 10-year follow up study of women living in the U.S. aged 45 and older, there was a significant trend of increased breast cancer risk among women with increased alcohol consumption at the start of the study (Zhang et al., 2007). Moreover, a woman's risk of liver cirrhosis

mortality and morbidity increases with higher levels of alcohol consumption (Rehm et al., 2010).

The literature on the relationship between mental health and heavy alcohol consumption is relatively recent (Schuckit, 2009). HAC is significantly associated with alcohol use disorders (when an individual's consumption of alcohol causes harm) (NIAAA, 2017; Sinclair, Latifi, & Latifi, 2008). HAC is also associated with psychiatric disorders such as panic and posttraumatic stress disorder (Chou, Liang, & Mackenzie, 2011) and depression (Kenney et al., 2015).

Social and Physical Factors Associated with HAC. Family influences can serve as a protective factor and may continue through adulthood (Little, Handley, Leuthe, & Chassin, 2009; Schinke, Fang, Cole, & Cohen-Cutler, 2011). Parenting styles such as showing rejection, having a lack of emotional warmth, being unsupportive, and having poor parental monitoring all contribute to a greater likelihood of heavy alcohol consumption among girls and women in the U.S. (Hoffmann & Bahr, 2014; Minaie, Hui, Leung, Toumbourou, & King, 2015). A longitudinal study following 9,942 12 years old adolescents for over 20 years, found that children of permissive parents or those with neglectful parenting styles were more likely to be heavy episodic drinkers by the age of 31 (Clark, Yang, McClernon, & Fuemmeler, 2015). Peer interaction is another factor that influences drinking levels. While culture and parenting styles may also mediate its impact, it is worthy to note that peer drinking is a primary predictor of heavy alcohol consumption (Li et al., 2017), especially when the peer is a spouse or partner (Corbin, Vaughan, & Fromme, 2008; Cunradi, Todd, & Mair, 2015).

Research has found differences in health outcomes between urban and rural areas (Borders & Booth, 2007; Jackson, Doescher, & Hart, 2006). Most studies portrayed that rural residents have poorer health outcomes (Jaffe, 2015) and less access to health care services (Widmer, Matter, Staub, Schoeni-Affolter, & Busato, 2009). After accounting for people who do not drink alcohol at all, a few studies have found that people living in urban and rural areas drink more heavily than those living in the suburbs (Booth & Curran, 2006; Borders & Booth, 2007). However, Jackson and colleagues (2006) found similar rates of heavy drinking among people living in metropolitan and rural counties (Jackson et al., 2006). These results differ from a Substance Abuse and Mental Health Services Administration (SAMHSA) study that found heavy drinking prevalence to be the highest in small metropolitan counties and the lowest in completely rural counties (Hartley, 2004). A study focused on women found that women living in rural areas were more likely not to drink alcohol and had lower rates of binge and heavy drinking compared to those who lived in urban areas (Booth & Curran, 2006). Thus, research on the associations of heavy alcohol consumption comparing women living in rural and urban areas are mixed and unclear.

Economic Factors Associated with HAC. Income plays a role in HAC. Increased economic resources provide more access to resources, services, and environments that can influence alcohol consumption and frequency (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006). Income is also associated with education and occupational choice, which complicates its relationship with alcohol consumption and subsequent health behaviors. Research has found that income is associated with excessive drinking (Huckle, You, & Casswell, 2010; Karlamangla, Zhou, Reuben, Greendale, &

Moore, 2006), drinking frequency (Batty, Lewars, Emslie, Benzeval, & Hunt, 2008; Peters & Stringham, 2006), and access to treatment for alcohol disorders (Choi, DiNitto, & Marti, 2015). Individuals with higher income tend to drink more frequently and consume smaller quantities of alcohol on most days of the week (moderate drinking) while those with less income tend to drink less frequently but consume larger quantities of alcohol on a few days a week (binge drinking) (Bloomfield, Grittner, Kramer, & Gmel, 2006; Elgar, Roberts, Parry-Langdon, & Boyce, 2005). For example, one study examined the effect of past year income on the odds of heavy drinking. The researchers found that people with lower income in the past year had higher odds of heavy drinking (3+ drinks per day vs light/moderate drinking <1-2 drinks per day) the following year (Cerdá, Johnson-Lawrence, & Galea, 2011).

In contrast, adolescents and college-age adults from families with more income are more likely to consume alcohol. There is evidence that adolescents from higher income families are at a higher risk of developing alcohol use disorders (Miller, Naimi, Brewer, & Jones, 2007). In families with more income, adolescents have greater financial resources to purchase alcohol at will (Collins, 2016). One study found that college students with less income were less likely to engage in binge drinking (Humensky, 2010).

Educational attainment is associated with health literacy, which is associated with health outcomes (Paasche-Orlow & Wolf, 2007). Additionally, education is associated with socioeconomic status which is associated with disease and disability (Gilman et al., 2008). Educational attainment is also associated with alcohol use. Studies have found that people with more education are more likely to engage in moderate alcohol consumption (Huckle et al., 2010; Katikireddi, Whitley, Lewsey, Gray, & Leyland, 2017). Thus,

women with a college degree are less likely to engage in HAC (Lui, Kerr, Mulia, & Ye, 2018). People with low education are more likely not to consume alcohol. However, among those who consume alcohol, they are more likely to engage in HAC (Huckle et al., 2010; Katikireddi et al., 2017). Women who have less than a high school education had a higher probability of heavy drinking (Karlamangla et al., 2006). HAC may be a way to cope with poverty (Glass et al., 2017). The field of public health needs to further understand the role of education (and income) on alcohol consumption as alcohol-related mortality and morbidity are higher among women who have less education and low income (Katikireddi et al., 2017).

Other Demographic Factors that May be Associated with HAC. Most research that has examined HAC among women focused on specific age groups (Delker et al., 2016), often younger women and women of childbearing age (Chen & Jacobson, 2012; Jenkins et al., 2011; Tan et al., 2015). This focus is likely to be due to the critical health consequences on the brain and infant development. Yet, HAC may continue throughout life. Research suggests that the health consequences of HAC increases with age (e.g., immune system disorders, cancer, muscle and bone damage, etc.) (Blazer & Wu, 2009; Epstein, Fischer-Elber, & Al-Otaiba, 2007). There are additional gaps in the literature on age and HAC. First, most of the research that has examined alcohol use among adolescents looks at single occasions of binge drinking rather than HAC. Second, in the U.S., abstinence from alcohol consumption is a high public health priority for women of childbearing age (ages 18-44), since there are no safe levels of alcohol use for women who are or may become pregnant at some point (US Department of Health and Human Services, 2005). Thus, alcohol related literature for women in this age group

includes an assortment of drinking patterns such as HAC, binge drinking and any alcohol consumption if the woman is pregnant.

The interplay between race/ethnicity and health disparities is well established. Women in minority groups have the greatest burden of health disparities. This relationship is the same for alcohol-related health outcomes. HAC varies across ethnic groups (Mulia et al., 2017). Racial/ethnic differences in alcohol consumption may be the result of social, historical, cultural, and psychological factors (Chartier & Caetano, 2010). Surveys of nationally representative samples generally report that white women have the highest levels of alcohol consumption, followed by Hispanic women and African American women, while Asian women report substantially lower levels of alcohol use than other racial/ethnic groups (Chen & Jacobson, 2012). Considerable evidence suggests that some women in minority groups in the U.S. may be particularly prone to experiencing problems and mortality associated with heavy drinking (Chartier & Caetano, 2010). For instance, compared with white women, African American and Hispanic women have elevated rates of alcohol-related morbidity and mortality, including motor vehicle crashes, homicide, cirrhosis and general injury (Wilsnack et al., 2013).

The literature has shown that there are more alcohol-related negative consequences among women in minority groups when consuming the same amounts of alcohol compared with white women (Grant et al., 2012; Jones-Webb, 1998; Mennis & Stahler, 2016). Different predictive factors (e.g., education, employment, marital status, religion) have been examined across numerous studies and have been found to be associated with racial/ethnic differences in alcohol consumption and heavier drinking

(Williams & Mohammed, 2009; Witbrodt, Mulia, & Zemore, 2014). As the population in the United States becomes more diverse, it would be useful for studies to explore racial differences beyond black and white women. Moreover, beyond minority groups, it may be helpful to further understand the role of acculturation on HAC because it may provide a pathway to understanding cultural drinking behaviors (Lee, Stein, Corte, & Steffen, 2018; Raffaelli et al., 2007).

Study Objectives. Although many studies have examined alcohol use among various groups of women, no studies examining the characteristics of women that are associated with HAC were identified. I use a large, nationally representative sample. My study is primarily descriptive. I compare women who are heavy drinkers with women who do not drink heavily. My goal is to identify demographic, social, economic, and other factors such as rural or urban residence that have been associated with heavy alcohol use described in the passages above. Results of my study can help to estimate the prevalence, distribution, and predictors of HAC.

Methods

Overview of Survey. This study uses data from the nationally representative, 2012-2016 National Survey on Drug Use and Health (NSDUH), an annual, cross-sectional survey of non-institutionalized civilians aged 12 and older. Sponsored by SAMHSA, NSDUH provides information on the use, treatment, and consequences of alcohol, drugs, and tobacco use of approximately 67,500 people annually. NSDUH also provides population estimates of substance abuse in the U.S. general population using a multistage area probability sampling method. All participants provided informed consent that enabled them to participate in the survey. Parents or an adult living in the household

may provide consent for those participants under the age of 18. Participants used Computer-Assisted Self-Interviewing (CAI) to complete the one-hour survey and receive an incentive of $30.

For the years 2012-2016, the NSDUH weighted response rates were 68.4%, 69.3%, 71.2%, 71.7%, and 73.0%, respectively. Response reliability was conducted as a part of the 2006 NSDUH using the interview/re-interview method of 3,136 participants (SAMHSA, 2010). A subset of SAMHSA participants in the reliability study were re-interviewed or asked to restate their drinking levels between 5 and 15 days after their initial NSDUH interview which resulted in a 75% weighted percent of consistency and a kappa value of 0.68, which signifies substantial agreement for alcohol measures (Cohen, 1968; SAMHSA, 2010). Moreover, several studies have shown construct validity for the NSDUH questionnaire, including a study by Paschall and colleagues (2010). The study by Paschall et al. found that 88% of the associations between NSDUH estimates of past 30-day binge drinking were at least moderately ($r \geq .30$) associated with per capita alcohol sales in their respective states (Paschall, Ringwalt, & Gitelman, 2010). The rates of alcohol sales and the rates of binge drinking per state moderately matched, such that states with higher alcohol sales had higher binge drinking rates. Other publications have more details about the survey design with the most up-to-date methodological summaries published in 2015 (Center for Behavioral Health Statistics and Quality, 2015).

Analytical Sample. Of the 146,670 women respondents from 2012-2016, this study includes 103,607 women (Figure 3). I included women who were not pregnant, and those who were 18 years and older. I also eliminated respondents with missing responses to one or more of the seven characteristics of interest. Participants with missing responses

were less than 1.5% of the sample. I excluded pregnant women because research has shown that women who are pregnant are likely to substantially under-report alcohol consumption (Ethen et al., 2009).

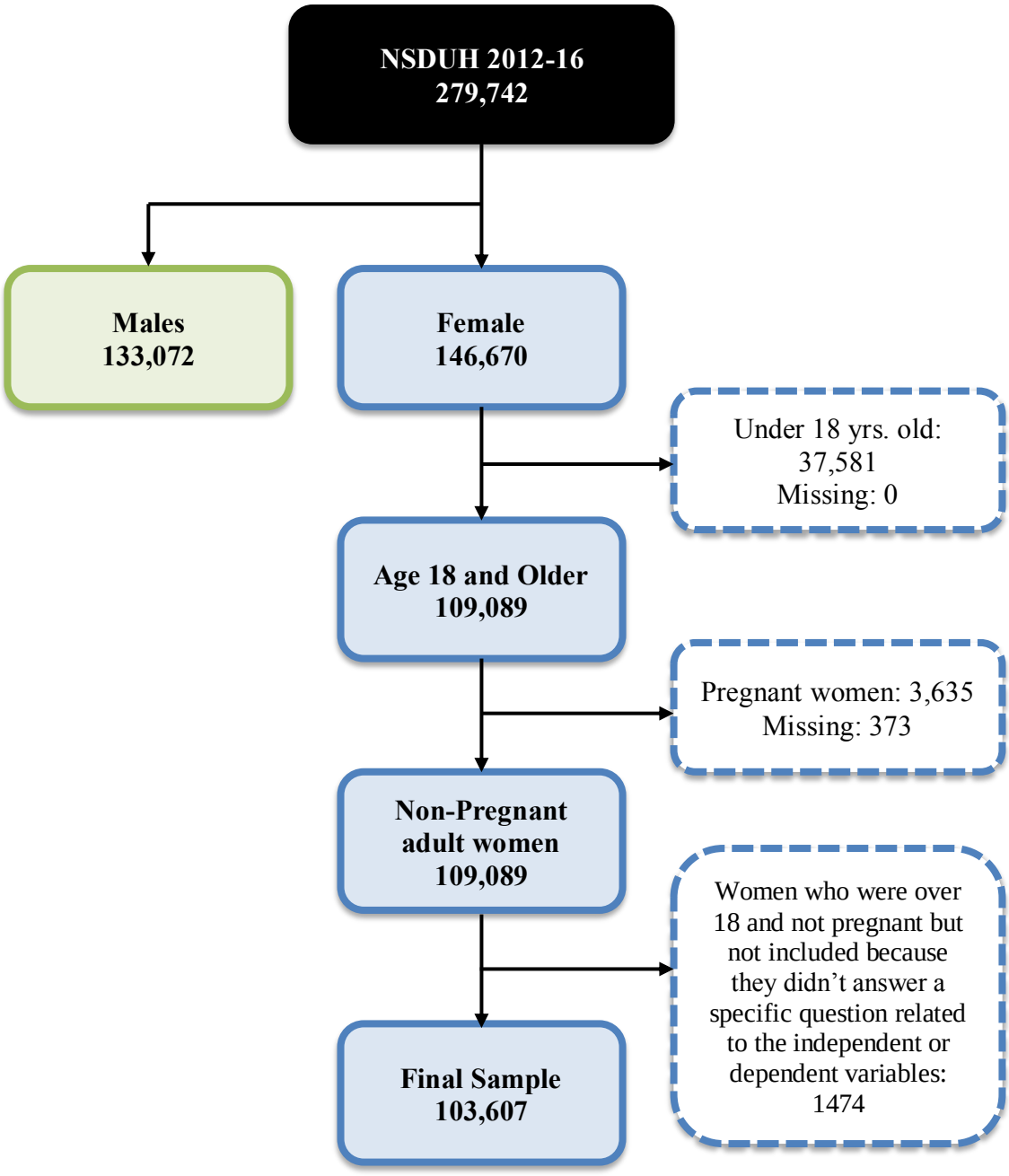

Figure 3. Flow chart of steps used to determine the analytic sample, National Survey on Drug Use and Health, 2012-2016

Measures. The dependent variable for this analysis is "heavy alcohol consumption in the past 30 days" (coded as 1). I defined HAC as binge drinking on 5 or more days in the past 30 days. The definition of binge drinking for women changed during the study period. For the surveys conducted in 2012-2014, binge drinking was defined as having 5 or more drinks at the same time or within 2 hours. As recommended by the National Institute on Alcohol Abuse and Alcoholism (NIAAA Advisory Council), in 2104, the definition for binge drinking became gender specific due to evidence showing that women absorb more alcohol than men, when consuming the same amount of alcohol. Thus, in the 2015 and 2016 surveys, binge drinking was defined as having 4 or more drinks at the same time or within 2 hours. I coded women in all other alcohol consumption categories as non-heavy drinkers (coded 0). Non-heavy drinkers included those who (1) did not drink at all in the past 30 days (2) engaged in moderate drinking (less than 4 drinks a day) in the past 30 days and (3) engaged in binge drinking on 1 to 4 days in the past 30 days.

