



Published in final edited form as:

Addict Behav. 2010 May ; 35(5): 383–391. doi:10.1016/j.addbeh.2009.12.014.

Epidemiology, Determinants, and Consequences of Cigarette Smoking in African American Women: An Integrative Review

Lavonda Mickens, Ph.D.^a, Katie Ameringer, B.A.^a, Molly Brightman, B.A.^a, and Adam M. Leventhal, Ph.D.^a

^aInstitute for Health Promotion and Disease Prevention Research, University of Southern California Keck School of Medicine, Department of Preventive Medicine, 1000 South Fremont Avenue Unit 8, Alhambra, CA, USA

Abstract

Tobacco smoking is a national public health problem that has been associated with numerous adverse health effects, including increased disease and cancer rates. Previous review articles on smoking in specific demographic populations have focused on smoking in women and on smoking in African Americans, but have not considered the dual roles of ethnicity and gender in smoking behavior. African American women (AAW) are an important subgroup to study because they are distinct from non-AAW and their male African American counterparts on biosychosocial factors that are relevant to smoking behavior. The purpose of the present review paper is to integrate and summarize the current literature on the epidemiology, determinants, and consequences of cigarette smoking among AAW, by contrasting them to relevant comparison groups (non-AAW and African American men). Evidence suggests that AAW are generally more likely to be light smokers and initiate smoking later. The prevalence rates of AAW smokers have decreased over the past 25 years, yet AAW are disproportionately affected by several smoking-related illnesses when compared to their ethnic and gender comparison groups. AAW smokers are distinct from relevant comparison groups in metabolic sensitivity to nicotine, aspects of smoking topography, and several psychosocial factors that influence smoking. Although a small literature on smoking in AAW is emerging, further empirical research of AAW smokers could inform the development of tailored interventions for AAW.

Keywords

African American Women; Cigarette Smoke

1. Introduction

Smoking is a national public health problem among US adults, and adverse health effects related to cigarette smoke account for approximately 1 in 5 deaths each year (US Department of Health and Human Services, National Center for Health Statistics, 2008; CDC, Morbidity and Mortality Weekly Report, 2008). The most recent census figures approximated that over

© 2009 Elsevier Ltd. All rights reserved.

Corresponding Author: Lavonda Mickens, Ph.D., Institute for Health Promotion and Disease Prevention Research, University of Southern California Keck School of Medicine, Department of Preventive Medicine, 1000 South Fremont Avenue Unit 8, Alhambra, CA 91803; Phone +1-626-457-6639; Fax +1-626-457-4012; mickens@usc.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

18 million US residents are African American females. However, African American women (AAW)¹ are at a dual disadvantage because they are historically underrepresented in research as African Americans and as women (Daunt, 2003; Geller, Adams, & Carnes, 2006; Sadler, et al., 2005). Despite minority status in population number, AAW are considered a “vulnerable population” due to their over-representation in poor health outcomes in general (Flaskerud & Winslow, 1998). Accordingly, research of smoking in AAW is a priority.

There are relatively large literatures that have examined smoking among women (Barker, Orleans, Halpin, & Barry, 2004; Cepeda-Benito, Reynoso, & Erath, 2004; Collins, et al., 2004; Patel, Bach, & Kris, 2004; Pauly, 2008; Reichert, Seltzer, Efferen, & Kohn, 2004; Schnoll, Patterson, & Lerman, 2007; Wetter, et al., 1999) and among African Americans (Brook, Saar, Zhang, & Brook, 2009; King, Polednak, Bendel, & Hovey, 1999; Lawrence, Graber, Mills, Meissner, & Warnecke, 2003; Moolchan, et al., 2007; Okuyemi, Pulvers, et al., 2007; Payne & Diefenbach, 2003; Pederson, Ahluwalia, Harris, & McGrady, 2000; Webb, 2008). Review articles on these topics have typically focused on differences between women and men without considering the concomitant role of ethnicity, or they have often focused on differences between African Americans and other ethnic groups without considering the role of gender [but see (Sanchez-Johnsen, 2005) for a review on smoking and obesity]. While these reports are informative for understanding smoking among AAW, there are several reasons why it is important to identify the epidemiology, determinants, and consequences of smoking in the specific population of AAW.

Among females, AAW are known to be different than non-AAW in several demographic, psychosocial, and physiological characteristics (Ahmed, Brown, Gary, & Saadatmand, 1994; Andrews, Felton, Ellen Wewers, Waller, & Tingen, 2007; Clemens, Klesges, Slawson, & Bush, 2003; Collins, et al., 2004; Delva, et al., 2006; Ensminger, Smith, Juon, Pearson, & Robertson, 2009; Harrell & Gore, 1998; King, et al., 2006; Manson, Sammel, Freeman, & Grisso, 2001; Rosenberg, Palmer, Rao, & Adams-Campbell, 2002; Sartor, et al., 2009; Wolff, Britton, & Wilson, 2003). Similarly, within the African American population, psychosocial and physiological factors differ between women and their male counterparts (Artinian, Washington, Flack, Hockman, & Jen, 2006; Fox, et al., 2004; King, et al., 1999; Lockery & Stanford, 1996; Murtaugh, Borde-Perry, Campbell, Gidding, & Falkner, 2002; Nollen, Catley, Davies, Hall, & Ahluwalia, 2005; Pulvers, et al., 2004; Qureshi, Suri, Zhou, & Divani, 2006; Savoca, et al., 2009; Woods, Harris, Ahluwalia, Schmelzle, & Mayo, 2001). In addition, considering the concomitant role of ethnicity and gender is important because these two characteristics may potentially interact to influence factors relevant to smoking, such that AAW may be disproportionately represented in comparison to other groups (which is the case in obesity outcomes; (Cook, Nies, & Hepworth, 2000; Klesges, et al., 1998; Pomerleau, et al., 2005; Sanchez-Johnsen, 2005).

Indeed, there is a small emerging empirical literature on tobacco use specifically among AAW. However, these findings have yet to be summarized and integrated in a comprehensive fashion. This is a notable gap in the literature because an up-to-date review may: (a) provide practitioners and researchers who work with this population with information that may be useful for tailoring treatment approaches; and (b) stimulate future research that targets important areas that have been previously neglected.

Accordingly, the present article reviews and integrates the current literature on the epidemiology, determinants, and consequences of cigarettes smoking specifically among AAW. The aims are to: (1) describe current epidemiological data, trends, and smoking behavior patterns for AAW smokers; (2) discuss biological and psychosocial factors that may influence

¹African American women are abbreviated as AAW

smoking behavior in AAW; (3) review the health consequences of smoking in AAW; and (4) and suggest important avenues that should be targeted in future research of smoking in AAW. For the purpose of this review, African Americans are defined as residents of the US who have “origins in any of the Black racial groups of Africa” (US Census Bureau, 2000). The term is used to refer to individuals of African descent who define themselves as African-American or Black with African roots. This is in contrast to individuals who primarily consider themselves to be “Black” with Hispanic or other roots. We compare African Americans with Caucasian Americans in the present review because Caucasian Americans currently represent the ethnic majority (US Census Bureau, 2000). We use the term “Caucasian American” to refer to individuals who identify themselves as Americans, report their race as “White,” and have descendants in Europe, North Africa, or some areas within the Middle East (US Census, 2000).

Some guiding questions to be considered in this paper are as follows: Are AAW different from their male African American counterparts in the epidemiology, determinants, and consequences smoking? Among women, are AAW different from non-AAW? Do ethnicity and gender interact in their influence on tobacco use patterns, determinants, and consequences?

2. Epidemiology of Tobacco Use and Associated Characteristics among AAW

2.1 Prevalence and Heaviness of Smoking

According to data collected in 2007, AAW currently appear to be the least likely to smoke (15.9%) when compared to African American men (23.4%), Caucasian American women (18.5%), and Caucasian American men (22.2%) (CDC, NCHS, 2008). That is, ethnicity and gender appear to have interactive effects on smoking risk such that the differences in smoking prevalence between Caucasian American men and women are less prominent than the corresponding differences between AAW and African American men, with AAW being at disproportionately lower risk (CDC, NCHS, 2008).

Ethnic and gender differences in current epidemiologic smoking prevalence rates are best interpreted in reference to changes in smoking rates in the U.S. population over the past 25 years. Notably, trends in recent years suggest that the rates of smoking among AAW have decreased. According to national data from the Centers for Disease Control and Prevention, (CDC, NCHS, 2008), there was a 30.9% smoking prevalence among AAW in 1985, and 20.7% prevalence in 2000 (NCHS, 2008), until rates fell to their current level of 15.9%. For African American men, smoking prevalence rates also considerably decreased from 1985 (40.2% smoked) to 2000 (25.7%), and again in 2007 (23.4%) (NCHS, 2008). Thus, it appears that smoking prevalence rates comparatively decreased more among African American men than AAW between 1985 and 2007, with rates among African American men decreasing by 16.8% and rates for AAW decreasing by 15.3%.

Recent comparisons of AAW to Caucasian American women suggest that both groups have shown recent declines in smoking prevalence, although reductions have been more dramatic among AAW (CDC National Center for Health Statistics, 2008). Data from the US Surgeon General’s Report on Women and Smoking (2001) indicated that 27.9% of Caucasian American women smoked in 1985; this was lower than the 30.9% of AAW who reported smoking in 1985. By the year 2000, however, more Caucasian American women smoked (22%) than AAW (20.7%), and this gap had widened by 2007 (18.5% of Caucasian American women vs. 15.6% of AAW, respectively) (CDC NCHS, 2008).

Regarding the heaviness of smoking, reports have suggested that AAW are more likely to be “light” smokers than African American men and Caucasian American women [(Okuyemi, Ahluwalia, Richter, Mayo, & Resnicow, 2001); US DHHS, 1998]. While there is no clear consensus for “light vs. heavy smoking” (Okuyemi, et al., 2002), the criteria that has been used

in previous research with AAW categorized light smokers as those having <10 or 15 cigarettes per day (Ahluwalia, et al., 2006; Okuyemi, Ebersole-Robinson, Nazir, & Ahluwalia, 2004; Webb & Carey, 2008). Using the cutoff of smoking less than 15 cigarettes per day to identify “light smoking” (US DHHS Surgeon General’s Report on Tobacco Use Among Racial/Ethnic Minorities, 1998), national data have suggested that 67.1% of AAW are light smokers. That is in comparison to 61.1% of African American men and 42% of Caucasian American women.

2.2 Mentholated Cigarettes

African Americans are more likely to smoke mentholated cigarettes as a group (Businelle, et al., 2009; Castro, 2004; Gardiner, 2004; Giovino, et al., 2004; Okuyemi, et al., 2004; Savitz, Dole, Terry, Zhou, & Thorp, 2001). Accordingly, studies have suggested that some 70% or more African Americans smoke menthol cigarettes (Ahluwalia, Harris, Catley, Okuyemi, & Mayo, 2002; Okuyemi, Faseru, Sanderson Cox, Bronars, & Ahluwalia, 2007). Although women are generally more likely to smoke mentholated cigarettes than men (Giovino, et al., 2004), AAW in particular appear more likely to smoke mentholated cigarettes than African American men (Allen & Unger, 2007) and Caucasian American women (Robles, Singh-Franco, & Ghin, 2008; Savitz, et al., 2001). These findings extend to pregnant smokers, as a large community sample of pregnant women ($N=2,418$), AAW showed a significantly higher preference for mentholated cigarettes than Caucasian American women (95% vs. 26%, respectively) (Savitz, et al., 2001). Among non-pregnant women, similar findings have been established. When given a choice, AAW smokers were significantly more likely to choose mentholated cigarettes as their usual preferred brand. (K. Ahijevych, Weed, & Clarke, 2004).

This is notable given results of a recent focus group study of African Americans, which found that participants were likely to believe that fewer negative health effects were linked to smoking mentholated (vs. non-mentholated) cigarettes and that non-menthol smokers were “hardcore” smokers (Richter, Beistle, Pederson, & O’Hegarty, 2008). Several studies have further demonstrated that African Americans smoking mentholated cigarettes were less confident about quitting and less likely to quit than those who smoked non-mentholated cigarettes (Harris, et al., 2004; Okuyemi, Faseru, et al., 2007).

2.3 Nicotine Dependence and Withdrawal

Nicotine dependence is a constellation of symptoms involving tolerance, withdrawal, and difficulty controlling tobacco use [American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR), 2000] and is a predictor of more pervasive and persistent smoking (Horn, Fernandes, Dino, Massey, & Kalsekar, 2003). Results on nicotine dependence have been mixed. For example, the definitions of nicotine dependence from the CARDIA Study (Coronary Artery Risk Development in Young Adults, $N=3,933$, 1991–1992) have been defined as “having one’s first cigarette within 30 minutes of awakening” (Son, Markovitz, Winders, & Smith, 1997). National data on cigarette smoke and nicotine dependence from the CARDIA Study were stratified by gender and ethnicity and included a cross sectional sample of AAW, African American men, Caucasian American men, and Caucasian American women. In the study, AAW were more likely to be nicotine dependent than Caucasian American women (15% vs. 8.2%, respectively), but were less likely to be nicotine dependent than African American men. In the sample, 19% of African American men were defined as nicotine dependent, as compared to 15% of AAW. The African American men in the CARDIA Study also appeared more likely to be nicotine dependent than Caucasian American men in this sample (19% vs. 12.6%, respectively). This is consistent with widespread national data which suggests men are more likely to be nicotine dependent than women [National Epidemiologic Survey on Alcohol and Related Conditions, $N=43,093$ (Grant, Hasin, Chou, Stinson, & Dawson, 2004)]. Between the two ethnic groups, African Americans were more likely to be nicotine dependent. More specifically, the results

of the CARDIA study indicated that AAW were more likely to be nicotine dependent than Caucasian American women.

Other data suggests that AAW may be less likely to be nicotine dependent than non-AAW, such as Caucasian American women. National data from the Surgeon General's report on Women and Smoking (US DHHS, 2001) indicate several differences between AAW and Caucasian American women in the prevalence of self-reported nicotine dependence symptoms. Data gathered were based on the National Household Survey on Drug Abuse (1992–1994). The women in the study were asked to report on nicotine dependence symptoms (NHSDA, 1992; NHSDA, 1994).

African American women who smoked <15 cigs/day evidenced similar self-reported (i.e., “felt dependent on cigarettes”) rates of nicotine dependence symptoms (56%) to those who smoked 16– 25 cigs/day (53%). Rates of nicotine dependence symptoms among AAW who smoke > 25 cigs/day were expectedly quite high (71%). By contrast, Caucasian American women who smoked <15 cigs/day indicated considerably lower rates of nicotine dependence symptoms (65%) than those smoked 16– 25 cigs/day (82%) and those who smoked > 25 cigs/day (79%) (US DHHS Surgeon General's Report, 2001), which were not substantially different from each other. These data show that Caucasian American women reported higher rates of nicotine dependence than AAW at each level of smoking heaviness. In addition, this suggests that increases in the prevalence of nicotine dependence symptoms across higher levels of smoking heaviness occur in a different fashion in AAW versus non-AAW. To date, AAW appear to be more likely to be light smokers. However, results are mixed on whether AAW are more likely to be dependent than non-AAW. Still, there is considerable research to suggest that AAW are at risk to continue to develop smoking-related health problems. This evidences a greater need for research to assess the epidemiology of nicotine dependence among AAW to inform future interventions.

Nicotine withdrawal is a syndrome that may occur upon the cessation of tobacco use, which includes symptoms such as anxiety, anger, depression, headaches, impatience, irritability, increased appetite and weight gain, difficulty concentrating, restlessness and insomnia [(Hughes, 2007); also see Diagnostic and Statistical Manual of Mental Disorder, 4th Edition, Text Revision (DSM-IV-TR)]. In multiethnic samples, women (as compared to men) have been shown to report greater increases in negative affect, withdrawal-related distress, and a desire to smoking in order alleviate negative affect as a result of tobacco withdrawal (Leventhal, et al., 2007). Similar findings were noted in a sample restricted to African American participants, as AAW reported significantly higher negative affect reduction as a reason to continue smoking when compared to African American men (Pulvers, et al., 2004). Thus, preliminary evidence suggests that the withdrawal syndrome among women is characterized by high levels of aversive symptoms and this appears to be consistent across ethnicities, although there is a lack of data that has examined whether gender and ethnicity interact to influence tobacco withdrawal.