I examined seven demographic, social, economic, and health characteristics as predictors of HAC: education (Huckle et al., 2010; Naimi, Nelson, & Brewer, 2010), race (Gilman et al., 2008), percent of federal poverty level (McKinney, Chartier, Caetano, & Harris, 2012), age (Grant et al., 2012), marital status (Homish, Leonard, & Kearns-Bodkin, 2006), health status (Okosun, Seale, Daniel, & Eriksen, 2005), and residential environment (Fone et al., 2012). I coded education as: less than a high school diploma, high school graduate (reference group), some college and college graduate. I coded race/ethnicity as non-Hispanic white (hereafter white) (reference group), non-Hispanic Black/African American (hereafter African American), Hispanic and Other. Of the

women identified as “Other” 1% were non-Hispanic Native American/Alaska Native, 0.5% were Non-Hispanic Native Hawaiian/Other Pacific Islander, 4% were non-Hispanic Asian, and 3% were Non-Hispanic more than one race. I defined percent of federal poverty threshold by 3 categories: less than 200% above poverty (lower income), 200-400% above poverty (middle income) (reference group) and more than 400% above poverty (higher income). I used this measure to compare access to financial resources. This measure refers to household income level. I defined age by 5 categories: 18 to 25 years old, 26 to 34 years old, 35 to 49 years old (reference group), 50 to 64 years old and 65 years and older. I defined marital status as: married (reference group), widowed/divorced/separated, and never been married. I defined residential environment as: large metro (reference group), small metro, and non-metro. Residential environment compares population density across geographies, and the definition is based on the revised definitions of metropolitan statistical areas (MSAs) as defined by the Office of Management and Budget (OMB) in June 2003 (OMB, 2003). Large metro has a total population of 1 million or more, a small metro has a total population of fewer than 1 million and non-metro consists of those counties that are not identified as large or small metro. I defined health status as excellent/very good (reference group), good, and fair/poor.

Statistical Analysis. First, I compared all the characteristics between women who engaged in HAC and non-HAC. I used the chi-square statistic to identify significant differences between HAC and non-HAC drinkers. Calculations provided the percent of the population engaged in HAC. Binary logistic regression estimated unadjusted odds ratios. Lastly, I used multivariable logistic regression to fit all covariates on one model

resulting in the adjusted odds ratios. I used SAS Enterprise version 6.1 for data analysis, and statistical significance was determined at $p<0.01$.

Results

Sample Characteristics. The descriptive results are reported in Table 1.1. The sample of 103,607 women represented about 121 million women living in the U.S. each year from 2012 to 2016. Four percent of women engaged in HAC. As shown in Table 1.1, alcohol consumption differed significantly for all seven of the demographic, social, economic, and health characteristics. The largest difference were among education, age, and marital status. Women with less than a high school education had the lowest prevalence of HAC (2.6%); women with some college or an associate degree had the highest HAC prevalence (4.8%). Women ages 65 and older had the lowest prevalence of HAC (1.1%); HAC prevalence was highest among women ages 18-25 years (8.2%). Married women had the lowest prevalence of HAC (2.6%); women who had never been married had the highest prevalence of HAC (7.2%).

Table 1.1 Characteristics of Participants by Heavy Alcohol Consumption Status among Women in the U.S. from the years 2012 to 2016, National Survey on Drug Use and Health (NSDUH)[a]

Variable	Total Women n=103,607	Non-Heavy Drinker n=97,927	Heavy Drinker n=5,680	Percent of Heavy Drinkers
	Column	Column	Column	Row
	n (weighted %)	n (weighted %)	n (weighted %)	weighted %
Age				
18-25	37,202 (13.17)	34,250 (12.59)	2,952 (27.52)	8.16
26-34	18,848 (14.80)	17,745 (14.54)	1,103 (21.21)	5.60
35-49	26,030 (25.21)	24,889 (25.15)	1,141 (26.63)	4.13
50-64	12,839 (26.28)	12,438 (26.57)	401 (19.12)	2.84
65 or older	8,688 (20.54)	8,605 (21.15)	83 (5.52)	1.05
Race/Ethnicity				
White	62,973 (65.07)	58,946 (64.68)	4,027 (74.87)	4.49
African American	13,673 (12.37)	13,158 (12.47)	515 (9.98)	3.15
Hispanic	17,310 (7.82)	9,202 (14.89)	449 (10.95)	2.10
Other[b]	9,651 (14.73)	16,621 (7.97)	689 (4.20)	2.90
Household Income Level				
Lower Income	48,699 (39.13)	46,045 (39.12)	2,654 (39.44)	3.94
Middle Income	33,544 (33.29)	31,795 (33.31)	1,749 (32.69)	3.84
Higher Income	21,364 (27.58)	20,087 (27.56)	1,277 (27.88)	3.95
Education				
Less than High School	13,322 (12.71)	12,812 (12.89)	510 (8.43)	2.59
High School Graduate	28,477 (26.97)	27,061 (27.07)	1416 (24.66)	3.57
Some College/ AA Degree	34,192 (30.09)	31,942 (29.81)	2,250 (37.14)	4.82
College Graduate	27,616 (30.22)	26,112 (30.24)	1,504 (29.77)	3.85
Residential Environment				
Large Metro	46,458 (54.52)	43,928 (54.49)	2,530 (55.15)	3.95
Small Metro	35,950 (30.01)	33,899 (29.92)	2,051 (32.22)	4.19
Nonmetro	21,199 (15.47)	20,100 (15.59)	1,099 (12.63)	3.19
Marital				
Married	41,038 (50.16)	39,729 (50.85)	1,309 (33.27)	2.59
Widowed/Divorced/Separated	17,513 (25.30)	16,731 (25.45)	782 (21.61)	3.34
Never Been Married	45,056 (24.54)	41,467 (23.71)	3,589 (45.12)	7.18
Health				
Excellent/Very Good	63,075 (57.13)	59,517 (56.99)	3,558 (60.50)	4.14
Good	28,339 (28.32)	26,766 (28.36)	1,573 (27.30)	3.77
Fair/Poor	21,193 (14.55)	11,644 (14.65)	549 (12.20)	3.27

[a] The categorical variables were estimated by the chi-square test. All values were significant with a p-value of less than 0.0001. [b] The women identified as "Other" include the following: Non-Hispanic Native American/Alaska Native, Non-Hispanic Native Hawaiian/Other Pacific Islander, Non-Hispanic Asian, and Non-Hispanic more than one race.
Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher Income is more than 400% federal poverty level.

Table 1.2. Association of Sociodemographic Characteristics with Heavy Alcohol Consumption, National Survey on Drug Use and Health (NSDUH) 2012-2016[a]

Characteristic		Heavy Drinking, Odds Ratio (95% Confidence Interval)	
		Unadjusted n=103,607	Adjusted[b] n=103,607
Age	18-25	2.079 (1.828 to 2.364)*	1.441 (1.228 to 1.692)*
	26-34	1.376 (1.166 to 1.623)*	1.234 (1.040 to 1.464)*
	35-49	1.00	1.00
	50-64	0.608 (0.493 to 0.750)*	0.543 (0.439 to 0.672)*
	65 or older	0.242 (0.161 to 0.363)*	0.190 (0.126 to 0.286)*
Race/ Ethnicity	White	1.00	1.00
	African American	0.740 (0.611 to 0.897)*	0.509 (0.416 to 0.621)*
	Hispanic	0.496 (0.401 to 0.615)*	0.408 (0.329 to 0.505)*
	Other[c]	0.676 (0.554 to 0.825)*	0.494 (0.395 to 0.616)*
Household Income Level	Lower Income	1.143 (1.005 to 1.299)*	0.986 (0.858 to 1.132)
	Middle Income	1.00	1.00
	Higher Income	0.953 (0.805 to 1.129)	1.177 (0.990 to 1.400)
Education	Less than High School	0.753 (0.615 to 0.923)*	0.818 (0.662 to 1.011)
	High School Graduate	1.00	1.00
	Some College/ AA Degree	1.305 (1.127 to 1.510)*	1.140 (0.981 to 1.324)
	College Graduate	0.947 (0.809 to 1.108)	0.880 (0.739 to 1.048)
Residential Environment	Large Metro	1.00	1.00
	Small Metro	1.062 (0.929 to 1.213)	1.020 (0.890 to 1.169)
	Nonmetro	0.794 (0.686 to 0.919)*	0.760 (0.652 to 0.884)*
Marital Status	Married	1.00	1.00
	Widowed/Divorced/Separated	1.465 (1.221 to 1.757)*	1.953 (1.620 to 2.354)*
	Never been married	3.258 (2.830 to 3.751)*	2.273 (1.938 to 2.666)*
Health	Excellent/Very Good	1.00	1.00
	Good	0.960 (0.845 to 1.091)	1.132 (0.991 to 1.293)
	Fair/Poor	0.959 (0.790 to 1.165)	1.416 (1.150 to 1.744)*

[a] Weighted analysis

[b] Adjusted for age, race/ethnicity, poverty, education, population density, marital, and health

[c] The women identified as "Other" include the following: Non-Hispanic Native American/Alaska Native, Non-Hispanic Native Hawaiian/Other Pacific Islander, Non-Hispanic Asian, and Non-Hispanic more than one race.

*Significant at a 0.01 level

Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher Income is more than 400% federal poverty level.

Note: Large metro has a total population of 1 million or more, small metro has a total population of fewer than 1 million and nonmetro consists of those counties not identified as large or small metro.

Unadjusted and Adjusted Results. Table 1.2 reports unadjusted (first column of results) and adjusted results (second column of results). In unadjusted analyses, the odds of HAC differed significantly for age, race/ethnicity, household income level, education, residential environment and marital status ($p<0.01$).

In adjusted analyses the odds of alcohol consumption differed significantly for age, race/ethnicity, residential environment, marital status, and health. It was not significant for household income level and education. There was a gradient effect for age. Compared to women ages 35-49, younger women had higher odds of HAC (18-25: odds ratio, OR, 1.44, 95% confidence interval, CI ,1.22-1.69; 26-34: OR 1.23, CI 1.04-1.46) and older women had lower odds of HAC (50-64: OR 0.54, CI 0.43-0.67; 65 and older: OR 0.19, CI 0.12-0.28). Hispanic women (OR 0.40, CI 0.32-0.50) and African American women (OR 0.50, CI 0.41-0.62) had lower odds of HAC than white women. The heavy drinking difference between women living in a small metro and women living in a large metro was not significant. On the other hand, women living in a nonmetro had significantly lower odds of HAC (OR 0.76, CI 0.65-0.88) compared to women living in a large metro. Women who had never been married and those who were widowed, divorced, or separated had higher odds of HAC (OR 2.27, CI 1.93-2.66; OR 1.95, CI 1.62-2.35, respectively) compared with married women. The difference between women in good health and women in excellent/very good health was not significant. On the other hand, women in fair/poor health had significantly higher odds of HAC (OR 1.41 CI 1.15-1.74) compared to women in excellent/very good health.

Discussion

This is one of only a few studies to examine heavy drinking among women living in the United States using a large nationally representative sample of women of all ages. I found that 4% of women engaged in HAC. The prevalence of HAC decreased substantially with age: 8% of women between the ages of 18-25 engaged in HAC while 1% of women 65 and over engaged in HAC.

All the bivariate differences for the seven characteristics had statistically significant associations with HAC, except for self-reported health. The largest significant differences in alcohol consumption were by age, marital status and education (not including college graduate). Although statistically significant likely due to capitalizing on the large sample size, the differences in alcohol consumption by race/ethnicity, household income, and residential environment were small.

In the adjusted analyses the differences among subgroups were larger. Age, race/ethnicity, residential environment, and marital status remained significantly associated with HAC. When adjusting for other characteristics, household income and education were not significantly associated with HAC. On the other hand, there was a significant association between self-reported health and HAC that was not seen in the bivariate analyses. The present study found that women from minority groups had lower odds of HAC, compared with white women. These results are consistent with previous research (Grant et al., 2017; Vourakis, 2017). However, the present study also found that 4% of white women, 3% of African American women and 2% of Hispanic women engage in HAC. This result is important because women in minority groups have lower rates of HAC compared to white women, but heavy drinkers from minority groups are

more likely to experience problems related to HAC (Chartier & Caetano, 2010; Delker et al., 2016).

The present study also found that unmarried women had greater odds of engaging in HAC. This is consistent with previous research that has shown heavier drinking women tend to be single or divorced, while women who are married or widowed are more likely to not consume alcohol or consume alcohol moderately (Dawson, Goldstein, Saha, & Grant, 2015). Research has shown that marriage leads to a reduction in alcohol use and may serve as a protective factor (Dinescu et al., 2016; Leonard & Eiden, 2007). While marriage provides a protective effect for women during the transition to marriage, an opposite effect is seen during the transition out of marriage (Bogart, Collins, Ellickson, Martino, & Klein, 2005; Reczek, Pudrovska, Carr, Thomeer, & Umberson, 2016). Transitioning out of marriage whether by separation, divorce or the death of a spouse has shown to increase alcohol consumption among women (Staff, Greene, Maggs, & Schoon, 2014). This may be due to using alcohol consumption as a way to reduce stress and to cope with their loss (Keyes, Hatzenbuehler, & Hasin, 2011). However, there is research that shows alcohol consumption may decrease following separation, divorce or widowhood if the spouse consumed alcohol heavily (Smith, Homish, Leonard, & Cornelius, 2012).

Strengths and Limitations. The primary strength of this study is that I used a large, nationally representative sample of women that allowed generalization of study findings to the U.S. population of women. Additionally, this study addresses HAC, which includes both the frequency and quantity of alcohol consumption and is an understudied area compared with binge drinking. The study has several limitations. The most notable

limitation is that the non-heavy alcohol group includes a broad range of responses from those that did not consume alcohol at all to being engaged in binge drinking for one to four days in the past 30 days. While the usage of this variable is intentional, the effect of using a broad range of responses to operationalize the non-heavy group, will likely underestimate the prevalence of women who consume problematic amounts of alcohol. Additional studies are needed to better classify heavy alcohol consumers and non-heavy alcohol consumers to better minimize underestimation. Furthermore, the operationalization of HAC varied depending on the year. Since my analysis used the higher threshold (5 drinks) for the binge drinking criteria for women represented in the 2012-2014 NSDUH, my study is likely to have underestimated the prevalence of binge drinking (and consequently HAC) among women compared to using the gender specific threshold of 4 drinks implemented in the 2015 NSDUH and later. Unfortunately, this impact could not be minimized as the dataset did not have variables available that would allow the application of the current definition of HAC to earlier data sets.

NSDUH is based on self-reported participant data. Recollection errors and reporting bias may have occurred. These biases may have caused the prevalence of HAC in this study to underestimate the true prevalence. Recollection errors was a potential problem in this study as participants had to recall events over several weeks, months and the entire year. To minimize the impact of recollection errors, most of the questions about alcohol use were limited to 30 days. Respondents may have under or over reported alcohol use due to stigmas associated with alcohol use which leads to reporting bias. To minimize the impact of response bias, computer-assisted self-interviewing was used. Lastly, NSDUH does not include homeless women not living in a shelter, military

personnel on active duty and residents of institutional group quarters such as jails, although the prevalence of HAC is known to be higher in some of these populations. Estimates from this study should be considered conservative.