2.4 Smoking Topography

Smoking topography, also known as “puffing behavior,” refers to the way an individual smokes and the specific behavioral patterns involved (Hammond, Fong, Cummings, & Hyland, 2005). Investigating smoking topography is particularly important for understanding nicotine dependence and increased risk of exposure to tar and carcinogens (Shields, 2000). Few studies have explored the smoking topography differences between African Americans and Caucasian Americans without considering the role of gender (Melikian, et al., 2007; Moolchan, Hudson, Schroeder, & Sehnert, 2004; Patterson, et al., 2003; Strasser, Pickworth, Patterson, & Lerman, 2004). Results have been mixed, with some studies finding significant ethnic differences while others did not. One study found that African Americans demonstrate higher CO boosts

following smoking than Caucasian Americans (Patterson, et al., 2003). There is some evidence to suggest that this finding is consistent in samples comprised of only women, as a previous study found that AAW had higher pre and post CO levels and CO boosts than Caucasian American women (K. Ahijevych & Gillespie, 1997). The AAW in the study also had higher cotinine per cigarette ratios and higher overall plasma cotinine levels than the Caucasian female participants.

In a study of smoking topography in AAW, Ahijevich and colleagues (1996) stratified a small, community-based sample of AAW and Caucasian American women into groups based on race and menthol or non-menthol cigarette preference ($N = 37$). A two-way factorial design was employed to observe differences between groups. While there were no significant differences in menthol preference in this study, the contents of the cigarettes chosen by AAW when compared to Caucasian American women were remarkable. Regarding exposure to nicotine, AAW women had significantly higher carbon monoxide (CO) boosts than Caucasian American women. There was also a non-significant trend for AAW to have higher nicotine boosts than their Caucasian counterparts in this study (21.4 ng/ml vs. 15.9 ng/ml, respectively). While there were no race-menthol interaction effects, Caucasian American women who smoked mentholated cigarettes were observed to have the lowest CO boost of all groups. Non-menthol AAW smokers had the highest CO boost of all groups, followed by Caucasian American non-menthol smokers and AAW menthol smokers (K. Ahijevych, Gillespie, Demirci, & Jagadeesh, 1996). Given the significant differences in carbon monoxide boost and rates of menthol cigarette smoking between AAW and Caucasian American women, AAW appear to be distinct from Caucasian American women. Evidence also suggests that AAW who are smokers smoke mentholated cigarettes more than African American males. Thus, additional research of menthol smoking in AAW is warranted to further understand potential health risks associated with menthol smoke and specific smoking topography patterns associated with mentholated cigarette smoking.

Few studies of smoking topography between AAW and African American men exist without menthol as a part of the investigation [see (Henningfield, et al., 2003; Okuyemi, Faseru, et al., 2007) for literature which also investigates differences related to mentholated smoking]. While research with mentholated cigarettes provide relevant information regarding brand preference and other sociocultural factors among African Americans (Allen & Unger, 2007; Richter, et al., 2008), there is conceivably more to understand about smoking topography patterns in AAW as compared to African American men who do not smoke mentholated cigarettes, especially given that mentholated cigarettes may provide a cooler smoke that can change smoking topography to increase tar, nicotine and carcinogenic absorption (Shields, 2000). However, there are exceptions. For example, Melikian and colleagues (2007) found that African American men had longer puff duration and volume than AAW, though AAW had significantly more puffs per cigarette. Evidently, findings are mixed to date. The present scarcity of research and mixture of findings highlight the need for continued research on smoking topography differences between AAW and their comparison groups.

2.5 Smoking across the Lifespan

African American women appear more likely to initiate smoking later than Caucasian American women (18.5 yrs) and African American men (18.0 yrs) (CDC, National Health Interview Survey, 2000; US DHHS, 1998; Chatila et al, 2004). On average, national data suggests that AAW initiate smoking at 19.28 years, well into late adolescence and later than their relevant comparison groups [as cited in (Moon-Howard, 2003), data collected by the CDC, National Health Interview Survey, 2000].

Despite a later smoking initiation onset, some national trends of smoking prevalence across different age groups among AAW are noteworthy. Cross-sectional survey data (National

Centers for Health Statistics, 2008) indicate that rates of smoking among AAW were 14.8% for women between ages 18–24, 15.4% for those between 25 and 34 years-old, 21% for 35 to 44 year-olds, 25.5% of 45 to 64 year-olds, and 9.3% for AAW over 65. By contrast, smoking rates among Caucasian American women were 20.7% for women between ages 18–24, 23.7% for those between 25 and 34 years-old, 22% for 35 to 44 year-olds, 18.8% of 45 to 64 year-olds, and 8.4% for Caucasian American women over 65. Overall, these data suggest smoking is less prevalent among AAW (vs. Caucasian American women) in young adulthood, but more common in AAW in older adulthood.

These later life data are noteworthy and could potentially be explained by generational differences across women of different ethnicities. Perhaps younger women have received more education about smoking and smoking related-illness in present times, and AAW have responded with lower smoking. By contrast, older AAW were socialized in earlier generations and may have had less access and exposure to smoking interventions than their Caucasian American female counterparts of the same age bracket. Although there are several potential explanations that could account for ethnic differences in smoking across the lifespan in women, the disproportionately high number of AAW smokers after age 45 highlights the need for assessment and intervention due to the potential for smoking-related illness and health problems in later adulthood.

3. Putative Determinants of Tobacco Use among AAW

3.1 Biological Determinants

Several potential biological determinants should be considered for AAW smokers. A relatively large body of literature has demonstrated that there is variability in the way that nicotine is metabolized between African Americans and other ethnic groups (K. L. Ahijevych & Wewers, 1994; Benowitz, Herrera, & Jacob, 2004; Krous & Hauck, 1998; Mustonen, Spencer, Hoskinson, Sachs, & Garvey, 2005; Schoedel, Hoffmann, Rao, Sellers, & Tyndale, 2004; Wagenknecht, Manolio, Sidney, Burke, & Haley, 1993). CYP2A6 is the primary enzyme that metabolizes nicotine into cotinine (Mwenifumbo, Sellers, & Tyndale, 2007; Schoedel, et al., 2004). Polymorphisms in the gene that codes for the CYP2A6 enzyme affect smoking behavior, and African Americans are more likely than other ethnic groups to have certain variants in this gene linked with increased nicotine metabolism (Fukami, et al., 2007). Relatedly, investigations of CYP2A6 enzyme activity among African American light smokers have demonstrated that, within this group, slower metabolizers have higher plasma nicotine levels and that higher CYP2A6 activity has been associated with greater cigarette consumption (Ho, et al., 2009; Mwenifumbo, et al., 2007).

Research focusing specifically on women has found that plasma cotinine levels of AAW were higher than Caucasian American women (K. Ahijevych & Gillespie, 1997). Because AAW appear to have higher plasma cotinine levels per cigarette smoked than Caucasian American women, differences in metabolism of nicotine may play a role in differential risk between AAW and Caucasian women for nicotine dependence among light smokers (K. Ahijevych & Gillespie, 1997; Caraballo, et al., 1998).

Genetic variation in systems other nicotine metabolism may also play a role in smoking among AAW. For example, African Americans with risk-related variants of dopamine D2 receptor (DRD2) or dopamine transporter (SLC6A3) gene had stronger cigarette cravings than non-carriers of the gene (Erblich, Lerman, Self, Diaz, & Bovbjerg, 2005). It is unclear whether there are any gender differences in DRD2 and SLC6A3 effects on smoking-related phenotypes among individuals of African American heritage; however, this information would be of interest.

Family studies also provide evidence of a genetic basis of smoking in AAW. A recent twin study showed that significant portions of variance in smoking-related variables (43% – 80%) among AAW were accounted for by genetic influences (Whitfield, et al., 2007); (Sartor, et al., 2009), similar research exists for Caucasians (Sullivan & Kendler, 1999). It remains unclear whether the extent to which genetic variance explains smoking behavior is larger or smaller among AAW in contrast to comparison groups.

In summary, there appear to be important differences in nicotine metabolism, which are linked to underlying genetics, which may be particularly relevant for AAW. Other biological factors, such as genetic variation in the dopamine system and general heritability, also play a role; although any differences in the extent of their influences on smoking in AAW as compared to other groups remains relatively unclear.

3.2 Psychosocial Determinants

3.2.1 Environment—The role of psychosocial stress on AAW smoking behaviors have been previously investigated and discussed to some extent (Ensminger, et al., 2009; Fernander, Schumacher, Wei, Crooks, & Wedlund, 2008; Jun & Acevedo-Garcia, 2007; Ludman, et al., 2002; Webb & Carey, 2008). A particular cluster of stressors come with urban setting and low income status which is particularly prevalent among AAW, and several authors have studied the role of these factors in the smoking habits of AAW for that reason (Artinian, et al., 2006; Bell, Zimmerman, Mayer, Almgren, & Huebner, 2007; Delva, et al., 2006; Elizabeth Jesse, Graham, & Swanson, 2006; Harrell & Gore, 1998; Woods, et al., 2001). In essence, AAW who live in urban, poorer environments are at an increased risk to smoke potentially in response to the stress of residing in such environments.

Research also indicates that geographic setting may be a potential environmental factor for AAW. In fact, AAW who resided in the southern regions of the US were significantly less likely to smoke than their AAW counterparts in the northeast (King, et al., 2006). One hypothesis is that fast paced, highly populated, and more expensive urban areas are likely to contribute to higher overall stress levels among AAW who live these areas. Unsurprisingly, both AAW and African American men living in urban environments with more reported “hassles” also smoked more cigarettes per day (Romano, Bloom, & Syme, 1991). Examples of hassles included: “being out of work for a month or longer”, “being concerned about living in an unsafe area”, and “not having enough money for food, clothing, housing or other necessities of life.” While the authors did not directly measure the use of smoking as a coping mechanism, Romano and colleagues (1991) indicated that smoking may represent a coping behavior that assuages the psychological impact of stressful environment.

Finally, because AAW are members of a historically disadvantaged minority group, particular examples of social stress may also include racism and discrimination. Both racism and discrimination experiences have been shown to be positively associated with smoking (Guthrie, Young, Williams, Boyd, & Kintner, 2002; Landrine & Klonoff, 2000). Thus, multiple forms of environmental stress may potentially contribute to smoking among AAW.

3.2.2 Education—Lower levels of education are an apparent contributor to smoking behaviors among AAW. Never smoking, initiating smoking at later ages, and quitting were found to be associated with higher educational attainment among a large, national survey sample including AAW (National Health Interview Survey, 1995, 1997–2001, $N = 14,903$) (King, et al., 2006).

A sample of AAW were a part of a neighborhood, inner city longitudinal study that followed African American males and females from age 6 to 42 to examine the associations between social disadvantage, poverty, and educational attainment. Only AAW were included in the

analyses for this study (N= 457) and the women were approximately 42 years of age at time of measurement.. Over half of the high school dropouts reported being smokers. Smokers were less likely to enroll in college and were more likely to have fair or unsatisfactory math grades dating back to the first grade. Poverty during young adulthood was also significantly associated with being a current smoker(Ensminger, et al., 2009).

In another low-income community sample of 263 AAW, Webb and Carey (2008) found that the number of cigarettes smoked per day was inversely associated with education among AAW. Evidently, the positive association between smoking and education among AAW cuts across small, homogenous samples and large multi-ethnic and multi-gendered samples. It is speculated that the link between smoking and education is a function of knowledge. As an individual becomes more educated in general, he or she may grow more exposed to the risks of smoking via formal curriculum (e.g., health and biology courses) and informal knowledge sources (e.g., campus health fairs, informal presentations, visits to student health centers). These factors may also extend to knowledge about the effects of smoking on fetal development, as a recent study found that AAW with lower levels of education were also more likely to report smoking during pregnancy. Among AAW, 47.8% of smokers had less than a high school education and 15.5% of non-smokers had less than a high school education in this study. (maybe add in a statistic regarding the percent of AAW with lower levels who are pregnant) (Elizabeth Jesse, et al., 2006). The association between education and smoking among pregnant women highlights a critical need for further investigation and further complicates the picture.

Pregnancy and single parenthood have been identified as stressors that may contribute to increased smoking among AAW (Bell, et al., 2007; Frost, et al., 1994; Harrell & Gore, 1998; Jun & Acevedo-Garcia, 2007). Indeed, research suggests that nearly one-half of AAW are single parents who maintain the household [McAdoo & Younge, pg. 103; as cited in (Neville, Tynes, & Utsey, 2009)]. Interventions for pregnant and parenting AAW smokers have been designed to decrease stress and minimize smoking impact on children of smoking mothers. Several successful interventions to date have been directed at building social support networks and prenatal healthcare assistance to alleviate stress (Jesse, Walcott-McQuigg, Mariella, & Swanson, 2005; Klerman, et al., 2001; Savitz, et al., 2001). Still, as almost one-half of all AAW mothers are head-of-household, it is important to continue to investigate the role that parenting has on smoking status and behaviors.

3.2.3 Intrapersonal and psychiatric factors—Psychological and psychiatric factors appear to uniquely contribute to smoking behaviors among AAW. There significant associations between nicotine dependence and Axis I and II psychiatric disorders in the general American population (Grant, et al., 2004). Examination of gender differences in the smoking-psychiatric disturbance link indicate that women who smoke are significantly more likely to experience current or past depression in their lifetime than men (Husky, Mazure, Paliwal, & McKee, 2008). In a multi-ethnic sample, Leventhal et al. (2007) found that women were more like to report abstinence-induced increases in desire to smoke to cope with negative affect than men.

Research suggests that the prominent role of negative affect in smoking among women extends to AAW smokers. For example, Pulvers and colleagues (2004) found that AAW reported higher levels of negative affect reduction smoking expectancies than African American men. Ethnic comparisons in a low-income sample of female smokers found that the influence of depression and stress on tobacco dependence was stronger among AAW than Caucasian American women (Ludman, et al., 2002). In a separate study, smoking status and cigarettes per day predicted anger among low-income AAW (Delva, et al., 2006), suggesting that these findings are relevant to several components of negative affect. Evidently, negative affect and depressive symptoms are associated with smoking behaviors particularly among AAW. This comorbidity reflects a

potential need for tailored, inclusive interventions that combine aspects of psychiatric and smoking cessation treatment for AAW.

3.2.4 Other substance use—According to data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC, $N = 41654$), there is a strong comorbidity between smoking behaviors and other substance use (e.g., alcohol) within the general population (Grant, et al., 2004). Consistent with this finding, a large, multi-ethnic community sample of women over 50 were surveyed about their current smoking status and alcoholic beverage consumption ($N = 946$). The sample population was solely comprised of AAW and Caucasian American women, and a significant association was found between positive smoking status and greater alcoholic beverage consumption between both groups. (Fredman, et al., 1999). Further, a cross-sectional study of national sample of AAW, ages 21 to 69, were surveyed about their alcohol consumption and other behavioral factors, such as smoking, as part of the *Black Women's Health Study* (1995, $N = 64,500$). Heavy drinking was associated with smoking status among AAW across several geographic regions in the US (Rosenberg, et al., 2002). In a smaller longitudinal sample of AAW twins ($N = 463$), both smoking and alcohol initiation rates shared strong genetic variances (62% and 44%, respectively). Significant associations were also found between initiation of cigarette smoking and alcohol, and between initiation of cigarette smoking and cannabis use (Sartor, et al., 2009). While genetics may account for some overlap between substance use and smoking among AAW, environmental contributors to smoking and substance comorbidities among AAW should be explored.

3.2.5 Social support, spirituality and religion—Two crucial protective psychosocial factors for AAW are social support and religion. Social support has been shown to be inversely associated with smoking status among AAW (Nollen, et al., 2005) and increases in social support have been shown to predict smoking abstinence (Andrews, et al., 2007). Regarding social support, there appears to be an interaction between social support and gender in predicting smoking behavior among African Americans. Specifically, strong social networks were associated with lower likelihood smoking among AAW, but not among African American men (Romano, et al., 1991). Further evidence suggests that religious affiliation and spiritual influences contribute to decreased smoking behaviors among AAW specifically (Ahmed, et al., 1994; Elizabeth Jesse, et al., 2006; Mann, McKeown, Bacon, Vesselinov, & Bush, 2007). Ensminger and colleagues (2009) found several associations between smoking and social disadvantage (e.g. poverty, low education) in a large metropolitan, longitudinal sample of AAW. Despite significant social disadvantages, the researchers found that AAW who reported attending church less than a few times a month were significantly more likely to endorse current smoking than those who endorsed never or former smoking.