Public Health Implications. The demographic description of women engaging in HAC provides opportunities for public health practitioners to design programs to address the needs of women who engage in HAC. Also, to provide opportunities for health care and social service practitioners to include screening procedures to better identify women who engage in HAC. For example, the Community Preventive Service Task Force, an independent, nonfederal, volunteer group of public health and prevention experts recommend electronic screening to identify heavy drinkers. The results of the present study suggest that it may be useful for primary care physicians to participate in electronic screenings. Additionally, one of the Healthy People 2020 goals is to "Reduce substance abuse to protect the health, safety, and quality of life for all, especially children" (U.S. Department of Health and Human Services, 2011). Understanding heavy consumption patterns among women helps us get closer to achieving such a goal. Furthermore, public health researchers can play a critical role in expanding our understanding of heavy drinking among women by using panel data to examine the life course effects of heavy drinking among women.

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CHAPTER 3: Differences in Alcohol Consumption among Older Women

Introduction

Alcohol is the most commonly used substance among older adults (U.S. Department of Health and Human Services, 2017). As individuals age they may become more sensitive to the effects of alcohol (Adminstration on Aging, 2015). Older adults have adverse effects from smaller quantities of alcohol compared to younger individuals (Barnes et al., 2010; Blow & Barry, 2012). Older adults often experience chronic disease and may use multiple prescription medications. Alcohol consumption often exacerbates these health conditions and may negatively interact with administered medications (Barnes et al., 2010). While an increasing number of older adults consume alcohol periodically, there is limited research to help the medical and public health community understand the prevalence of alcohol use and characteristics of older adults who consume alcohol. The limited amount of research may be the result of alcohol consumption studies that used samples that mostly included small numbers of older adults (Moos, Brennan, Schutte, & Moos, 2010). Additionally, prevalence may be underestimated as alcohol consumption related issues among older adults may tend to mimic other disorders such as depression and dementia and are seldomly detected by primary care providers (Moyer, 2013). Also, clinicians are less likely to screen older women for alcohol use due to personal biases and avoidance of certain difficult discussions (Sorocco & Ferrell, 2006). These factors contribute toward the invisibility of alcohol consumption among the older population, thus labelling it an invisible epidemic (Donatelli & Somes, 2014).

Older adults are currently the fastest growing subpopulation in the United States. One in every seven people are over the age of 65; by 2050 it will be close to one in five (Adminstration on Aging, 2015). The majority (55.7%) of the older population are women (U.S. Department of Health and Human Services, 2017). As this population increases, so will associated health issues. Studies that specifically address growth among the older population, have identified that the number of older individuals in need of alcohol related treatment will double in the near future (Satre, 2015; White et al., 2015) Addressing problematic alcohol consumption among older adults is an important issue especially among women who face different health challenges compared with older men (Sacco, Bucholz, & Harrington, 2014). For instance, older women are more likely to live longer, yet they experience increased prevalence of morbidity compared to men; women have been known to develop different chronic diseases than older men (Kelly, Olanrewaju, Cowan, Brayne, & Lafortune, 2016). Older women are more likely to live alone and in poverty (Vlachantoni, 2012). Additionally, older women have physical risk factors that make them susceptible to the negative effects of increased alcohol consumption (Blow & Barry, 2002). For example, women absorb and metabolize alcohol differently than men; thus, women are at higher risk when consuming the same levels of alcohol to that of men (Erol & Karpyak, 2015; Nolen-Hoeksema & Hilt, 2006; Wilsnack, Wilsnack, & Kantor, 2013).

Patterns of Alcohol Consumption among Older Women. Past research shows that the proportion of nondrinkers in the population increases with age and that there is a decrease in social and binge alcohol consumption (Grant et al., 2004). Despite this, the epidemiological evidence on the current estimation of alcohol consumption is unclear

among women age 50 and older (Satre, 2015). Previous research analysis suggests that approximately 60% to 84% of older women do not consume alcohol (Kirchner et al., 2007; Merrick et al., 2008; Moos, Brennan, Schutte, & Moos, 2010). On the other hand, between 4% and 32% consume alcohol excessively (more than 4 alcoholic beverages per occasion) (Kirchner et al., 2007; Merrick et al., 2008; Moos et al., 2010). For example, Moos and colleagues reported that 27% of women ages 75-85 consumed more than 2 drinks per day or 7 drinks per week (Moos et al., 2010). Fink and colleagues found that 17% of women over the age of 65 engaged in harmful alcohol consumption (includes abusive and dependent alcohol consumption) and 33% engaged in hazardous alcohol consumption (consumption that pose risks for medical problems) (Fink et al., 2002). Additionally, Merrick and colleagues found that 4% of women over the age of 65 and enrolled in Medicare engaged in heavy episodic alcohol consumption (4 or more alcoholic beverages on any given day in the past month) (Merrick et al., 2008). The variation in alcohol prevalence rates in the literature among older women may be the result of various definitions of problematic or high-risk alcohol consumption and the usage of gender specific definitions. Different studies may define problematic or high-risk alcohol consumption differently which results in alcohol prevalence rates variation.

Drinking Guidelines and Rationale. The same quantity of alcohol has a greater effect among older women than younger women, primarily due to certain factors related to aging including multiple chronic conditions and the use of multiple prescription medications. For this reason, safe alcohol consumption recommendations are lower for older women than younger women primarily due to the exacerbation of current conditions and interactions with medications (Epstein, Fischer-Elber, & Al-Otaiba,

2007). The National Institute on Alcohol Abuse and Alcoholism (NIAAA) and American Geriatrics Society (AGS) developed clinical guidelines defining risky alcohol consumption for people that are age 65 and older (National Institute on Alcohol Abuse and Alcoholism, 2005). These guidelines are consistent with the nutritional guidelines recommendation that women consume no more than 1 alcoholic beverage a day (U.S. Department of Agriculture and U.S. Department of Health and Human & Services., 2010). Furthermore, the NIAAA and AGS recommend that high-risk or problem alcohol consumption among older women be defined as more than 3 alcoholic beverages per day (NIAAA, 2005). Exceeding such limits is often associated with significant physical, mental and interpersonal problems for older women (NIAAA, 2005).

Risky Alcohol Use and Older Women. In the past, research has shown that moderate alcohol consumption may provide some health benefits (Ronksley, Brien, Turner, Mukamal, & Ghali, 2011; Wilsnack et al., 2013). However recent research studies have shown that there are no health benefits associated with alcohol consumption overall (Griswold et al., 2018). While there may be conflicting literature on the health risks and benefits associated with not consuming alcohol and moderate consumption of alcohol, it has been well established that excessive alcohol consumption is unhealthy for everyone. The current literature suggests that risky alcohol consumption (binge and heavy alcohol consumption) among older women is associated with considerable health challenges (Blazer & Wu, 2009). For example, risky alcohol consumption among older women predicts falls leading to hip fracture (Saitz, 2003), increased hospitalization (Zanjani et al., 2016), and increased depression (Moos, Schutte, Brennan, & Moos, 2004). In a meta-analysis, researchers found that one alcoholic beverage per day was

associated with an elevated risk of liver cirrhosis mortality among women (Rehm et al., 2010). The higher the volume of alcohol intake, the greater the risk (Rehm et al., 2010). The number of older women who are engaged in risky alcohol consumption or drinking more than 2 drinks per day has increased. A study looking at women from 1993 to 2001 showed that 14% of women ages 35 to 54 and 5% of women older than 55 engaged in binge consumption in the past month (Naimi, Brewer, et al., 2003). This is somewhat consistent with a later study by Blazer and colleagues that used the 2005-2006 National Survey on Drug Use and Health [NSDUH] and found 9% of women ages 50 to 64 and 3% of women ages 65 years or older engage themselves in heavy alcohol consumption (Blazer & Wu, 2009). In a recent analysis using the NSDUH, researchers found that past month binge alcohol use among older women (age 50 and older) increased by 44% and past year alcohol use disorders increased by 85% from 2005 to 2014 (Han, Moore, Sherman, Keyes, & Palamar, 2017). In this study, being Hispanic and having a high household income (greater than $75,000 a year) were the factors associated with binge consumption. Being white and having a low household income (less than $20,000 a year) were the factors associated with having an alcohol use disorder (Han, Moore, Sherman, Keyes, & Palamar, 2017).

Demographic Correlations. *Health.* Much of the literature focuses on the consequences or outcomes of excessive alcohol consumption, yet only a few studies exist that associate self-rated health with problematic alcohol consumption (Okosun, Seale, Daniel, & Eriksen, 2005). However, the association between self-rated health and problematic alcohol consumption is widely inconsistent, with some studies showing an association (Vaez & Laflamme, 2003), while others do not show an association (Carlson,

2001). The inconsistent relationship between self-rated health and alcohol consumption may be due in part to the "sick quitter" bias, that suggest older adults that do not consume alcohol may include ex-drinkers who have stopped or cut down their alcohol consumption because of poor health or problems related to alcohol consumption (Dawson, Goldstein, & Grant, 2013). Additionally, the inconsistent relationship may be due partly to the fact that some people with extremely high alcohol consumption die prematurely and are excluded from current prevalence rates.

Race/Ethnicity. Racial/ethnic differences in alcohol consumption may be the result of social, historical, cultural, and psychological factors (Mulia, Ye, Greenfield, & Zemore, 2009). Surveys of nationally representative samples generally report that white women have the highest levels of alcohol consumption, followed by Hispanic women and African American women, while Asian women report substantially lower levels of alcohol use than other racial/ethnic groups (Chen & Jacobson, 2012; Collins & McNair, 2002). While older white women reported more alcohol consumption, older women in minority groups generally reported more problematic alcohol consumption. For example, Blazer and Wu found that binge alcohol consumption among older women were significantly associated with being African American (Blazer & Wu, 2009). In another study of interest, researchers found Hispanic older women had a significantly increased risk for engaging in problematic alcohol consumption compared with white women (Breslow, Faden, & Smothers, 2003). This result is consistent with studies that have shown that African American and Hispanic women have elevated rates of alcohol-related morbidity and mortality, including motor vehicle crashes, homicide, cirrhosis and general injury (Wilsnack et al., 2013).While there have been a few studies that have proven to be

essential in examining race/ethnicity differences in alcohol consumption, there is little research that included older adults.

Marital Status. Peer interaction is another factor that influences alcohol consumption levels. While culture may mediate its impact, peer drinking is a primary predictor of problematic alcohol consumption (Leonard & Eiden, 2007), especially when the peer is a spouse or partner (Kendler, Lönn, Salvatore, Sundquist, & Sundquist, 2016; Fischer & Wiersma, 2012; Levitt & Leonard, 2013). Women who consume problematic amounts of alcohol tend to remain single or even become divorced, while women who are married or widowed are more likely to not consume alcohol or consume alcohol in moderation (Merrick et al., 2008). However, further studies have also found a positive association between alcohol consumption patterns of spouses (Devries et al., 2014; Simon, 2002). For example, a study by Graham and Braun (1999) showed that among older couples (age 65 and older), those who had a spouse that consumed alcohol, were more likely to have higher alcohol consumption rates. Additionally, spouses who share similar alcohol consumption behavior are significantly associated with happiness in their marriage (Homish & Leonard, 2007).

Residential Environment. Research has found several differences in health outcomes between urban and rural areas (Hartley, 2004). Most studies have successfully noted that rural residents have poorer health outcomes (Jaffe, 2015) and less access to health care (Widmer, Matter, Staub, Schoeni-Affolter, & Busato, 2009). After accounting for people who do not consume alcohol at all, few studies have found differences in alcohol consumption between people living in suburban, urban, and rural areas (Booth & Curran, 2006; Borders & Booth, 2007). Jackson and colleagues (2006) found similar

rates of problematic alcohol consumption among people living in metropolitan counties and rural counties (Jackson, Doescher, & Hart, 2006). This result differs from a Substance Abuse and Mental Health Services Administration (SAMHSA) study that found problematic alcohol consumption prevalence to be the highest in small metropolitan counties and the lowest in very rural counties (Hartley, 2004). The results of the research on the associations of heavily alcohol consumption comparing women living in rural and urban areas are mixed. Research in this area is limited. No studies have examined this topic using a sample of older women in the U.S.

Income. Increased economic resources provide more access to resources, services, and environments that can influence alcohol consumption and frequency (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006). Individuals with higher income tend to consume alcohol more frequently and consume smaller quantities of alcohol on most days of the week (moderate drinking); while those with less income tend to consume alcohol less frequently but consume larger quantities of alcohol on a few days a week (binge drinking) (Bloomfield, Grittner, Kramer, & Gmel, 2006; Elgar, Roberts, Parry-Langdon, & Boyce, 2005). For example, in a sample of community-dwelling older adults, higher income was associated with a higher frequency of alcohol consumption, but not with heavy alcohol consumption compared to lower income older adults (Merrick et al., 2008).

Education. Education is associated with health literacy, which is associated with positive health outcomes (Paasche-Orlow & Wolf, 2007). Additionally, education is associated with socioeconomic status, which is associated with disease and disability (Gilman et al., 2008). Education is also associated with alcohol use. Studies have found

that people with more education are more likely to engage in moderate alcohol consumption (Casswell, Pledger, & Hooper, 2003; Huckle, You, & Casswell, 2010; Katikireddi, Whitley, Lewsey, Gray, & Leyland, 2017). Women who have less than a high school education have a higher probability of problematic alcohol consumption (Karlamangla, Zhou, Reuben, Greendale, & Moore, 2006). For example, women over the age of 50 with less than a high school education had the highest likelihood of engaging in binge alcohol consumption compared with women with at least a high school education (Blazer & Wu, 2009).

Study Aims. Although there is evidence that alcohol consumption among older women is increasing, the prevalence assessment may be underestimated because the operationalization of alcohol related measurements in most of the literature does not consider age. Alcohol related problems among older women may develop at consumption amounts much lower than younger women. Thus, there is a vital need to apply age specific guidelines to accurately capture the alcohol consumption patterns among older women. While women who are ages 45 to 64 are often referred to as middle aged women, and women who are age 65 and older are referred to as older women. I defined older women as age 50 and over. Using age 50 and older for the purpose of this research is consistent with established approaches to defining older populations especially in the contexts of health promotion and chronic disease (Centers for Disease Control and Prevention, 2007).

Due to the sparse amount of literature that is available on alcohol consumption behavior among older women, this study is primarily descriptive in nature. I focus on alcohol consumption patterns and several social and demographic correlates (age, race,

household income, education, residential environment, marital status and self-perceived health). Based on the existing literature, I expect older women who adhere strictly to the NIAA guidelines and consume alcohol in moderate quantities to be older, white, married, in good health, with a higher household income and education. My study expands on previously existing research by using a recent nationally representative data set of women ages 50 and over, and by applying age specific alcohol consumption guidelines. The findings from my study can contribute toward the epidemiologic information on alcohol consumption patterns and correlates among older women.

Methods

Data Source. This study uses nationally representative data from the combined 2012-2016 National Survey on Drug Use and Health (NSDUH) public data files to examine the sample characteristics of women who are age 50 and older. Sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA) of the United States Department of Health and Human Services, NSDUH is a national health survey that provides information about the use, treatment and consequences of alcohol, drugs, and tobacco among non-institutionalized U.S. household population age 12 and older. The survey sample design is a stratified, multistage, area probability that is designed to provide population estimates. NSDUH surveys approximately 67,500 people annually, using a combination of face-to-face household interviews by trained staff and computer assisted interviewing (CAI). Participants receive $30 as compensation for the interview, which lasts an hour on average.