Protective factors, such as social support, religious affiliation, and spirituality, may further reduce the effects of demonstrated social stress or disadvantages that are experienced among AAW. Such protective factors may ultimately assist with smoking prevention or cessation in this group. Because AAW are members of a historically disadvantaged minority group, particular examples of social stress may also include racism and discrimination. Both racism and discrimination experiences have been shown to be positively associated with smoking (Guthrie, et al., 2002; Landrine & Klonoff, 2000).

Culturally-tailored social support interventions for AAW that include counseling and/or religious or spiritual elements enhance odds of cessation success (Andrews, et al., 2007; Sanchez-Johnsen, 2005), which further supports and combines the roles of social support and religion in reducing smoking risk in women. Yet, it is unknown whether these interventions if used in combination with pharmacological treatments, standard smoking cessation counseling, and education about biological genetic factors about nicotine metabolism, would be particularly effective for AAW. It is possible that a more comprehensive intervention that aims

to address multisystemic factors involved in smoking could lead to greater cessation rates for AAW.

4. Consequences

Although the prevalence of smoking is lower in AAW than other demographic groups, when examined in detail, several statistics are alarming and represent significant health disparities that singly exist for AAW. In general, African Americans are more likely to develop smoking-related illness, including cerebrovascular disease, hypertension, lung and bronchial cancer and stroke (CDC, NHIS, 2007), which speaks to general ethnic health disparities without considering gender. The American Cancer Society has tracked the incidence of smoking-related illness and cancers specifically among AAW (ACS, 2007). There appear to be interactions between gender and ethnicity in predicting risk of lung and bronchial cancers, which are the second most commonly diagnosed cancer among African Americans. While AAW are less likely to smoke and develop lung or bronchial cancer than African American men (112.2 vs. 53.1 per 100,000 individuals), differences in the incidence of lung and bronchial cancers between Caucasian American men and women are less pronounced (81.7 vs. 54.7 per 100,000 individuals).

There are also noteworthy disparities in smoking-related cancers (e.g., lung, bronchial) between AAW and Caucasian American women. For example, the incidence of lung and bronchial cancers between AAW and Caucasian American women were almost identical (53.1 vs. 54.7 per 100,000 persons, respectively). At first glance, this statistic may not seem significant. However, it is especially alarming when considering that Caucasian American women are more likely to be smokers and are more often “heavy” smokers than AAW according to national statistics (CDC, NCHS, 2008). If smoking status is lower among AAW, one would expect smoking-related cancer rates to be much lower. Contrarily, this not the case, as AAW appear to be *approximately equivalent* in lung or bronchial cancer diagnoses. Additional evidence indicates that AAW are more likely to develop cancer of the larynx, esophageal cancer, cerebrovascular disease, and cardiovascular disease than Caucasian American women (American Cancer Society, 2005). Furthermore, smoking trends in the last 25 years demonstrate that smoking has decreased among AAW, but smoking-related illnesses have not (ACS, 2005; CDC Mortality and Morbidity Weekly Report, 2008; US DHHS, 1998).

Several factors could potentially contribute to the relative discrepancy between smoking rates and lung and bronchial cancers in AAW. Underreporting of smoking behavior is one potential factor. In one sample of AAW, the underreporting percentages varied, but were considerable. Eight-six percent of light smokers underreported smoking when reports were contrasted with cotinine values. Moderate and heavy AAW smokers also underreported (70% and 21%, respectively), though percentages suggest that they did so less than light smokers. (K. L. Ahijevych & Wewers, 1994). This finding is suggestive that self-identified “light” AAW smokers may be heavier smokers than they report. Another potential explanation is that AAW are differentially sensitive to the carcinogenic effects of smoking when compared to Caucasian American women (K. L. Ahijevych & Wewers, 1994). Finally, the rate of smoking-related diseases among AAW may simply be explained by the relatively high prevalence of smoking among older AAW (CDC, NCHS, 2008)]. There is a relatively high prevalence of smoking in older AAW. Thus, trends indicating high rates of smoking-related diseases among AAW could be a product of smoking during late adulthood, which is when several smoking related diseases onset (Mermelstein, 2003). Health disparities could also be due to other lifestyle and health factors such as diet and nutrition, overweight status/obesity, physical inactivity, cardiovascular disease, second hand smoke and other comorbid health problems (American Cancer Society,

2005; CDC, NCIS, 2007; Darozewski, 2004). Nonetheless, these findings highlight a greater need for exploration of factors involved in smoking-related illness for AAW.

5. Summary

This article reviewed and integrated the current literature on the epidemiology, determinants, and consequences of smoking among AAW. Several notable trends were identified, which speak to the need for research and practice to consider the unique factors that play a role in smoking among the AAW.

In comparison to African American men and Caucasian women, AAW are less likely to smoke, initiate smoking later, are more likely to smoke mentholated cigarettes, and more likely to be classified as “light” smokers, and less likely to be nicotine dependent. Despite starting later and smoking less, AAW appear more likely to smoke with older age, which is a high risk period for health problems. This may, in part, explain why AAW continue to have high rates of smoking-related diseases. There are some unique etiologic influences on smoking among AAW, including metabolic and genetic factors. In addition, AAW appear to be prone to smoking because of its negative affect reducing properties, which may be useful to help cope against the unique and considerable psychosocial stressors that AAW face (e.g., urban environment, low economic resources, single parenthood). In essence, AAW are products of unique biological, psychosocial, and sociocultural factors, which may play a role in smoking.

Implications for future research and practice can be drawn from the trends noted in this review of the literature. Additional research is needed to understand why smoking prevalence in AAW has decreased over the years. Perhaps if specific protective factors that account for these declining trends were identified, interventions to reduce and prevent smoking among AAW could be developed. Relatedly, it will be important for future research to investigate unique factors that potentially link smoking behavior to tobacco-related diseases among AAW, given epidemiologic trends for smoking-related illnesses among AAW continue to indicate high risk.

Given the present state of the etiology literature for smoking among AAW, additional research clarifying smoking topography indices among AAW and their potential linkages with biochemical determinants of smoking (e.g., nicotine metabolism) is warranted. Because there is now a reasonable degree of evidence indicating the important role of psychosocial stressors and negative affect in smoking vulnerability in AAW, tailored treatments targeting these determinants may be particularly effective in AAW smokers. AAW appear to have benefited from interventions that utilize social support and counseling models to address some distinct psychosocial issues associated with smoking (Ahmed, et al., 1994; Li, et al., 1984). Thus, tailored interventions designed to help AAW deal with stress and negative affect may be useful if methods to enhance social support and religious community involvement are emphasized (Ensminger, et al., 2009; Nollen, et al., 2005). AAW have been historically underrepresented in research as African Americans and as women. Undoubtedly, continued research of epidemiology, determinants, and consequences of smoking in AAW is a worthwhile endeavor that could ultimately reduce the public health burden of tobacco use.

References

- Ahijevych K, Gillespie J. Nicotine dependence and smoking topography among black and white women. *Res Nurs Health* 1997;20(6):505–514. [PubMed: 9397130]
- Ahijevych K, Gillespie J, Demirci M, Jagadeesh J. Menthol and nonmenthol cigarettes and smoke exposure in black and white women. *Pharmacol Biochem Behav* 1996;53(2):355–360. [PubMed: 8808144]
- Ahijevych K, Weed H, Clarke J. Levels of cigarette availability and exposure in black and white women and efficient smokers. *Pharmacol Biochem Behav* 2004;77(4):685–693. [PubMed: 15099913]

- Ahijevych KL, Wewers ME. Patterns of cigarette consumption and cotinine levels among African American women smokers. *Am J Respir Crit Care Med* 1994;150(5 Pt 1):1229–1233. [PubMed: 7952545]
- Ahluwalia JS, Harris KJ, Catley D, Okuyemi KS, Mayo MS. Sustained-release bupropion for smoking cessation in African Americans: a randomized controlled trial. *JAMA* 2002;288(4):468–474. [PubMed: 12132977]
- Ahluwalia JS, Okuyemi K, Nollen N, Choi WS, Kaur H, Pulvers K, et al. The effects of nicotine gum and counseling among African American light smokers: a 2 × 2 factorial design. *Addiction* 2006;101(6):883–891. [PubMed: 16696632]
- Ahmed F, Brown DR, Gary LE, Saadatmand F. Religious predictors of cigarette smoking: findings for African American women of childbearing age. *Behav Med* 1994;20(1):34–43. [PubMed: 7919633]
- Allen B Jr, Unger JB. Sociocultural correlates of menthol cigarette smoking among adult African Americans in Los Angeles. *Nicotine Tob Res* 2007;9(4):447–451. [PubMed: 17454699]
- American Cancer Society. *Cancer Facts and Figures for African Americans, 2007–2008*. Atlanta, GA: American Cancer Society; 2007.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR)*. Washington, DC: Author; 2000.
- Andrews JO, Felton G, Ellen Wewers M, Waller J, Tingen M. The effect of a multi-component smoking cessation intervention in African American women residing in public housing. *Res Nurs Health* 2007;30(1):45–60. [PubMed: 17243107]
- Artinian NT, Washington OG, Flack JM, Hockman EM, Jen KL. Depression, stress, and blood pressure in urban African-American women. *Prog Cardiovasc Nurs* 2006;21(2):68–75. [PubMed: 16760688]
- Barker D, Orleans T, Halpin H, Barry M. So near, yet so far: tobacco dependence treatment for pregnant women. *Nicotine Tob Res* 2004;6:S259–S267. [PubMed: 15203826]
- Bell JF, Zimmerman FJ, Mayer JD, Almgren GR, Huebner CE. Associations between residential segregation and smoking during pregnancy among urban African-American women. *J Urban Health* 2007;84(3):372–388. [PubMed: 17226080]
- Benowitz NL, Herrera B, Jacob P 3rd. Mentholated cigarette smoking inhibits nicotine metabolism. *J Pharmacol Exp Ther* 2004;310(3):1208–1215. [PubMed: 15084646]
- Brook JS, Saar NS, Zhang C, Brook DW. Familial and non-familial smoking: effects on smoking and nicotine dependence. *Drug Alcohol Depend* 2009;101(1–2):62–68. [PubMed: 19101100]
- Businelle MS, Kendzor DE, Costello TJ, Cofta-Woerpel L, Li Y, Mazas CA, et al. Light versus heavy smoking among African American men and women. *Addict Behav* 2009;34(2):197–203. [PubMed: 18976867]
- Caraballo RS, Giovino GA, Pechacek TF, Mowery PD, Richter PA, Strauss WJ, et al. Racial and ethnic differences in serum cotinine levels of cigarette smokers: Third National Health and Nutrition Examination Survey, 1988–1991. *JAMA* 1998;280(2):135–139. [PubMed: 9669785]
- Castro FG. Physiological, psychological, social, and cultural influences on the use of menthol cigarettes among Blacks and Hispanics. *Nicotine Tob Res* 2004;6:S29–S41. [PubMed: 14982707]
- Centers for Disease Control and Prevention. *Smoking-Attributable Mortality, Years of Potential Life Lost, and Productivity Losses—United States, 2000–2004*. *Morbidity and Mortality Weekly Report* 2008. 2009 57(45):1226–1228.
- Centers for Disease Control and Prevention. *Health, United States, 2008*. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Division of Data Services; 2009 [Accessed August 19, 2009]. <http://www.cdc.gov/nchs/data/hs/hs08.pdf>
- Centers for Disease Control and Prevention. *National Health Interview Survey*. Hyattsville, MD: National Center for Health Statistics, Division of Data Services; 2000 [Accessed August 12, 2009]. Available at: www.cdc.gov/nchs/nhis.htm
- Cepeda-Benito A, Reynoso JT, Erath S. Meta-analysis of the efficacy of nicotine replacement therapy for smoking cessation: differences between men and women. *J Consult Clin Psychol* 2004;72(4):712–722. [PubMed: 15301656]

- Clemens LH, Klesges RC, Slawson DL, Bush AJ. Cigarette smoking is associated with energy balance in premenopausal African-American adult women differently than in similarly aged white women. *Int J Obes Relat Metab Disord* 2003;27(10):1219–1226. [PubMed: 14513070]
- Collins BN, Wileyto EP, Patterson F, Rukstalis M, Audrain-McGovern J, Kaufmann V, et al. Gender differences in smoking cessation in a placebo-controlled trial of bupropion with behavioral counseling. *Nicotine Tob Res* 2004;6(1):27–37. [PubMed: 14982685]
- Cook TH, Nies MA, Hepworth JT. Race differences in the relationships between dietary nutrients and overweight in women. *Health Care Women Int* 2000;21(1):41–51. [PubMed: 11022448]
- Daunt DJ. Ethnicity and recruitment rates in clinical research studies. *Appl Nurs Res* 2003;16(3):189–195. [PubMed: 12931333]
- Delva J, Tellez M, Finlayson TL, Gretebeck KA, Siefert K, Williams DR, et al. Correlates of cigarette smoking among low-income African American women. *Ethn Dis* 2006;16(2):527–533. [PubMed: 17682259]
- Elizabeth Jesse D, Graham M, Swanson M. Psychosocial and spiritual factors associated with smoking and substance use during pregnancy in African American and White low-income women. *J Obstet Gynecol Neonatal Nurs* 2006;35(1):68–77.
- Ensminger ME, Smith KC, Juon HS, Pearson JL, Robertson JA. Women, smoking, and social disadvantage over the life course: A longitudinal study of African American women. *Drug Alcohol Depend*. 2009
- Erblich J, Lerman C, Self DW, Diaz GA, Bovbjerg DH. Effects of dopamine D2 receptor (DRD2) and transporter (SLC6A3) polymorphisms on smoking cue-induced cigarette craving among African-American smokers. *Mol Psychiatry* 2005;10(4):407–414. [PubMed: 15381926]
- Fernander A, Schumacher M, Wei X, Crooks P, Wedlund P. Smoking risk and the likelihood of quitting among African-American female light and heavy smokers. *J Natl Med Assoc* 2008;100(10):1199–1206. [PubMed: 18942282]
- Flaskerud JH, Winslow BJ. Conceptualizing vulnerable populations health-related research. *Nurs Res* 1998;47(2):69–78. [PubMed: 9536190]
- Fox E, Harkins D, Taylor H, McMullan M, Han H, Samdarshi T, et al. Epidemiology of mitral annular calcification and its predictive value for coronary events in African Americans: the Jackson Cohort of the Atherosclerotic Risk in Communities Study. *Am Heart J* 2004;148(6):979–984. [PubMed: 15632881]
- Fredman L, Sexton M, Cui Y, Althuis M, Wehren L, Hornbeck P, et al. Cigarette smoking, alcohol consumption, and screening mammography among women ages 50 and older. *Prev Med* 1999;28(4):407–417. [PubMed: 10090870]
- Frost FJ, Cawthon ML, Tollestrup K, Kenny FW, Schrage LS, Nordlund DJ. Smoking prevalence during pregnancy for women who are and women who are not Medicaid-funded. *Am J Prev Med* 1994;10(2):91–96. [PubMed: 8037937]
- Fukami T, Nakajima M, Yamanaka H, Fukushima Y, McLeod HL, Yokoi T. A novel duplication type of CYP2A6 gene in African-American population. *Drug Metab Dispos* 2007;35(4):515–520. [PubMed: 17267622]
- Gardiner PS. The African Americanization of menthol cigarette use in the United States. *Nicotine Tob Res* 2004;6:S55–S65. [PubMed: 14982709]
- Geller SE, Adams MG, Carnes M. Adherence to federal guidelines for reporting of sex and race/ethnicity in clinical trials. *J Womens Health (Larchmt)* 2006;15(10):1123–1131. [PubMed: 17199453]
- Giovino GA, Sidney S, Gfroerer JC, O'Malley PM, Allen JA, Richter PA, et al. Epidemiology of menthol cigarette use. *Nicotine Tob Res* 2004;6:S67–S81. [PubMed: 14982710]
- Grant BF, Hasin DS, Chou SP, Stinson FS, Dawson DA. Nicotine dependence and psychiatric disorders in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Arch Gen Psychiatry* 2004;61(11):1107–1115. [PubMed: 15520358]
- Guthrie BJ, Young AM, Williams DR, Boyd CJ, Kintner EK. African American girls' smoking habits and day-to-day experiences with racial discrimination. *Nurs Res* 2002;51(3):183–190. [PubMed: 12063417]