The average weighted response rate was 70.72% for the 2012-2016 NSDUH surveys. More specifically, the weighted response rates were 68.4%, 69.3%, 71.2%,

71.7%, and 73.0%, for the 20212-2016 NSDUH, respectively. Various studies have shown construct validity for the NSDUH questionnaire, including a study by Paschall and colleagues in 2010 (Paschall, Ringwalt, & Gitelman, 2010). The study by Paschall et al. found that 88% of the associations between NSDUH estimates of past 30-day binge drinking were at least moderately ($r \geq 30$) associated with per capita alcohol sales in their respective states (Paschall et al., 2010). In this study, states with higher alcohol sales had higher binge drinking rates, such that the rates of alcohol sales and the rates of binge drinking per state moderately matched each other. Reliability of alcohol related questions were confirmed with a sample of 3,136 participants during the 2006 NSDUH, by using the interview/re-interview method. Five to 15 days after their initial NSDUH interview, a subset of SAMHSA respondents participated in the reliability study. During the reliability study, participants were re-interviewed or asked to restate their alcohol consumption resulting in a 75% weighted percent of consistency and a kappa value of 0.68, which indicates substantial agreement (Cohen, 1968; Substance Abuse and Mental Health Services Administration, 2010). Other existing publications have reported on the specifics surrounding the survey design with the most up to date methodological summaries published in 2015 (Center for Behavioral Health Statistics and Quality, 2015).

Analytical Sample. Of the 146,670 women respondents from 2012-2016, this study includes 21,178 50 years old and older. I eliminated certain respondents with missing responses to one or more of the seven characteristics of interest. Participants with missing responses were less than 1.6% of the sample. Figure 4 shows the inclusion and exclusion criteria used to identify the analytic sample.

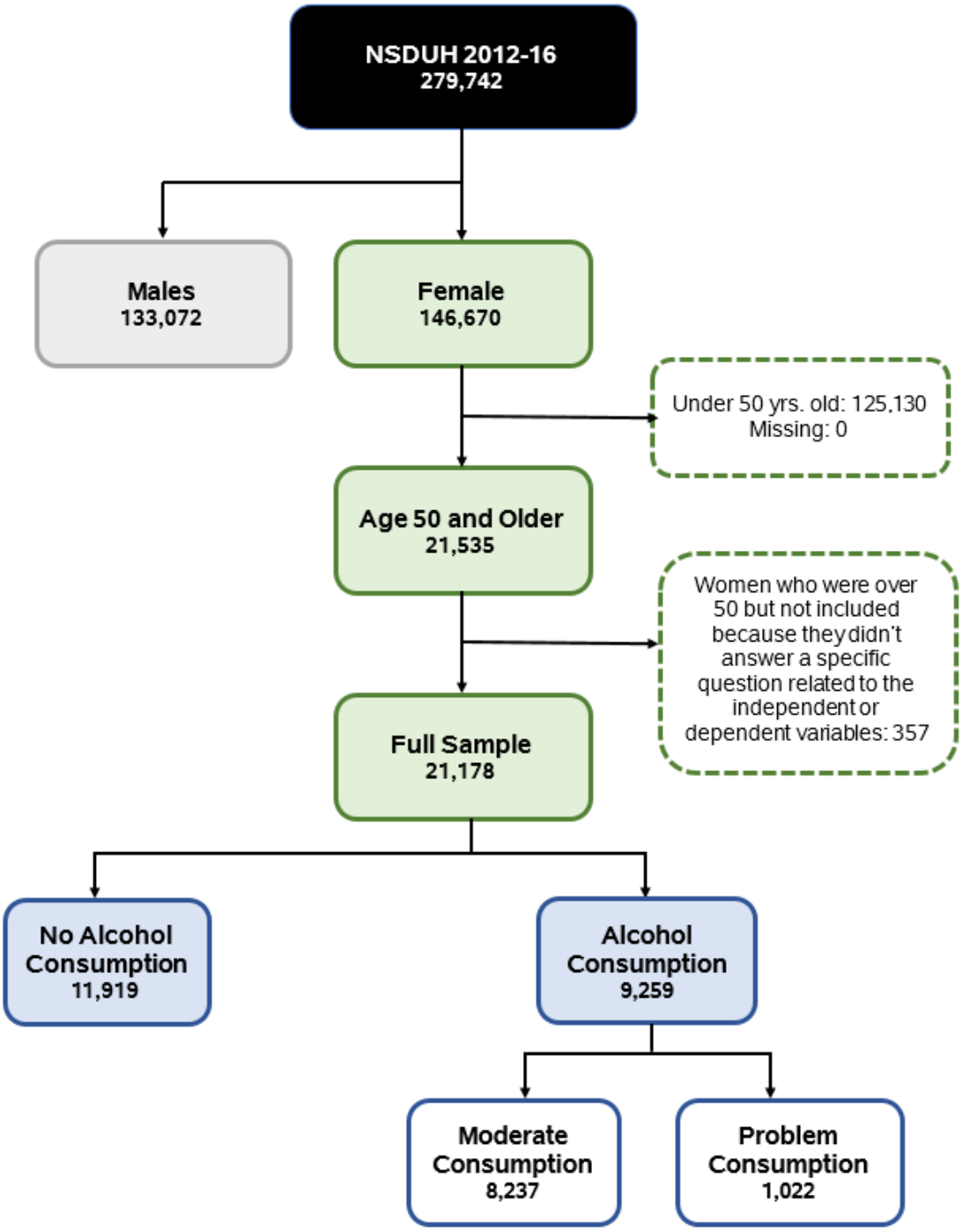

Figure 4. Flow chart of steps used to determine the analytic sample, National Survey on Drug Use and Health, 2012-2016

Measures. ***Main Outcome Variable.*** Alcohol consumption is a categorical variable. The categories are based on the American Geriatric Society's clinical guidelines for alcohol consumption (NIAAA, 2005). The categories are no alcohol consumption, moderate consumption, and problem consumption. To identify alcohol consumption, participants responded to the following question "On days that you drank during the past 30 days, how many drinks did you usually have? Count as a drink a can or bottle of beer; a wine cooler or a glass of wine, champagne or sherry; a shot of liquor or a mixed drink or cocktail."

Problem Consumption. I defined problem consumption as drinking 4 or more drinks in a single day, anytime in the past 30 days. Problem consumption includes both binge drinkers and heavy drinkers. Binge consumption for women is having 4 or more drinks at the same time or within 2 hours (NIAA, 2008). Heavy consumption is binge drinking on 5 or more days in the past 30 days (NIAA, 2008). I coded problem consumption as 3 when calculating the prevalence and as 1 in both logistic regressions.

Moderate Consumption. I defined moderate consumption as drinking between 1 and 3 drinks on a single day, anytime in the past 30 days. I coded moderate consumption as 2 when calculating the prevalence and as 0 in the logistic regression.

No Consumption. I defined no consumption as no alcohol use on any day in the past month. I coded no consumption as 1 when calculating the prevalence and as 0 in the logistic regression.

Predictor Variables. I examined seven demographic, social, economic, and health characteristics as correlates of alcohol consumption patterns: age (Epstein et al., 2007), race (Gilman et al., 2008), percent of federal poverty level (McKinney, Chartier, Caetano, & Harris, 2012), education (Huckle et al., 2010), residential environment (Fone et al., 2012), marital status (Homish, Leonard, & Kearns-Bodkin, 2006) and health status (Okosun et al., 2005). I defined age by 2 categories: 50 to 64 years old (reference group) and 65 years and older. My analysis of the 2012-2016 NSDUH dataset was limited specifically to the public release files which only provides categorical variables for age. The two categories used in this study were the only two provided for older women. I coded race/ethnicity as non-Hispanic white (hereafter white) (reference group), non-Hispanic Black/African American (hereafter African American), Hispanic and Other. Of the women identified as "Other," 1% is Non-Hispanic Native American/Alaska Native, 0.2% is Non-Hispanic Native Hawaiian/Other Pacific Islander, 2% is Non-Hispanic Asian, and 3% is Non-Hispanic more than one race. I defined percent of federal poverty threshold (FPT) by 3 categories: less than 200% of the FPT (lower income), 200-400% of the FPT (middle income) (reference group) and more than 400% above the FPT (higher income). I used this measure to compare access to financial resources. This measure refers to household income level. I coded education as less than a high school diploma, high school graduate (reference group), some college and college graduate. I defined residential environment as large metro (reference group), small metro, and non-metro. Residential environment compares population density across geographies and the definition is based on the revised definitions of metropolitan statistical areas (MSAs) defined by the Office of Management and Budget (OMB) in June 2003 (OMB, 2003).

Large metro has a total population of 1 million or more, small metro has a total population of fewer than 1 million and non-metro consists of those counties not identified as large or small metro. I defined marital status as married (reference group), widowed/divorced/separated, and never been married. I defined health status as excellent/very good (reference group), good, and fair/poor.

Statistical Analyses. First, I compared all the characteristics found among women age 50 and older. I calculated prevalence by alcohol consumption pattern, age group, race/ethnicity, household income level, education, residential environment, marital status and health status. I used the chi-square statistic to identify significant differences among each variable. I used multivariate logistic regression to estimate the differences in the various subsamples of older women. The first regression analysis examines the factors that are associated with problem consumption compared to no alcohol consumption. The second regression analysis examines the factors that are associated with problem consumption compared to moderate consumption. Each of the subsample analyses controlled for age group, race/ethnicity, household income level, education, residential environment, marital status and health status. I used SAS Enterprise version 6.1, proc surveylogistic for data analysis and statistical significance was determined at $p<0.01$; all analyses were weighted.

Results

Prevalence of Alcohol Consumption. The nationally representative descriptive results are in Table 2.1. Table 2.1 shows information representing all women over the age of 50 living in the U.S, with a sample of 21,315 older women. Overall, 44% of older women reported consuming alcohol in the past month.

Table 2.1. Characteristics of Participants by Alcohol Consumption among Older Women (50 and older) in the U.S. from the years 2012 to 2016, National Survey on Drug Use and Health (NSDUH)[a]

Variable	All Women n= 21,315	No Consumption n=11,919	Moderate Consumption n=8,237	Problem Consumption n=1,022
	n (column %)	n (column %), [row%]	n (column %), [row%]	n (column %), [row%]
Age				
50-64	12644 (56)	6438 (50), [51]	5371 (62), [42]	835 (79), [7]
65 or older	8534 (44)	5481 (50), [64]	2866 (38), [34]	187 (21), [2]
Race/Ethnicity				
White	15379 (73)	7774 (66), [51]	7030 (86), [46]	575 (56), [4]
African American	2377 (11)	1668 (14), [70]	587 (7), [25]	122 (12), [5]
Hispanic	2058 (10)	1477 (13), [72]	363 (4), [18]	218 (22), [11]
Other[b]	1364 (6)	1000 (8), [73]	257 (3), [19]	107 (10), [8]
Household Income Level				
Lower Income	7169 (33)	5296 (43), [74]	1436 (17), [20]	437 (40), [6]
Middle Income	6474 (31)	3711 (32), [57]	2481 (30), [38]	282 (27), [4]
Higher Income	7535 (37)	2912 (25), [39]	4320 (53), [57]	303 (33), [4]
Education				
Less than High School	3083 (14)	2495 (21), [81]	412 (5), [13]	176 (15), [6]
High School Graduate	6659 (31)	4232 (34), [64]	2024 (24), [30]	403 (39), [6]
Some College/ AA Degree	5798 (27)	3015 (25), [52]	2485 (30), [43]	298 (29), [5]
College Graduate	5638 (28)	2177 (20), [39]	3316 (41), [59]	145 (17), [3]
Residential Environment				
Large Metro	8807 (51)	4684 (49), [53]	3670 (55), [42]	453 (55), [5]
Small Metro	7234 (31)	4112 (31), [57]	2799 (31), [39]	323 (28), [4]
Nonmetro	5137 (18)	3123 (20), [61]	1768 (14), [34]	246 (17), [5]
Marital				
Married	11293 (55)	5741 (50), [51]	5064 (63), [45]	488 (50), [4]
Widowed/Divorced/Separated	8276 (38)	5199 (43), [63]	2647 (31), [32]	430 (40), [5]
Never Been Married	1609 (7)	979 (7), [61]	526 (6), [33]	104 (10), [6]
Health				
Excellent/Very Good	10485 (50)	4636 (39), [44]	5415 (66), [52]	434 (44), [4]
Good	6338 (30)	3965 (33), [63]	2036 (25), [32]	337 (35), [5]
Fair/Poor	4355 (20)	3318 (28), [76]	786 (9), [18]	251 (21), [6]

[a] The categorical variables were estimated by the chi-square test. All values were significant with a p-value of less than 0.0001.

[b] The women identified as "Other" include the following: Non-Hispanic Native American/Alaska Native, Non-Hispanic Native Hawaiian/Other Pacific Islander, Non-Hispanic Asian, and Non-Hispanic more than one race.

Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher Income is more than 400% federal poverty level.

Note: Large metro has a total population of 1 million or more, small metro has a total population of fewer than 1 million and nonmetro consists of those counties not identified as large or small metro.

Note: All percentages are weighted.

The weighted sample showed that although the sample was evenly split among women ages 50-64 and 65 and older (column %), younger women had a higher prevalence of alcohol consumption (moderate and problem) than older women (row %). For example, of all the women age 65 and older, 2% (row %) engaged in problem alcohol consumption and 34% (row %) engaged in moderate alcohol consumption. Of all women ages 50-64, 7% (row %) were engaged in problem alcohol consumption and 42% (row %) were engaged in moderate alcohol consumption.

White women have a higher prevalence of consuming alcohol relative to African American and Hispanic women (50% versus 30%, 29%, respectively). Among older women who consume alcohol, Hispanic (11%) and African American (5%) women had a higher prevalence of problem consumption than white women (4%). However, a greater percentage of white women (46%) had moderate alcohol consumption than African American (25%) and Hispanic (18%) women. A much higher prevalence of women with higher income consumed alcohol moderately (57%) compared with women with lower income (20%). Furthermore, older women with less than a high school education had a higher prevalence of not consuming alcohol (81%) compared to women with a college education (39%). On the other hand, older women with a college education had a greater prevalence of moderate alcohol consumption (59%) compared to older women with less than a high school education (13%).

Adjusted Results. Adjusted odds ratios of problem consumption relative to no alcohol consumption are shown in the first column of results in Table 2.2. Women who were age 65 and over had 71% lower odds of problem consumption of alcohol (odds ratio, OR, 0.29, 95% confidence interval, CI 0.23-0.37) compared to women ages 50 to

64. Compared to white women, Hispanic women were more likely to engage in problematic alcohol consumption (OR 2.16, CI 1.69-1.76). College graduates (OR 0.55, CI 0.41-0.71) and women with less than a high school education (OR 0.61, CI 0.46-0.80) were less likely engage in problem consumption, relative to women with high school level education. Women who were not married had greater odds of problem alcohol consumption (Widowed, divorced, separated: OR 1.28, CI 1.05-1.56; Never been married: OR 1.49, CI 1.11-2.01) compared to married women. Women who were in poorer health had 25% lower odds of problem consumption of alcohol (OR 0.75, CI 0.60-0.94) compared with women in excellent or very good health conditions.