- Hammond D, Fong GT, Cummings KM, Hyland A. Smoking topography, brand switching, and nicotine delivery: results from an in vivo study. *Cancer Epidemiol Biomarkers Prev* 2005;14(6):1370–1375. [PubMed: 15941943]
- Harrell JS, Gore SV. Cardiovascular risk factors and socioeconomic status in African American and Caucasian women. *Res Nurs Health* 1998;21(4):285–295. [PubMed: 9679806]
- Harris KJ, Okuyemi KS, Catley D, Mayo MS, Ge B, Ahluwalia JS. Predictors of smoking cessation among African-Americans enrolled in a randomized controlled trial of bupropion. *Prev Med* 2004;38(4):498–502. [PubMed: 15020185]
- Henningfield JE, Benowitz NL, Ahijevych K, Garrett BE, Connolly GN, Wayne GF. Does menthol enhance the addictiveness of cigarettes? An agenda for research. *Nicotine Tob Res* 2003;5(1):9–11. [PubMed: 12745502]
- Ho MK, Mwenifumbo JC, Al Koudsi N, Okuyemi KS, Ahluwalia JS, Benowitz NL, et al. Association of nicotine metabolite ratio and CYP2A6 genotype with smoking cessation treatment in African-American light smokers. *Clin Pharmacol Ther* 2009;85(6):635–643. [PubMed: 19279561]
- Horn K, Fernandes A, Dino G, Massey CJ, Kalsekar I. Adolescent nicotine dependence and smoking cessation outcomes. *Addict Behav* 2003;28(4):769–776. [PubMed: 12726789]
- Hughes JR. Depression during tobacco abstinence. *Nicotine Tob Res* 2007;9(4):443–446. [PubMed: 17454698]
- Husky MM, Mazure CM, Paliwal P, McKee SA. Gender differences in the comorbidity of smoking behavior and major depression. *Drug Alcohol Depend* 2008;93(1–2):176–179. [PubMed: 17850991]
- Jesse DE, Walcott-McQuigg J, Mariella A, Swanson MS. Risks and protective factors associated with symptoms of depression in low-income African American and Caucasian women during pregnancy. *J Midwifery Womens Health* 2005;50(5):405–410. [PubMed: 16154068]
- Jun HJ, Acevedo-Garcia D. The effect of single motherhood on smoking by socioeconomic status and race/ethnicity. *Soc Sci Med* 2007;65(4):653–666. [PubMed: 17493724]
- King G, Polednak A, Fagan P, Gilreath T, Humphrey E, Fernander A, et al. Heterogeneity in the smoking behavior of African American women. *Am J Health Behav* 2006;30(3):237–246. [PubMed: 16712438]
- King G, Polednak AP, Bendel R, Hovey D. Cigarette smoking among native and foreign-born African Americans. *Ann Epidemiol* 1999;9(4):236–244. [PubMed: 10332929]
- Klerman LV, Ramey SL, Goldenberg RL, Marbury S, Hou J, Cliver SP. A randomized trial of augmented prenatal care for multiple-risk, Medicaid-eligible African American women. *Am J Public Health* 2001;91(1):105–111. [PubMed: 11189800]
- Klesges RC, Zbikowski SM, Lando HA, Haddock CK, Talcott GW, Robinson LA. The relationship between smoking and body weight in a population of young military personnel. *Health Psychol* 1998;17(5):454–458. [PubMed: 9776004]
- Krous HF, Hauck FR. Racial and ethnic differences in serum cotinine levels. *JAMA* 1998;280(24):2075–2076. [PubMed: 9875872]
- Landrine H, Klonoff EA. Racial discrimination and cigarette smoking among Blacks: findings from two studies. *Ethn Dis* 2000;10(2):195–202. [PubMed: 10892825]
- Lawrence D, Graber JE, Mills SL, Meissner HI, Warnecke R. Smoking cessation interventions in U.S. racial/ethnic minority populations: an assessment of the literature. *Prev Med* 2003;36(2):204–216. [PubMed: 12590996]
- Leventhal AM, Waters AJ, Boyd S, Moolchan ET, Lerman C, Pickworth WB. Gender differences in acute tobacco withdrawal: effects on subjective, cognitive, and physiological measures. *Exp Clin Psychopharmacol* 2007;15(1):21–36. [PubMed: 17295582]
- Li VC, Coates TJ, Spielberg LA, Ewart CK, Dorfman S, Huster WJ. Smoking cessation with young women in public family planning clinics: the impact of physician messages and waiting room media. *Prev Med* 1984;13(5):477–489. [PubMed: 6527989]
- Lockery SA, Stanford EP. Physical activity and smoking: gender comparisons among older African American adults. *J Health Care Poor Underserved* 1996;7(3):232–251. [PubMed: 8768467]
- Ludman EJ, Curry SJ, Grothaus LC, Graham E, Stout J, Lozano P. Depressive symptoms, stress, and weight concerns among African American and European American low-income female smokers. *Psychol Addict Behav* 2002;16(1):68–71. [PubMed: 11934089]

- Mann JR, McKeown RE, Bacon J, Vesselinov R, Bush F. Religiosity, spirituality, and tobacco use by pregnant women. *South Med J* 2007;100(9):867–872. [PubMed: 17902285]
- Manson JM, Sammel MD, Freeman EW, Grisso JA. Racial differences in sex hormone levels in women approaching the transition to menopause. *Fertil Steril* 2001;75(2):297–304. [PubMed: 11172830]
- Melikian AA, Djordjevic MV, Hosey J, Zhang J, Chen S, Zang E, et al. Gender differences relative to smoking behavior and emissions of toxins from mainstream cigarette smoke. *Nicotine Tob Res* 2007;9(3):377–387. [PubMed: 17365769]
- Moolchan ET, Fagan P, Fernander AF, Velicer WF, Hayward MD, King G, et al. Addressing tobacco-related health disparities. *Addiction* 2007;102:30–42. [PubMed: 17850612]
- Moolchan ET, Hudson DL, Schroeder JR, Sehnert SS. Heart rate and blood pressure responses to tobacco smoking among African-American adolescents. *J Natl Med Assoc* 2004;96(6):767–771. [PubMed: 15233486]
- Moon-Howard J. African American women and smoking: starting later. *Am J Public Health* 2003;93(3):418–420. [PubMed: 12604485]
- Murtaugh KH, Borde-Perry WC, Campbell KL, Gidding SS, Falkner B. Obesity, smoking, and multiple cardiovascular risk factors in young adult African Americans. *Ethn Dis* 2002;12(3):331–335. [PubMed: 12148703]
- Mustonen TK, Spencer SM, Hoskinson RA, Sachs DP, Garvey AJ. The influence of gender, race, and menthol content on tobacco exposure measures. *Nicotine Tob Res* 2005;7(4):581–590. [PubMed: 16085529]
- Mwenifumbo JC, Sellers EM, Tyndale RF. Nicotine metabolism and CYP2A6 activity in a population of black African descent: impact of gender and light smoking. *Drug Alcohol Depend* 2007;89(1):24–33. [PubMed: 17161559]
- Neville, HA.; Tynes, BM.; Utsey, SO. *Handbook of African American psychology*. Los Angeles: SAGE; 2009.
- Nollen NL, Catley D, Davies G, Hall M, Ahluwalia JS. Religiosity, social support, and smoking cessation among urban African American smokers. *Addict Behav* 2005;30(6):1225–1229. [PubMed: 15925130]
- Okuyemi KS, Ahluwalia JS, Richter KP, Mayo MS, Resnicow K. Differences among African American light, moderate, and heavy smokers. *Nicotine Tob Res* 2001;3(1):45–50. [PubMed: 11260810]
- Okuyemi KS, Ebersole-Robinson M, Nazir N, Ahluwalia JS. African-American menthol and nonmenthol smokers: differences in smoking and cessation experiences. *J Natl Med Assoc* 2004;96(9):1208–1211. [PubMed: 15481749]
- Okuyemi KS, Faseru B, Sanderson Cox L, Bronars CA, Ahluwalia JS. Relationship between menthol cigarettes and smoking cessation among African American light smokers. *Addiction* 2007;102(12):1979–1986. [PubMed: 17916223]
- Okuyemi KS, Pulvers KM, Cox LS, Thomas JL, Kaur H, Mayo MS, et al. Nicotine dependence among African American light smokers: a comparison of three scales. *Addict Behav* 2007;32(10):1989–2002. [PubMed: 17307303]
- Okuyemi KS, Richter KP, Ahluwalia JS, Mosier MC, Nazir N, Resnicow K. Smoking reduction practices among African American smokers. *Nicotine Tob Res* 2002;4:S167–S173. [PubMed: 12573177]
- Patel JD, Bach PB, Kris MG. Lung cancer in US women: a contemporary epidemic. *JAMA* 2004;291(14):1763–1768. [PubMed: 15082704]
- Patterson F, Benowitz N, Shields P, Kaufmann V, Jepson C, Wileyto P, et al. Individual differences in nicotine intake per cigarette. *Cancer Epidemiol Biomarkers Prev* 2003;12(5):468–471. [PubMed: 12750245]
- Pauly JR. Gender differences in tobacco smoking dynamics and the neuropharmacological actions of nicotine. *Front Biosci* 2008;13:505–516. [PubMed: 17981564]
- Payne TJ, Diefenbach L. Characteristics of African American smokers: a brief review. *Am J Med Sci* 2003;326(4):212–215. [PubMed: 14557737]
- Pederson LL, Ahluwalia JS, Harris KJ, McGrady GA. Smoking cessation among African Americans: what we know and do not know about interventions and self-quitting. *Prev Med* 2000;31(1):23–38. [PubMed: 10896841]