Adjusted odds ratios of problem consumption relative to moderate consumption are shown in the second column of results in Table 2.2. Women who were age 65 and over had had 55% lower odds of problem consumption of alcohol (OR 0.45, CI 0.35-0.57) compared to women age 50 to 64. Compared to white women, Hispanic women had 5 times greater odds (CI 3.86-6.61) and African American women had 1.5 times greater odds (CI 1.11-2.04) of having problem alcohol consumption. Women with low income had higher odds of problem alcohol consumption (OR 1.44, CI 1.14-1.83) than those with high income. More education was associated with lower odds of being a problematic consumer of alcohol compared to high school graduates. For instance, women who had a college degree had 71% lower odds of having problematic alcohol consumption (OR 0.29, CI 0.22-0.39) than women with a high school degree. Women who were not married had greater odds of problem consumption of alcohol (Widowed, divorced, separated: OR 1.29, CI 1.04-1.60; Never been married: OR 1.54, CI 1.10-2.16) compared to married women. Poorer health was associated with greater odds of problem

consumption of alcohol (Good: OR 1.55, CI 1.26-1.92; Fair/Poor: OR 1.75, CI 1.35-2.27) than women in excellent or very good health status.

Table 2.2. Logistic Regression Analyses of Patterns of Alcohol Consumption among Older Women (50 and older) in the U.S. from the years 2012 to 2016, National Survey on Drug Use and Health (NSDUH)[a]

	Patterns of Alcohol Consumption	
Predictor	**Problem vs. None n = 12,941 OR (95% CI)**	**Problem vs. Moderate n = 9,259 OR (95% CI)**
Age		
50-64	Reference	Reference
65 or older	0.29 (0.23 – 0.37)**	0.45 (0.35 – 0.57)**
Race/Ethnicity		
White	Reference	Reference
African American	0.94 (0.72 – 1.22)	1.51 (1.11 – 2.04)**
Hispanic	2.16 (1.69 – 1.76)**	5.05 (3.86 – 6.61)**
Other [c]	0.96 (0.77 – 1.19)	4.92 (3.24 – 7.47)**
Household Income Level		
Lower Income	0.96 (0.77 – 1.19)	1.44 (1.14 – 1.83)**
Middle Income	Reference	Reference
Higher Income	1.57 (1.24 – 2.00)**	0.94 (0.74 – 1.20)
Education		
Less than High School	0.61 (0.46 – 0.80)**	1.08 (0.79 – 1.48)
High School Graduate	Reference	Reference
Some College/ AA Degree	0.89 (0.72 – 1.10)	0.61 (0.49 – 0.77)**
College Graduate	0.55 (0.41 – 0.71)**	0.29 (0.22 – 0.39)**
Residential Environment		
Large Metro	Reference	Reference
Small Metro	0.89 (0.73 – 1.09)	0.93 (0.75 – 1.14)
Nonmetro	0.86 (0.68 – 1.08)	1.16 (0.90 – 1.49)
Marital		
Married	Reference	Reference
Widowed/Divorced/Separated	1.28 (1.05 – 1.56)**	1.29 (1.04 – 1.60)*
Never Been Married	1.49 (1.11 – 2.01)**	1.54 (1.10 – 2.16)**
Health		
Excellent/Very Good	Reference	Reference
Good	0.98 (0.90 – 1.20)	1.55 (1.26 – 1.92)**
Fair/Poor	0.75 (0.60 – 0.94)*	1.75 (1.35 – 2.27)**

[a] Weighted analysis [b] Adjusted for age, race/ethnicity, poverty, education, population density, marital, and health
Note: Problem alcohol consumption refers to drinking 4 or more alcohol drinks in a single day, anytime in the past 30 days.
Note: Moderate alcohol consumption refers to drinking between 1 and 3 alcohol drinks on a single day, anytime in the past 30 days.

Discussion

Among older women, the prevalence of alcohol consumption is increasing in the U.S. Yet, little is known about the current estimates and the demographic, social, economic, and health characteristics of women who engaged in problematic consumption of alcohol. My analysis addresses this gap in the literature by examining alcohol consumption patterns and various demographic, social, economic, and health correlates. My measure of alcohol consumption was consistent with NIAA recommendation for older women (NIAAA, 2005). This study showed that older women (65 and older) were more likely to adhere to the NIAA guidelines and consume little to none alcohol. Consistent with my expectations, characteristics of problematic consumers of alcohol were being in a racial/ethnic minority group (Dawson, Goldstein, Saha, & Grant, 2015), low income (Glass et al., 2017), and less education (Gilman et al., 2008).

My study contributes to the literature by focusing on women age 50 and older, as well as, providing evidence that relationships found in younger women are similar among a nationally representative older women (Centers for Disease Control and Prevention (CDC), 2012; Kuntsche, Knibbe, Gmel, & Engels, 2006; Tan, Denny, Cheal, Sniezek, & Kanny, 2015). Additionally, my study contributes to the literature by using a nationally representative sample of older women living in the U.S, unlike previously executed research that have primarily used community surveys (McCaul et al., 2010; Sacco et al., 2015).

An unexpected result in the present study is the high prevalence rate and much greater likelihood of engaging in problematic alcohol consumption among Hispanic older women. This is consistent with an earlier study by Blazer and Wu, in which 5.6% of

older Hispanic women engaged in binge alcohol consumption (5 or more drinks on the same occasion) in 2005 and 2006 (Blazer & Wu, 2009). Most of the early research in this area shows that Hispanic women typically do not consume alcohol or engage in moderate alcohol consumption (Caetano, Clark, & Tam, 1998; Randolph, Stroup-Benham, Black, & Markides, 1998). However, results of the present study and several other recent studies show higher problem consumption rates among Hispanic women (Han et al., 2017; McCabe, Schaefer Solle, Peragallo Montano, & Mitrani, 2017; Ornelas et al., 2016). For example, using a community sample of Hispanic women, researchers found that 19% were engaged in high risk drinking as defined by the CAGE (CAGE is acronym for the 4 question survey and refers to cut, annoyed, guilty, eye-opener) alcohol screening assessment (McCabe et al., 2017). This result is similar to a 2016 study in which 19.3% of Hispanic women were engaging in binge alcohol consumption (Ornelas et al., 2016). While these studies showed an increasing rate of binge drinking among Hispanic women, their participants were not limited to older women. More research on problematic alcohol consumption among older Hispanic women is needed to understand the various roles such as culture, and acculturation shaping patterns of alcohol consumption.

Strengths and Limitations. The strength of this study is that I made use of age specific definitions of alcohol consumption. Previous studies addressing older women and alcohol have often used the standard definitions of alcohol consumption for problem drinking including binge drinking and heavy drinking. These definitions do not reflect special considerations facing older adults such as increased sensitivity to alcohol, increased health problems and adverse interactions with medications (NIAAA, 2010). The present study used definitions based on clinical guidelines for older adults, which

helps to minimize the underreporting of problem drinking among this population. The NSDUH survey provides one of the largest samples of substance use among women who are within the age range of 50 and older that allows for analysis by race and ethnic groups. NSDUH has high response rates and good validity and reliability. Also, the NSDUH uses computer assisted self-interviewing to minimize reporting bias.

This study has several limitations. NSDUH data was obtained by self-report and may be susceptible to bias due to stigmas associated with alcohol consumption. Due to stigma, alcohol consumption is often underreported among older women (Blow, 2000). Thus, the findings may have underestimated problem drinking among older women. However, the 2012-2016 NSDUH studies incorporated audio computer assisted self-interviewing technology, which may minimize stigma and under reporting. The findings are based on cross-sectional national surveys and can confirm changes in prevalence and associations but cannot provide casual relationships between alcohol use and the impact of key factors on these relationships. For example, it is possible that older women who consume problematic amounts of alcohol are more likely to die at younger ages and are less represented in samples of older people. This may cause an underestimation of older women who engage in problematic alcohol consumption. On the other hand, older adults that do not consume alcohol may include women who have stopped alcohol consumption because of their poor health or problems related to alcohol (sick quitter) (Shaper, Wannamethee, & Walker, 1988). This may cause an overestimation of older women who do not consume alcohol. But, because NSDUH measures could not capture such individuals, I can only indicate associations between health and alcohol consumption, not causality. Additionally, while I was able to examine a number of demographic, social,

economic, and health correlates, the NSDUH does not allow for an exhaustive examination of interpersonal (e.g. personality and life experiences) or contextual (e.g. neighborhood and alcohol outlets) factors that may be of relevance to both older women and alcohol consumption. For example, in the public dataset, age was limited to 50-64 and 65+. It would be useful for future studies to sample subgroups of older women by age, e.g., 65-74, 75-84, and 85+ to further understand intergroup differences among older women. Lastly, the survey does not include women who reside in an institutional setting, e.g., nursing homes, or those who were homeless. Thus, these findings do not apply to them, despite some settings containing a higher prevalence of alcohol use than the broader community. For example, in a study using a national sample of homeless older adults over the age of 50, 24% had a current alcohol problem and 51% had a lifetime alcohol problem (Dietz, 2007).

Public Health Implications. This study contributes to the limited literature on alcohol consumption among older women using a nationally representative sample. Many older women tend to not consume alcohol; however, the field of public health and medical practitioners should not overlook older women who engage in alcohol consumption, especially problematic consumption. By 2060, the number of Americans over the age of 65 will have doubled and will represent almost a quarter of the population (Mather, Pollard, & Jacobsen, 2009). Not only will there be a larger population of older Americans, they will be much more diverse, with minority groups consuming half of the aging population (Mather et al., 2009). More specifically, as the baby boomer generation age, the number of older adults consuming alcohol is projected to grow (Breslow, Castle, Chen, & Graubard, 2017). Older women in minority groups were more likely to engage

in problematic alcohol consumption. Further research is needed to understand alcohol consumption among women in racial and ethnic minority groups.

This study further provides support to dispel the myth that older women do not engage in problematic drinking. It would be useful for future research to examine who and when women decide to not drink alcohol or stop consumption as they get older. And for those that do consume alcohol, how the challenges of culture/life influence women's use of alcohol for enjoyment or coping mechanism. While older women engaging in problem alcohol consumption may have barriers to getting help (i.e., isolation, shame and stigma), research has positively shown that self-help groups are helpful (Cunningham & Breslin, 2004; Day, Copello, & Hull, 2015; Delker, Brown, & Hasin, 2016). The results of the present study regarding alcohol consumption prevalence, racial and ethnic differences and characteristics associated with alcohol consumption patterns may help health care and public health professionals to develop more effective ways to communicate with older women about alcohol consumption.

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CHAPTER 4: Black-White Disparities in Alcohol Consumption Trends in the United States, 1990-2015

Introduction

Alcohol consumption among women is increasing (Corbin, Vaughan, & Fromme, 2008; Vourakis, 2017). The majority of research examining the frequency and impact of alcohol use among women has focused on alcohol-related health risks, prevalence among pregnant women, as well as, domestic and sexual violence associated with alcohol use (Park et al., 2014; Reed, Amaro, Matsumoto, & Kaysen, 2009; Rothman, Reyes, Johnson, & LaValley, 2012). Among women, the rate of high-risk alcohol consumption (4 or more alcoholic drinks per day for women) has increased by 58% and alcohol use disorders have increased by 84% since 2001 (Grant, Chou & Saha, 2017). Over the past 25 years, details about this increasing trend has been provided for adolescent girls, college women and women of childbearing age. Yet, little is known about alcohol consumption trends among women in minority groups

In the United States, recent trend analyses indicate an increase in drinking frequency among women; however, there is a lack of research examining trends in alcohol consumption by race, particularly among African American women (Chartier & Caetano, 2010). Surveys of nationally represented samples generally report that non-Hispanic white (hereafter white) women have the highest levels of alcohol use, followed by Hispanic women and African American women, while Asian women report substantially lower levels of alcohol use than other racial/ethnic groups (Chen & Jacobson, 2012). Considerable evidence suggests that some women in minority groups in the U.S. may be particularly prone to experiencing problems and mortality associated

with heavy alcohol consumption (Chartier & Caetano, 2010). Even at the same levels of alcohol consumption as white women, studies have highlighted the greater risk for negative alcohol-related consequences among women in minority groups (Mulia, Ye, Greenfield, & Zemore, 2009). Thus, it is useful to examine alcohol consumption patterns and trajectories by racial and ethnic groups, especially among African American women who have more alcohol related problems than white women (Chartier & Caetano, 2010; Witbrodt, Mulia, & Zemore, 2014).

Alcohol Use Prevalence. African American women tend to consume less alcohol than white women (Chartier & Caetano, 2010). According to the 2014 National Survey on Drug Use and Health, 44% of African American women consumed alcohol within the past month compared to 58% of white women (Center for Behavioral Health Statistics, 2016). This trend is the same for lifetime and past year alcohol consumption rates. About 75% of African American women reported consuming alcohol at least once in their lifetime, and of those 59% reported alcohol consumption in the past year (Center for Behavioral Health Statistics, 2016); comparable results for white women are 87% and 71% (Center for Behavioral Health Statistics, 2016).

Research shows that compared with white women, African American women are less likely to consume alcohol, start consuming at older ages, and are less likely to consume any alcohol (Chartier & Caetano, 2010). Despite these differences in alcohol consumption between African American and white women, the gap is narrowing for problematic alcohol consumption (heavy or binge consumption). The percentage of women who engage in binge consumption (having 4 or more drinks at the same time or within 2 hours) and the percentage of women who consume heavy amounts of alcohol

(binge drinking on 5 or more days in the past 30 days) are similar among African American and white women. In 2014, binge consumption in the past month was reported among 24% of white women and 22% of African American women (Center for Behavioral Health Statistics, 2016). Meanwhile, heavy alcohol use among women in the past year was reported among 7% of white women and 5% of African American women (Center for Behavioral Health Statistics, 2016).

Alcohol-Related Problems. While a higher percentage of white women consume alcohol, a higher percentage of African American women experience alcohol-related problems. For instance, rates for alcohol-related diseases and disorders were 10% higher among African American women than women in other racial and ethnic groups (Xu, Kochanek, & Murphy, 2010). Similarly, in earlier studies, African American women were more likely to develop and die of liver cirrhosis and other alcohol-related causes than white women (Rehm et al., 2010). Compared to white women with similar drinking patterns, African American women were five times more likely to report alcohol dependence symptoms and three times more likely to report having arguments, injury, and occupational, legal and health-related problems (Mulia et al., 2009). These disparities in health consequences can be explained, in part, by the lack of protective factors (i.e., education, employment, marital status, etc.) among African American women. (Williams & Mohammed, 2009; Witbrodt, Mulia, & Zemore, 2014).

Cultural Factors Relating to Alcohol Use. There are cultural factors surrounding alcohol consumption that are unique to African American women. African American women tend to prefer liquor, which has a higher alcohol concentration than other alcoholic beverages such as beer (Kerr, Patterson, & Greenfield, 2009). African

American neighborhoods are more likely to have a liquor store compared to white neighborhoods (Jones-Webb & Karriker-Jaffe, 2013; Kwate & Meyer, 2009). In addition, it is estimated that one-fourth of people of African descent have the alcohol dehydrogenase (ADH) gene which can modify alcohol metabolism and produce a stronger response (increased nausea and rapid heartbeat) to alcohol (Gelernter et al., 2014). Currently this genotype has only been found in Asian and African American populations.

There are elements of African American culture that protect African Americans from excessive alcohol consumption, specifically parental influences (Clark, Belgrave, & Abell, 2012), strong ethnic identity (Pugh & Bry, 2007) and religion (Agrawal et al., 2017; Meyers, Brown, Grant, & Hasin, 2017). African American parents tend to have negative beliefs about alcohol consumption and are more likely to ban alcohol use among their children, compared to people in other racial and ethnic groups (Zapolski, Pedersen, McCarthy, & Smith, 2014). This anti-alcohol cultural norm among African Americans may decrease the likelihood of adolescent alcohol use (Corbin et al., 2008). A study by Pugh and Bry examined the relationship between ethnic identity and alcohol consumption. Ethnic identity is the degree to which individuals from minority groups identify with their ethnic heritage. The results revealed a strong protective relationship between ethnic identity and alcohol consumption among African American young adults (Pugh & Bry, 2007). This finding is consistent with research findings showing higher levels of ethnic identity associated with lower alcohol use (Stock et al., 2013). Lastly, African American women report higher levels of religiosity (Brechting et al., 2010). A number of studies have found that greater religiosity among African American women is

associated with lower rates of alcohol consumption, higher abstinence and decreased risk of problem behavior related to alcohol use compared to white women (Agrawal et al., 2017; Meyers et al., 2017). Thus, African American women's level of religious participation may serve a protective function, buffering them from higher rates of alcohol use.

In addition to culturally related protective factors, there are also culturally related risk factors. African American women experience more legal, social and financial consequences due to alcohol (Jones-Webb, 1998). African Americans who reported low to moderate levels of heavy alcohol consumption were three times more likely to experience fights, accidents and workplace problems than people in other racial and ethnic groups (Mulia et al., 2009). Among African American women, an earlier study examining ethnic differences in treatment for alcoholism found that although African American women had a later onset of alcohol consumption and treatment, the onset of alcohol-related problems occurred earlier than among white women (Hesselbrock, Hesselbrock, Segal, Schuckit, & Bucholz, 2003). African American women had more frequent and severe alcohol-related symptoms than white women who consumed heavy amounts of alcohol (Hesselbrock et al., 2003). This is consistent with a later study, which found that African American women have a greater unmet need for alcohol treatment as compared to white women (Mennis & Stahler, 2016). Finally, African American women tend to experience higher rates of discrimination and stress than white women, which are significantly associated with consuming alcohol to cope (Cooper, Thayer, & Waldstein, 2014).

Demographic, Social, and Economic Factors Related to Alcohol Consumption.

Age. Alcohol consumption has age-related trends that allows researchers to identify the age at which individuals are most likely to consume and abuse alcohol (Malone, Northrup, Masyn, Lamis, & Lamont, 2012). For example, early adolescence usually marks the period of alcohol use initiation, while emerging adulthood is the period of excessive alcohol consumption and older adulthood represents a time of low to no alcohol consumption (Alvanzo et al., 2011). Understanding these transitions are important, because heavy alcohol consumption at a young age often predicts heavy alcohol consumption and alcohol related problems at a later age (Schinke, Fang, Cole, & Cohen-Cutler, 2011). Current research highlights ethnic differences in the course of alcohol consumption (Grant et al., 2012).

For African American women, alcohol consumption initiation often starts much later in life, as does excessive drinking and alcohol related problems, compared to white women (Hasin, Stinson, Ogburn, & Grant, 2007; Kalaydjian et al., 2009). For example, among African American and white women, the odds of developing alcohol use disorders and alcohol dependence decreased as white women got older, but increased as African American women got older (Grant et al., 2012). This is consistent with previous studies that have discovered low alcohol consumption rates among African American girls (Alvanzo et al., 2011) and college aged African American women (Zamboanga, Schwartz, Ham, Borsari, & Van Tyne, 2010), and highlights the later onset of alcohol consumption among African American women. Understanding ethnic age-related differences in alcohol consumption may be highly beneficial to the field of public health as they begin to prevent heavy alcohol consumption.

Income. Traditionally, increased economic resources provide more access to resources, services, and environments that can influence alcohol consumption and frequency (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006). Income is also associated with education and occupational choice, which complicates its relationship with alcohol consumption and health behaviors. This is important as the overall poverty rate among African Americans is two to three times higher than those of whites and the median per capita family income for African Americans is 60% of levels for white families (Gradín, 2012). Moreover, African American women are exposed to greater economic lost such as job loss and more difficulty paying rent/mortgage than white women (Zemore, Mulia, Jones-Webb, Liu, & Schmidt, 2013). African American women are poorer than white women and this directly impacts an individual's exposure to financial problems, disadvantaged neighborhoods, and stressors (Cerdá, Johnson-Lawrence, & Galea, 2011; Gradín, 2012). For example, African American women are more likely to live in disadvantaged neighborhoods with high alcohol density including liquor stores and bars (Karriker-Jaffe, 2013). Additionally, Jones-Webb and colleagues found that while job loss causes stress for all women, only African Americans stress was positively associated with days of drunkenness (Jones-Webb, Karriker-Jaffe, Zemore, & Mulia, 2016).

Education. Heavy alcohol consumption is a behavioral factor that may be explained in part by education (Cutler & Lleras-Muney, 2010). Studies have found that people with more education are less likely to engage in heavy alcohol consumption (Huckle, You, & Casswell, 2010; Katikireddi, Whitley, Lewsey, Gray, & Leyland, 2017). More specifically, women who have less than a high school education have a higher probability of heavy drinking (Karlamangla, Zhou, Reuben, Greendale, & Moore, 2006).

However, there is not much literature on African American women education and its relationship with alcohol consumption. We know that almost a quarter of African American women living in the U.S. have a college degree, which is five times the percentage in 1940 (Reeves & Guyot, 2017). Yet, this increase in education did not show an increase in positive health outcomes. For example, mortality among African American women remained substantially higher than white women from 1999 to 2016 (Bilal & Diez-Roux, 2018). More specifically, binge drinking and past month alcohol usage is increasing among African American women (Center for Behavioral Health Statistics, 2016). Thus, despite the increase in educational attainment, alcohol consumption, disease and death are also increasing. For African American women, narrowing the racial gap in education, is not narrowing the gap in health disparities (Williams, Mohammed, Leavell, & Collins, 2010). Other pathways must be explored (i.e. stress, income gaps, single family homes, etc.) to understand the role of education on alcohol consumption, if any, among African American women.

Marital Status. While culture may mediate its impact, peer drinking is a primary predictor of problematic alcohol consumption (Devries et al., 2014). Previous research has shown that women who are single or divorced tend to consume alcohol more heavily than women who are married, while women who are married or widowed are more likely to be abstainers or moderate drinkers (Kendler, Lönn, Salvatore, Sundquist, & Sundquist, 2016). We do not know if these associations are true for African American women. However, we do know that among married African American couples, there are significantly higher rates of alcohol related intimate partner violence and female initiated partner violence than among white couples (McKinney, Chartier, Caetano, & Harris,

2012). While partner violence represents one pathway to understand the role of alcohol on marital status, it should be viewed as only a component especially considering the increasing rates of non-married African American women over the past 40 years (Raley, Sweeney, & Wondra, 2015).

Health. While much of the literature focuses on the consequences of excessive alcohol consumption, only a few studies exist in associating self-rated health with alcohol consumption (Okosun, Seale, Daniel, & Eriksen, 2005). Understanding the role of self-rated health is important among African American women, as they have more disease, death and disability than white women (Adler & Rehkopf, 2008). However, the association between self-rated health and problematic alcohol consumption is inconsistent, with some studies showing an association (Vaez & Laflamme, 2003), while others do not show an association (Zajacova & Dowd, 2011). To further add to the inconsistency, for African American women, we are still not clear if self-rated health is strongly associated with poorer health (Assari, Lankarani, & Burgard, 2016). Given challenges associated with this measure including interpretation, more research is needed to understand if self-rated health is an appropriate measure to use to compare health status across different minority groups and to identify culturally-specific determinants of self-rated health (Benjamins, Hirschman, Hirschtick, & Whitman, 2012; Bombak & Bruce, 2012).

Study Objectives and Hypothesis. The existing trend analyses of alcohol consumption in the U.S. population have primarily shown an increase in prevalence rates among women, older adults, and people with social and economic disadvantages over the past 20 years (Grant et al., 2017). Additionally, trends have shown that the alcohol

consumption gap among men and women is closing gradually (Slade et al., 2016). Thus, women are consuming alcohol at rates similar to men. However, we have yet to understand temporal changes in alcohol consumption among African American women. Alcohol use statistics among this population is often lost in studies that are not stratified by race and gender (Grant et al., 2017); or research that tends to focus on substance abuse issues (Hughes, Wilsnack, & Kristjanson, 2015) or subsets of African American women (i.e. pregnant, sexually promiscuous, HIV positive, diagnosed with breast cancer, etc.) (Seth, Wingood, DiClemente, & Robinson, 2011). No study has examined the recent trends in alcohol consumption among African American women. I address this gap in this present study, using a nationally representative sample of African American women.

Understanding demographic trends of alcohol consumption for African American women can help to inform public health screening and interventions. The purpose of this study was to examine various changes in alcohol consumption trends among African American women from 1990 to 2015 using measures that could be compared across time in 6 National Survey on Drug Use and Health data sets. Since non-Hispanic white (hereafter white) women constitute the largest racial and ethnic group of women in the U.S., trends in alcohol consumption in this group determine the overall trend in alcohol consumption in the U.S. In 2016, much of the total female population was non-Hispanic white (62.4 percent), while 16.3 percent were Hispanic, 12.6 percent were African American, 5.7 percent were Asian. Less than 1 percent of the female population was non-Hispanic American Indian/Alaska Native or non-Hispanic Native Hawaiian/Other Pacific Islander, while 1.9 percent were non-Hispanic multiple race (Substance Abuse and Mental Health Services Administration, 2017).

To gain a better understanding of the current temporal alcohol consumption trends among African American women related to the majority population of women, I used a national sample of white women from 1990 to 2015 as the reference group. I hypothesize that (1) the prevalence of not consuming alcohol decreased across the period of 25-years; (2) the prevalence of moderate, binge and heavy consumption increased over the same period of time; (3) the racial disparity in alcohol consumption will decrease among African American and white women during the study period; and (4) differences in the prevalence of heavy and binge alcohol consumption between African American and whites will decrease during the study period. Results from this study can help the field of public health identify alcohol consumption patterns over time among African American women. The results may have useful public health implications related to education, policy, prevention and intervention efforts. More specifically, results from this study can describe temporal changes in alcohol related behavior which can improve the monitoring of alcohol related mortality and morbidity rates among African American women.

Methods

The National Survey on Drug Use and Health. The National Survey on Drug Use and Health (NSDUH), sponsored by Substance Abuse and Mental Health Services Administration (SAMHSA) provides information on the use, treatment, and consequences of alcohol, drugs, and tobacco among non-institutionalized, U.S. civilians aged 12 or older. Since its initiation, the study has evolved to address new topics including mental health (1994), risk/availability of drugs (1996), cigar smoking (1997), tobacco brand (1997), marijuana purchase (2001) and social environment (2003). The

alcohol trend analyses presented in this paper are based on the last 25 years using public data files from 1990 to 2015. This sample is the result of a multistage area sample design with an oversampling of young people, minorities, and Washington, DC. About 67,500 people participated annually. All participants provided informed consent. Parents or an adult living in the household may provide consent for those participants under the age of 18. In 2015, 51% of the sample population were women; 13% of women identified as African American. After completing a one-hour survey using Computer Assisted Self-Interviewing (CAI) participants received a $30 incentive.

Other publications have provided information on the survey design with the most up to date methodological summaries published in 2015 (Center for Behavioral Health Statistics and Quality, 2015). The published information on the 1990 data does not include the response rates. The interview response rate was 80% in 1995, 74% in 2000, 76% in 2005, 74% in 2010, and 71% in 2015. The year 1995, was the only year with published interview rates stratified by race/ethnicity. During that year African American interview rates was 80%. Among 3,126 participants in the 2006 NSDUH study, the interview/re-interview method was used to test response reliability (Substance Abuse and Mental Health Services Administration, 2010). Participants provided responses to the questionnaire and 5-15 days later were retested to see how closely the answers matched. The results revealed a 75% weighted percent of consistency and a kappa value of 0.68, which signifies substantial agreement for alcohol measures (Cohen, 1968; Substance Abuse and Mental Health Services Administration, 2010). Construct validity for the NSDUH questionnaire have been proven in several studies, including a study by Paschall and colleagues (2010). This study found that the rates of alcohol sales and the rates of

binge drinking per state moderately matched, such that states with higher alcohol sales had higher binge drinking rates. More specifically, Paschall et al. found that 88% of the associations between NSDUH estimates of past 30-day binge drinking were at least moderately ($r \geq .30$) associated with per capita alcohol sales in their respective states (Paschall, Ringwalt, & Gitelman, 2010).

Analytical Sample. The study population include African American women over the age of 12, sampled in the NSDUH 1990 (n=1,113), 1995 (n=2,569), 2000 (n=3,837), 2005 (n=3,942), 2010 (n=3,887), and 2015 (n=4,079). The study population also included white women over the age of 12, sampled in the NSDUH 1990 (n=2,841), 1995 (n=4,689), 2000 (n=21,360), 2005 (n=18,767), 2010 (n=18,460), and 2015 (n=17,512). I eliminated respondents with missing responses to one or more of the six characteristics of interest. Participants with missing responses were less than 1% of the sample.

Measures. ***Main Outcome Variable.*** The dependent variable for this analysis is "alcohol consumption in the past 30 days." To identify alcohol consumption, participants responded to the following question "On days that you drank during the past 30 days, how many drinks did you usually have? Count as a drink a can or bottle of beer; a wine cooler or a glass of wine, champagne or sherry; a shot of liquor or a mixed drink or cocktail." This variable was categorized as heavy alcohol consumption, binge alcohol consumption, moderate alcohol consumption and no alcohol consumption in the past 30 days.

Heavy Alcohol Consumption: I defined heavy alcohol consumption (coded 4) as binge drinking on 5 or more days in the past 30 days (NIAAA, 2008).

Binge Alcohol Consumption: I defined binge alcohol consumption (coded 3) as having 4 or more alcoholic drinks at the same time or within 2 hours (NIAAA, 2008). If the respondent had binge episodes on 4 or less days, they were classified as binge alcohol consumption.

Moderate Alcohol Consumption: I defined moderate alcohol consumption (coded 2) as having 1 to 3 alcoholic drinks per day in the past 30 days (NIAAA, 2008).

No Alcohol Consumption: I defined "no alcohol consumption" (coded 1), as no alcohol consumption in the past 30 days.

Covariates. I examined five demographic, social, economic, and health characteristics as covariates of alcohol consumption patterns: age (Muthén & Muthén, 2000), percent of federal poverty level (McKinney et al., 2012), education (Huckle et al., 2010), marital status (Homish, Leonard, & Kearns-Bodkin, 2006) and health status (Okosun et al., 2005). I coded education as: less than a high school diploma, high school graduate (reference group), some college and college graduate. I defined percent of federal poverty threshold by 3 categories: less than 200% above poverty (lower income), 200-400% above poverty (middle income) (reference group) and more than 400% above poverty (higher income). I used this measure to compare access to financial resources. This measure refers to household income level. I defined age by 6 categories: 12 to 17 years old, 18 to 25 years old, 26 to 34 years old, 35 to 49 years old (reference group), 50 to 64 years old and 65 years and older. I defined marital status as: married (reference

group), widowed/divorced/separated, and never been married. I defined health status as excellent/very good (reference group), good, and fair/poor.