- Pomerleau OF, Pomerleau CS, Mehringer AM, Snedecor SM, Ninowski R, Sen A. Nicotine dependence, depression, and gender: characterizing phenotypes based on withdrawal discomfort, response to smoking, and ability to abstain. *Nicotine Tob Res* 2005;7(1):91–102. [PubMed: 15804681]
- Pulvers KM, Catley D, Okuyemi K, Scheibmeir M, McCarter K, Jeffries SK, et al. Gender, smoking expectancies, and readiness to quit among urban African American smokers. *Addict Behav* 2004;29(6):1259–1263. [PubMed: 15236832]
- Qureshi AI, Suri MF, Zhou J, Divani AA. African American women have poor long-term survival following ischemic stroke. *Neurology* 2006;67(9):1623–1629. [PubMed: 17101894]
- Reichert VC, Seltzer V, Efferen LS, Kohn N. Women and tobacco dependence. *Med Clin North Am* 2004;88(6):1467–1481. x. [PubMed: 15464108]
- Richter P, Beistle D, Pederson L, O'Hegarty M. Small-group discussions on menthol cigarettes: listening to adult African American smokers in Atlanta, Georgia. *Ethn Health* 2008;13(2):171–182. [PubMed: 18425713]
- Robles GI, Singh-Franco D, Ghin HL. A review of the efficacy of smoking-cessation pharmacotherapies in nonwhite populations. *Clin Ther* 2008;30(5):800–812. [PubMed: 18555928]
- Romano PS, Bloom J, Syme SL. Smoking, social support, and hassles in an urban African-American community. *Am J Public Health* 1991;81(11):1415–1422. [PubMed: 1951797]
- Rosenberg L, Palmer JR, Rao RS, Adams-Campbell LL. Patterns and correlates of alcohol consumption among African-American women. *Ethn Dis* 2002;12(4):548–554. [PubMed: 12477142]
- Sadler GR, Peterson M, Wasserman L, Mills P, Malcarne VL, Rock C, et al. Recruiting research participants at community education sites. *J Cancer Educ* 2005;20(4):235–239. [PubMed: 16497136]
- Sanchez-Johnsen LA. Smoking cessation, obesity and weight concerns in black women: a call to action for culturally competent interventions. *J Natl Med Assoc* 2005;97(12):1630–1638. [PubMed: 16396055]
- Sartor CE, Agrawal A, Lynskey MT, Buchholz KK, Madden PA, Heath AC. Common genetic influences on the timing of first use for alcohol, cigarettes, and cannabis in young African-American women. *Drug Alcohol Depend* 2009;102(1–3):49–55. [PubMed: 19261395]
- Savitz DA, Dole N, Terry JW Jr, Zhou H, Thorp JM Jr. Smoking and pregnancy outcome among African-American and white women in central North Carolina. *Epidemiology* 2001;12(6):636–642. [PubMed: 11679790]
- Savoca MR, Quandt SA, Evans CD, Flint TL, Bradfield AG, Morton TB, et al. Views of hypertension among young African Americans who vary in their risk of developing hypertension. *Ethn Dis* 2009;19(1):28–34. [PubMed: 19341160]
- Schnoll RA, Patterson F, Lerman C. Treating tobacco dependence in women. *J Womens Health (Larchmt)* 2007;16(8):1211–1218. [PubMed: 17937574]
- Schoedel KA, Hoffmann EB, Rao Y, Sellers EM, Tyndale RF. Ethnic variation in CYP2A6 and association of genetically slow nicotine metabolism and smoking in adult Caucasians. *Pharmacogenetics* 2004;14(9):615–626. [PubMed: 15475735]
- Shields PG. Epidemiology of tobacco carcinogenesis. *Curr Oncol Rep* 2000;2(3):257–262. [PubMed: 11122851]
- Son BK, Markovitz JH, Winders S, Smith D. Smoking, nicotine dependence, and depressive symptoms in the CARDIA Study. Effects of educational status. *Am J Epidemiol* 1997;145(2):110–116. [PubMed: 9006307]
- Strasser AA, Pickworth WB, Patterson F, Lerman C. Smoking topography predicts abstinence following treatment with nicotine replacement therapy. *Cancer Epidemiol Biomarkers Prev* 2004;13(11 Pt 1):1800–1804. [PubMed: 15533910]
- Substance Abuse and Mental Health Services Administration. National Household Survey on Drug Abuse: Main Findings. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration, Office of Applied Studies, 1995a; 1992. DHHS Publication No. (SMA) 94-3012
- Substance Abuse and Mental Health Services Administration. National Household Survey on Drug Abuse: Population Estimates. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration, Office of Applied Studies, 1995b; 1994. DHHS Publication No. (SMA) 95-3063

- Sullivan PF, Kendler KS. The genetic epidemiology of smoking. *Nicotine Tob Res* 1999;1:S51–S57. discussion S69–70. [PubMed: 11768187]
- US Census Bureau. Definition of “Black or African American.”. 2000 [Accessed August 24, 2009]. http://quickfacts.census.gov/qfd/meta/long_RHI325200.htm
- US Census Bureau. American Community Survey: Demographic and Housing Estimates 2005–2007. 2007 [Accessed September 18, 2009]. <http://factfinder.census.gov/servlet/ACSSAFFacts>
- US Department of Health and Human Services. US Surgeon General’s Report. Tobacco Use Among Racial/Ethnic Minority Groups: A Report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 1998 [Accessed August 19, 2009]. http://www.cdc.gov/tobacco/data_statistics/sgr/1998/complete_report/index.htm
- US Department of Health and Human Services. US Surgeon General’s Report. Women and Smoking: A Report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2001 [Accessed August 19, 2009]. http://www.cdc.gov/tobacco/data_statistics/sgr/2001/complete_report/index.htm
- Wagenknecht LE, Manolio TA, Sidney S, Burke GL, Haley NJ. Environmental tobacco smoke exposure as determined by cotinine in black and white young adults: the CARDIA Study. *Environ Res* 1993;63(1):39–46. [PubMed: 8404773]
- Webb MS. Treating tobacco dependence among African Americans: a meta-analytic review. *Health Psychol* 2008;27(3 Suppl):S271–S282. [PubMed: 18979980]
- Webb MS, Carey MP. Tobacco smoking among low-income Black women: demographic and psychosocial correlates in a community sample. *Nicotine Tob Res* 2008;10(1):219–229. [PubMed: 18188763]
- Wetter DW, Fiore MC, Young TB, McClure JB, de Moor CA, Baker TB. Gender differences in response to nicotine replacement therapy: objective and subjective indexes of tobacco withdrawal. *Exp Clin Psychopharmacol* 1999;7(2):135–144. [PubMed: 10340153]
- Whitfield KE, King G, Moller S, Edwards CL, Nelson T, Vandenberg D. Concordance rates for smoking among African-American twins. *J Natl Med Assoc* 2007;99(3):213–217. [PubMed: 17393944]
- Wolff MS, Britton JA, Wilson VP. Environmental risk factors for breast cancer among African-American women. *Cancer* 2003;97(1 Suppl):289–310. [PubMed: 12491493]
- Woods MN, Harris KJ, Ahluwalia JS, Schmelzle KH, Mayo MS. Smoking in urban African Americans: behaviors, gender differences, and motivation to quit. *Ethn Dis* 2001;11(3):532–539. [PubMed: 11572418]