Statistical Analyses. First, I compared all characteristics among African American and white women by year from 1990 to 2015. I calculated the outcomes of interest by year for age, household income level, education, marital status and health status. Next, I calculated the prevalence for four categories of alcohol consumption by five-year periods 1990-2015 separately for African American and whites. I used the Cochrane-Armitage test to determine the statistical significance of trends in alcohol consumption (heavy alcohol consumption, binge alcohol consumption, moderate alcohol consumption, never consume alcohol in the past month) over time among African American and white women separately. Additionally, I calculated the change over time for each alcohol consumption pattern (heavy alcohol consumption, binge alcohol consumption, moderate alcohol consumption, and no alcohol consumption in the past month) by subtracting prevalence in 2015 from prevalence in 1990 for African American and white women separately. Alcohol consumption patterns that changed significantly over the years, identified through the Cochran-Armitage test, are the outcomes of interest for logistic regressions. Lastly, to verify differences in alcohol consumption patterns identified by the Cochran-Armitage test, I controlled for all covariates shown in Table 5 and Table 6 with multivariable logistic regression to estimate changes in alcohol consumption patterns over the years. I used SAS Enterprise version 6.1 for data analysis and statistical significance was determined at $p<0.05$.

Results

Sample Characteristics. Demographic characteristics of the sample of African American women are presented in Table 3.1 and white women are presented in Table 3.2. For both African American and white women across the years, the study participants were primarily over the age of 35, self-identified their health status as excellent/very good, and with a high school diploma or less. There were large differences in household income level and education between African American and whites. Most of the African American women reported lower incomes (56% – 59%), yet white women were tended to report either middle income or high income (except for 2010). Also, there were large differences in educational attainment between African American and whites. In 2015, 32% of white women had a college degree which is much higher than the 17% of African American women with a college degree. White women were more likely to be married (58% - 50%), as opposed to African American women who had never been married (36% in 1990, 42% in 1995, 44% in 2000, 46% in 2005, 50% in 2010, 49% in 2015).

Table 3.1. Characteristics of Black Women Participants by Year in the U.S. from the years 1990 to 2015, National Survey on Drug Use and Health (NSDUH)[a]

Variable	1990 n= 1,113	1995 n=2,569	2000 n=3,837	2005 n=3,942	2010 n=3,887	2015 n=4,079
	n (weighted %)	n (weighted %)	n (weighted %)	n (weighted %)	n (weighted %)	n (weighted %)
Age						
12-17	240 (12.07)	537 (12.35)	1336 (11.84)	1303 (12.19)	1238 (10.80)	885 (9.72)
18-25	240 (17.08)	609 (15.67)	1251 (15.15)	1382 (15.09)	1360 (15.69)	1153 (14.92)
26-34	312 (20.52)	766 (18.61)	594 (16.78)	409 (15.04)	418 (16.29)	670 (15.14)
35-49	162 (24.94)	502 (27.24)	385 (29.22)	543 (28.89)	560 (25.55)	817 (24.60)
50 or older	159 (25.40)	155 (26.14)	271 (27.01)	305 (28.80)	311 (31.67)	554 (35.63)
Household Income Level						
Lower Income	503 (55.87)	1678 (59.81)	1724 (44.36)	2052 (54.71)	2099 (57.94)	2675 (59.05)
Middle Income	374 (32.66)	633 (27.56)	2785 (35.27)	1139 (31.74)	993 (28.38)	1008 (27.81)
Higher Income	236 (11.47)	258 (12.63)	3813 (20.37)	723 (13.55)	737 (13.68)	396 (13.14)
Education						
High School Graduate or Less	809 (72.97)	1793 (67.72)	2850 (64.20)	2849 (63.00)	2712 (58.38)	2358 (51.77)
Some College	182(15.80)	532 (20.06)	679 (23.47)	761 (22.82)	832 (25.81)	1201 (31.34)
College Graduate	122 (11.22)	244 (12.22)	308 (12.32)	332 (14.18)	343 (15.36)	520 (16.90)
Marital						
Married	247 (32.23)	511 (30.50)	613 (30.72)	506 (26.85)	455 (24.84)	687 (25.43)
Widowed/Divorced/Separated	259 (31.54)	452 (27.91)	365 (25.10)	400 (26.96)	384 (25.35)	596 (25.92)
Never Been Married	607 (36.23)	1606 (41.59)	2859 (44.18)	3036 (46.20)	3048 (49.80)	2796 (48.65)
Health						
Excellent/Very Good	612 (52.32)	1602 (55.91)	2545 (56.01)	2431 (53.36)	2418 (50.57)	2335 (50.85)
Good	325 (28.73)	664 (26.71)	956 (28.93)	1088 (30.05)	1041 (30.34)	1215 (32.17)
Fair/Poor	174 (18.95)	296 (17.38)	334 (15.06)	422 (16.59)	426 (19.08)	529 (16.98)

Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher income is more than 400% federal poverty level.

Table 3.2. Characteristics of White Women Participants by Year in the U.S. from the years 1990 to 2015, National Survey on Drug Use and Health (NSDUH)[a]

Variable	1990 n= 2,841	1995 n=4,689	2000 n=21,360	2005 n=18,767	2010 n=18,460	2015 n=17,512
	n (weighted %)	n (weighted %)	n (weighted %)	n (weighted %)	n (weighted %)	n (weighted %)
Age						
12-17	596 (8.42)	1095 (8.88)	6363 (8.86)	5682 (8.73)	5306 (7.88)	3514 (7.53)
18-25	570 (13.23)	940 (11.54)	6280 (11.39)	6060 (11.55)	5908 (11.52)	4074 (10.86)
26-34	768 (18.07)	1537 (15.65)	3300 (13.31)	1815 (12.36)	1870 (12.40)	2813 (12.61)
35-49	361 (26.39)	733 (27.26)	2572 (27.88)	3085 (26.33)	2978 (23.35)	3671 (20.81)
50 or older	546 (33.88)	384 (36.67)	2845 (38.56)	2125 (41.04)	2398 (44.85)	3440 (48.19)
Household Income Level						
Lower Income	781 (33.99)	1552 (28.72)	5195 (25.74)	5205 (30.60)	5221 (57.94)	6186 (29.83)
Middle Income	1205 (45.74)	1661 (38.42)	5593 (33.33)	5388 (34.49)	5096 (28.38)	7245 (38.48)
Higher Income	855 (20.27)	1476 (32.86)	10224 (40.92)	7836 (34.92)	7617 (13.68)	4081 (31.69)
Education						
High School Graduate or Less	1822 (63.32)	2836 (56.41)	13417 (53.79)	11384 (48.90)	10680 (45.12)	8022 (37.41)
Some College	512 (18.66)	971 (22.03)	4483 (23.93)	4219 (25.01)	4120 (25.78)	5066 (31.00)
College Graduate	507 (18.03)	882 (21.56)	3460 (22.28)	3164 (26.09)	3660 (29.11)	4424 (31.59)
Marital						
Married	1187 (58.44)	1944 (56.18)	7329 (54.13)	5732 (53.43)	5525 (51.07)	6503 (50.63)
Widowed/Divorced/Separated	532 (21.16)	643 (21.38)	2234 (22.28)	1872 (21.92)	1982 (23.62)	2606 (23.67)
Never Been Married	1122 (20.40)	2102 (22.44)	11797 (23.59)	11163 (24.65)	10953 (25.31)	8403 (25.70)
Health						
Excellent/Very Good	1772 (61.33)	3413 (66.59)	15368 (63.80)	13374 (64.62)	13077 (63.89)	11828 (62.82)
Good	780 (26.74)	1003 (23.36)	4561 (24.78)	4162 (24.44)	4109 (24.66)	4140 (25.27)
Fair/Poor	287 (11.93)	268 (10.05)	1424 (11.42)	1225 (10.94)	1271 (11.45)	1543 (11.91)

Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher income is more than 400% federal poverty level.

Trends in Alcohol Consumption. Tables 3.3 and 3.4 shows the weighted prevalence rates of alcohol patterns and the statistical significance of change over the years. From 1990 to 2015, binge consumption prevalence rates increased for both African American and white women. During this same period, not consuming alcohol in the past month decreased for both African American women and white women. The prevalence of binge alcohol consumption among African American women significantly increased from 3.4% in 1990 to 16.9% in 2015, with a prevalence difference of 13.4. Among African American women, the prevalence of not consuming alcohol in the past month significantly decreased from 66.9% in 1990 to 58.5% in 2015. This significant decrease in prevalence resulted in a difference of 8.3%. Similarly, among white women, binge alcohol consumption significantly increased from 7.2% in 1990 to 17.2% in 2015, with a prevalence difference of 10%. Additionally, white women who did not consume alcohol in the past month decreased from 52.5% in 1990 to 46.7% in 2015, with a prevalence difference of 5.8%; however, this result was not statistically significant. Additionally, the upward trend in heavy alcohol consumption and the downward trend in moderate alcohol consumption were not significant for both African American and white women.

Table 3.3. Monthly Patterns of Alcohol Consumption among Black Women in the U.S. from the years 1990 to 2015, National Survey on Drug Use and Health (NSDUH) in percentage [a]

	1990 n= 1,113	1995 n=2,569	2000 n=3,837	2005 n=3,942	2010 n=3,887	2015 n=4,079	Prevalence Difference	Z Statistic [b]
Heavy Consumption	2.81	1.87	2.44	2.1	2.45	3.43	0.62	-0.3434
Binge Consumption	3.42	3.72	10.43	12.71	12.54	16.91	13.49	-3.8400**
Moderate Consumption	24.97	23.82	14.59	19.58	23.54	20.85	-4.12	0.4808
No past month alcohol consumption	66.90	70.58	72.54	65.61	61.47	58.52	-8.38	-1.8836*

[a] Percentages are weighted [b] Cochran-Armitage test for trend where the null hypothesis is no change over time

* Significant at a .05 level **Significant at a .01 level

Note: Heavy drinkers are women engaged in binge drinking on 5 or more days. Binge drinkers are women who have consumed more than 4 drinks over a two-hour period. Moderate drinkers are women who consume 4 or less drinks per day.

Table 3.4. Monthly Patterns of Alcohol Consumption among White Women in the U.S. from the years 1990 to 2015, National Survey on Drug Use and Health (NSDUH) in percentage [a]

	1990 n= 2,841	1995 n=4,689	2000 n=21,360	2005 n=18,767	2010 n=18,460	2015 n=17,512	Prevalence Difference	Z Statistic [b]
Heavy Consumption	1.66	2.00	2.94	3.55	3.81	4.98	3.32	-1.5473
Binge Consumption	7.24	6.96	10.76	12.00	12.15	17.26	10.02	-2.5497**
Moderate Consumption	35.08	37.19	31.09	36.05	35.47	31.04	-4.04	0.5136
No past month alcohol consumption	52.56	51.02	55.21	48.40	48.57	46.72	-5.84	-1.0365

[a] Percentages are weighted [b] Cochran-Armitage test for trend where the null hypothesis is no change over time

* Significant at a .05 level **Significant at a .01 level

Note: Heavy drinkers are women engaged in binge drinking on 5 or more days. Binge drinkers are women who have consumed more than 4 drinks over a two-hour period. Moderate drinkers are women who consume 4 or less drinks per day.

Adjusted Results

Table 3.5 reports adjusted results from African American women who did not consume alcohol in the past month (columns 1 and 2) and binge alcohol consumption (columns 3 and 4). These regressions were done because no alcohol consumption and binge alcohol consumption significantly changed from 1990 to 2015 among African American women. Table 3.6 reports adjusted results for white women engaging in binge alcohol consumption (columns 1 and 2). These models were estimated because binge alcohol consumption significantly changed from 1990 to 2015 among white women. After adjusting for demographic factors (age, income, education, marital status, health), there was a statistically significant increase in binge consumption prevalence each year (except 1995) among both African American and white women. Only African American women had a statistically significant decrease in not consuming alcohol in the past month.

During the 1990-2015 study period (except for 1995), the odds of having binge alcohol consumption increased for both African American women and white women. For example, African American women in 2000 had 3.32 greater odds (95% confidence interval, CI 2.03-5.42) of binge alcohol consumption than women in 1990, and 5.88 greater odds (CI 3.67- 9.44) in 2015. Similarly, white women in 2015 had 3.16 greater odds (CI 2.63- 3.80) of binge alcohol consumption than women in 1990.

African American women surveyed in 2000 had 1.43 greater odds (CI 1.13-1.80) than African American women in 1990. In contrast, in 2015 African American women had 27% lower odds of not consuming alcohol in the past 30 days (OR 0.73, CI 0.59-0.90) compared with African American women in 1990.

Table 3.5. Multivariable Logistic Regression Analysis of Demographics Associated with No Drinking and Binge Drinking among Black Women in the U.S. from the years 1990 to 2015, National Survey on Drug Use and Health (NSDUH)

Variable	No Past Month Alcohol Consumption[a]		Binge Alcohol Consumption[a]	
	Adjusted Odds Ratio	(95 % Confidence Interval)	Adjusted Odds Ratio	(95 % Confidence Interval)
Year				
1990	Reference	Reference	Reference	Reference
1995	0.95	0.76 – 1.19	1.08	0.64 – 1.84
2000	1.43**	1.13 – 1.80	3.32**	2.03 – 5.42
2005	1.01	0.80 – 1.26	4.22**	2.59 – 6.87
2010	0.84	0.67 – 1.05	3.98**	2.45 – 6.48
2015	0.73**	0.59 – 0.90	5.88**	3.67 – 9.44

[a]This model adjusted for age, household income level, education, marital status and health

Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher income is more than 400% federal poverty level.

* Significant at a .05 level **Significant at a .01 level

Table 3.6. Multivariable Logistic Regression Analysis of Demographics Associated with Binge Drinking among White Women in the U.S. from the years 1990 to 2015, National Survey on Drug Use and Health (NSDUH)

Variable	Binge Alcohol Consumption[a]	
	Adjusted Odds Ratio	(95 % Confidence Interval)
Year		
1990	Reference	Reference
1995	0.93	0.74– 1.18
2000	1.52**	1.26 – 1.85
2005	1.80**	1.49 – 2.18
2010	1.86**	1.53 – 2.25
2015	3.16**	2.63 – 3.80

[a] This model adjusted for age, household income level, education, marital status and health

Note: Lower income is less than 200% federal poverty level, middle income is 200-399% federal poverty level, and higher income is more than 400% federal poverty level.

* Significant at a .05 level **Significant at a .01 level

Discussion

While we understand that alcohol use is increasing among women, it is unclear if such trends and patterns also apply to African American women. It is important to study alcohol use by race since African American women tend to have more alcohol related problems (Jones-Webb et al., 2016; Zapolski et al., 2014) and are understudied (Chartier & Caetano, 2010). This study adds to the limited literature on alcohol consumption among African American women by using a nationally representative sample of African American women to describe drinking patterns over the past 25 years. Consistent with my first hypothesis, over the past 25-years among African American women there has been significant increase in alcohol consumption. This is consistent with previous research (Caetano, Baruah, & Chartier, 2011; Chartier & Caetano, 2010; Plant, 2008). The prevalence of African American women who did not consume alcohol in the past month has decreased substantially. With the increase in alcohol consumption comes a troubling finding about problematic alcohol consumption. Partly consistent with the second hypothesis, there has been a significant increase in binge drinking among African American. This is consistent with previous research (Tan, Denny, Cheal, Sniezek, & Kanny, 2015; Vourakis, 2017). The trends for heavy drinking were not statistically significant. Not consistent with the second hypothesis is that since 1990, there has been a decrease in moderate alcohol consumption; however, this decrease was not statistically significant.

The racial disparity in moderate alcohol consumption and past month alcohol consumption remained proportional over time and is consistent with the third hypothesis. Historically, African American women have relatively high rates of no alcohol

consumption compared with white women (Mulia et al., 2009). Additionally, among women who consume alcohol, white women are more likely to moderately consume alcohol (Chartier & Caetano, 2010). However, the present study is the first find that this trend is decreasing, and more African American women are consuming alcohol at rates higher than in the previous 25 years.

Not only are more African American women consuming alcohol since 1990, more have engaged in binge consumption. Furthermore, consistent with the fourth hypothesis, the racial disparity has narrowed among African American and white women engaging in problematic alcohol consumption. I found that in 2015, 1 in 5 African American women had problematic alcoholic consumption (3% heavy alcohol consumption and 17% binge alcohol consumption). This is similar to the prevalence rates among white women (5% heavy alcohol consumption and 17% binge alcohol consumption). However according to my findings, 25 years ago, the prevalence rates of problematic drinking were different among African American and white women. In 1990, there was an estimated 1 in 20 African American women (3% heavy alcohol consumption and 3% binge alcohol consumption) had problem drinking. Among white women, 2% consumed heavy amount of alcohol and 7% engaged in binge alcohol consumption. Although not stratified by gender, the increased alcohol consumption is consistent with current literature that is showing a 35% increase in alcohol sales data in U.S. (National Institute on Alcohol Abuse and Alcoholism, 2012). While the high prevalence rates of binge consumption are consistent with previous studies (Courtney & Polich, 2009; Tan, Denny, Cheal, Sniezek, & Kanny, 2015), this is the first to report on the increasing trends among African American women. Additionally, the present study adds to the limited literature on racial

disparities among problematic alcohol consumption narrowing among African American and white women (Han, Moore, Sherman, Keyes, & Palamar, 2017; Naimi, Nelson, & Brewer, 2010).

The rise in binge alcohol consumption occurred simultaneously with a decrease in no past month alcohol consumption, which is to be expected. However, it is interesting that an increase in past month alcohol consumption did not actually result in an increase in moderate alcohol consumption. In fact, moderate alcohol consumption among African American women went down although the decrease was not significant. This fact suggests that African American women who consume alcohol, tend to consume excessive amounts (Chartier & Caetano, 2010). Additionally, the characteristics of African American women in the different samples were similar over the 25-year period and were adjusted for in the trend analysis, suggesting that other risk factors are keeping problematic alcohol consumption in African American women at high levels. Recent literature reviews has suggested stress (Cooper, Thayer, & Waldstein, 2014), neighborhood advertisement (Kwate & Meyer, 2009) and proximity of liquor stores (LaVeist & Wallace, 2000) to be potential pathways.

One pathway emerging in the alcohol literature is neighborhood disadvantage. Research suggests that the neighborhood disadvantage among African Americans contribute to the increased prevalence of alcohol consumption. For example, Kwate and Meyer studied the relationship between alcohol advertisements and African American women in New York City. They found that more exposure to alcohol advertisement significantly related to increased odds of engaging in problematic alcohol consumption (Kwate & Meyer, 2009). Additionally, larger alcoholic beverages were found at bars

serving predominantly African American clients, compared with bars that served mainly white or racially and ethnically diverse clients (Kerr et al., 2009). Lastly, alcohol promotion and availability was the greatest among African American neighborhoods compared to white neighborhoods (Jones-Webb et al., 2008).

Strengths and Limitations. The key strength of this paper is that I used a large, nationally representative sample of African American women in the United States. Furthermore, this study is the first to examine trends and demographic changes in alcohol consumption among a sample of African American and white women. The study has several limitations. The NSDUH survey is cross-sectional and include samples of different participants each year of the study period. Thus, it is not possible to infer causality from the observed associations. To minimize the impact of this issue, future research may want to follow respondents over time in order to look at longitudinal associations with outcomes. Another limitation is that the NSDUH survey, relies on self-reported substance abuse data and depends upon accuracy of individual respondents. Survey respondents may underreport alcohol consumption. It is possible that some of the underreported alcohol use is due to social desirability bias. Thus, it is likely that this study underestimates problematic alcohol consumption such as binge drinking, and estimates may be considered moderate. Lastly, because NSDUH only captures noninstitutionalized civilians, homeless and incarcerated women, as well as, women in active duty and enrolled in substance abuse treatment programs are not included. Thus, the alcohol use estimates in the study cannot be generalized to these populations.

Public Health Implications. African American women are engaging in more problematic alcohol consumption. The racial disparity in problematic alcohol

consumption among African American and white women has narrowed during the past 25 years. Over the past 25 years, the prevalence of African American women not consuming alcohol in the past month has significantly decreased. The prevalence of African American women engaging in binge alcohol consumption has significantly increased. The significant increase in the national trends of binge alcohol consumption among African American women is of great concern because African American women have risks and challenges that may differ from white women. While this study has identified that there is growing problem with binge alcohol consumption among African American women, there is still a need to further understand factors that may be related to the cause of this increase. Additionally, this study highlights the need for the field of public health to begin to develop culturally appropriate prevention strategies and intervention efforts addressing the increase in alcohol consumption among African American women.

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CHAPTER 5: Conclusion

The social norm that once painted the picture of American women seldomly consuming alcohol but serving alcohol to male counterparts has changed. It has been replaced with alcohol advertisements that portray women drinkers as sexy, fun-loving and the life of the party (Kubacki et al, 2016). Among women there are higher alcohol consumption rates and a growing number of women that engage in problematic alcohol consumption (Grant et al., 2017; Vourakis, 2017). Problematic or hazardous alcohol consumption is the quantity or pattern of alcohol use that often puts women at risk of adverse consequences (NIAA, 2008). This consumption behavior is troubling as it is often the cause of adverse impacts physically (liver cirrhosis), socially (domestic violence) and mentally (depression) (Boden & Fergusson, 2011; Hughes, Anderson, Morleo, & Bellis, 2008; Wilsnack, Wilsnack, & Kantor, 2013). It causes death, disability and decreased quality of life, with women in minority groups carrying the greatest burden (Chartier & Caetano, 2010; Vourakis, 2017). While there is a growing literature that tends to highlight this new drinking culture among women, it seldom provides the answer to, "*Among women, who is engaging in problematic alcohol consumption?"* Without addressing this question, the field of public health and similar fields of health cannot truly develop education and prevention strategies, provide treatment options, and implement policies that are both effective and efficient.

My dissertation addresses this gap in the literature and examines the question, "*Among women, who is engaging in problematic alcohol consumption?"* This question is simple in sentence structure but complex to comprehend as the answer must take into

consideration an assortment of factors. It is simple in the fact that prevalence rates across a nationally represented sample of women seems straightforward. It is complex in the fact that alcohol consumption is problematic at different levels of alcohol consumption for different groups of women.

The dissertation begins with a review of biological process and consequences of heavy alcohol consumption among women living in the U.S. Next, it discusses studies that have identified determinants of problematic alcohol consumption among women, with a distinct focus on age, income and race. The discussion of problematic alcohol consumption determinants is grounded in historical time and place and timing from the life course theory to provide insight into the interactions of age, culture, location and other evidence-based factors on patterns and predictors of heavy alcohol consumption among women. Three manuscripts were developed to answer to study differences among women based on demographic factors, race and ethnicity, and trends in alcohol consumption over the past 25 years.

In the first article, chapter two, the association between demographic, social, economic, and other factors such as rural or urban residence and heavy alcohol consumption was explored among women living in the U.S. Although many studies have examined alcohol use among various groups of women, no studies of which I am aware have examined characteristics of women that are associated with heavy alcohol consumption. While the largest significant differences in alcohol consumption were by age, marital status and education, the most interesting findings were related to women from minority groups. In this study, women from minority groups had lower odds of heavy alcohol consumption; however, the results show that 4% of white women, 3% of

African American women and 2% of Hispanic women engaged in heavy alcohol consumption. This result is important because although women in minority groups have lower rates of heavy alcohol consumption compared to white women, heavy drinkers from minority groups are more likely to experience problems related to heavy alcohol consumption (Chartier & Caetano, 2010; Delker et al., 2016).

The second article, chapter three, builds on the findings from the first article and focuses specifically on older women. Older women are more sensitive to alcohol compared to younger adult women; alcohol related problems develop at much lower consumption amounts. This article describes alcohol consumption behavior among women age 50 and older using national guidelines to examine alcohol consumption patterns of older women. This study showed that older women (65 and older) were more likely to adhere to the NIAA guidelines and consume alcohol moderately or not at all compared to women ages 50-64. Consistent with my expectations, factors associated with problem alcohol consumption were being in a racial/ethnic minority group (Dawson, Goldstein, Saha, & Grant, 2015), low income (Glass et al., 2017) and less education (Gilman et al., 2008), having poor health (Fat, Cable, & Shelton, 2015).

A common finding in both the first and second manuscript is the high prevalence rates of problematic alcohol consumption among women in minority groups. Yet it is unclear in both articles if this is a trend yet detected in public health. The third article, chapter four, examines changes in alcohol consumption trends among African American and white women from 1990 to 2015 using measures that could be compared across time in 6 waves of the National Survey on Drug Use and Health. No study of which I am aware has examined recent trends in alcohol consumption among African American

women. I found that there has been significant increase in alcohol consumption and in binge drinking among African American women over the past 25 years. The racial disparity in moderate alcohol consumption and past month alcohol consumption remained proportional over time: a greater percentage of white women than African American women consumed alcohol moderately. Not only are more African American women consuming alcohol, more are engaging in binge consumption now compared to 1995. Another interesting finding from this study is that the racial disparity in problematic alcohol consumption between African American and white women has narrowed between 1995 and 2015. As problematic drinking rates increase among African American women, their rates, while still lower than white women, are more similar in 2015 compared to 1995.

Implications of Heavy Alcohol Consumption among Women

The conclusions drawn from my dissertation on alcohol consumption among women living in the U.S. primarily center on the fact that women are consuming high amounts of alcohol, especially women in minority groups. Results of my dissertation research showed that currently, 4% of women were engaging in heavy alcohol consumption, 9% of older women engaged in problematic alcohol consumption and 41% of African American women consume alcohol. Additionally, a large number of women in minority groups do not consume alcohol. This statistic often overshadows the problematic prevalence rates of heavy alcohol consumption and binge alcohol consumption. All three manuscripts show a pattern among African American and Hispanic women in which the prevalence rate of problematic alcohol consumption is similar or exceeds that of white women. Furthermore, while the literature is unclear on

whether moderate consumption provides health benefits, results of my analysis show that a low percentage of women in minority groups drink moderate amounts of alcohol. Thus, the alcohol consumption style of African American and Hispanic women, seems to be either no alcohol consumption or high levels of alcohol consumption.

Public Health Implications

No longer can the field of public health afford to assume that consuming alcohol is an activity related to men, college students, and whites. The gender (Wilsnack, Wilsnack, Gmel, & Kantor, 2018), age (Knott, Coombs, Stamatakis, & Biddulph, 2015) and racial differences (Witbrodt, Mulia, Zemore, & Kerr, 2014) in problematic alcohol consumption is narrowing. The lack of attention to patterns of alcohol consumption among women, especially women in minority groups, is unfortunate. I have contributed to the limited research on alcohol consumption among women by identifying the demographic description of women engaging in high alcohol consumption and described the characteristics of problematic consumers of alcohol among women age 50 and older, using a national sample. Lastly, I have identified a significant increase in alcohol consumption among African American women and a narrowing racial disparity in binge alcohol consumption over the past 25 years.

It has been well established that problematic alcohol consumption is one of the most serious public health problems in the United States. The physical, psychological and social risks associated with problematic alcohol consumption are greater for women (Plant, 2008). The findings from my dissertation show that women are engaging in harmful alcohol consumption patterns and provide opportunities for the field of public

health, including both practice and research. The field of public health needs to address alcohol consumption among women, especially since alcohol consumption is responsible for increased illness, injury and death, with the risk increasing with alcohol volume (Room, Babor, & Rehm, 2005).

To decrease binge and heavy alcohol consumption, effective public health interventions must be developed to address problematic consumption patterns among women. Given the drinking differences by race, it is important that prevention strategies be culturally sensitive. Most public health interventions focus on self-help groups and clinical treatment. While there have been effective treatment interventions specific to women such as Women for Sobriety and women-only Alcohol Anonymous Groups, clinical treatment as an intervention has several issues (i.e., stigma, fear of losing a child if enrolled, inadequate insurance to cover expenses, etc.) (Oleski, Mota, Cox, & Sareen, 2010; Small, Curran, & Booth, 2010; Tuchman, 2010; Wallhed Finn, Bakshi, & Andréasson, 2014). The public health response must also include suitable alcohol screening tailored for women. Alcohol screening questionnaires should be improved to consider questionnaire cut points that are specific to women. Without addressing this, problematic consumption among women may be underestimated. Currently, there have been limited exploration on alcohol screening that are specific to women.

Lastly, public health will have to rely on policy and regulation to effectively reduce the adverse outcomes of alcohol by decreasing population level consumption (Babor, 2010). Simply, it must target the greater population of women with the intention to decrease alcohol consumption prevalence and encourage harm reduction among those subpopulations who are impacted the most. To build effective alcohol policies, public

health strategies cannot be compromised by the alcohol industry. The field of public health cannot afford to treat alcoholic beverages as the norm and overlook the very serious health and social problems related to alcohol consumption (Lachenmeier, Taylor, & Rehm, 2011). There is a public health need, at the national, state and local level, to control and regulate the market for alcoholic beverages, especially among women and disadvantaged neighborhoods (Casswell, 2012; Morrison, Gruenewald, & Ponicki, 2016; Parry, Patra, & Rehm, 2011; Snowden, 2016).

Strengths and Limitations

The primary strength of this dissertation is that I used a large, nationally representative sample of women in the United States that allowed for analysis by multiple subgroups. The NSDUH survey provides one of the largest samples of substance use among women that allows for analysis by age, race and ethnic groups. NSDUH has high response rates and good validity and reliability. Also, the NSDUH uses computer assisted self-interviewing to minimize reporting bias. This dissertation has several limitations. The NSDUH survey is cross-sectional; thus, the results of my research do not provide a basis to infer causality. Another limitation is that the NSDUH survey relies on self-reported response and is subject to social desirability bias. The bias is usually under-reporting of alcohol consumption. Thus, the results are may underestimate problematic alcohol consumption such as binge drinking. Recall bias was a potential problem in this study as participants had to recall events over several weeks, months and the entire year. However, limiting most of the questions about alcohol use to past 30 days reduced effects of recall bias. Lastly, the survey included a limited number of social and economic and

demographic variables and does not include women who lived in an institutional setting, e.g., nursing homes, or those who were homeless.

Directions for Future Research

The results in my dissertation show that women are engaging in problematic alcohol consumption regardless of age and race. Future research efforts should explore the changing role of women in society (i.e. employment status, role in family, stress, types of employment) and its association with problematic alcohol consumption. Moreover, future research should provide a more detailed perspective on age and race and ethnicity. More specifically, future studies should include more specific age categories (e.g., 50-64, 65-74, 75-84), a broader representation of ethnic groups in demographic categories (i.e. African, Black Caribbean, Haitian, African American). Qualitative research on women and alcohol consumption is needed in future research to help us understand the patterns, strengths and interaction of various alcohol related variables. There is a need to understand why women consume alcohol, which is beyond the scope of quantitative data alone. The research suggested above may get the field of public health one step closer to providing effective interventions, developing policy and decreasing the adverse health outcomes related to alcohol consumption among women living the United States.

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