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Determinants of dental care utilization among low-income African-American women

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DISSERTATION

DETERMINANTS OF DENTAL CARE UTILIZATION AMONG LOW-INCOME AFRICAN-AMERICAN WOMEN

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DEDICATION

I would like to dedicate this work to my parents Amal and Hussain, my patient husband Mohammad, and my wonderful kids Abdulelah and Salma. Their love, support and prayers made this dissertation achievable and worthwhile.

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DETERMINANTS OF DENTAL CARE UTILIZATION

AMONG LOW-INCOME AFRICAN-AMERICAN WOMEN

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ABSTRACT

Objectives: To investigate determinants of dental care utilization among low-income African-American women, focusing on psychosocial factors and predictors relevant to this population.

Methods: We used data from Wave I and II of the Detroit Dental Health Project. Participants were selected to represent African-American women caring for young children, and living in Detroit households below 250% of the federal poverty level. Papers I and II are cross-sectional, using baseline data from 969 women. Paper III follows 736 women longitudinally. Our main outcome variable was dental care utilization. The main independent variable in paper I was depression. The role of social support as a moderator was also assessed in that paper. In paper II, the main independent variables were depression, perceived discrimination, and food insufficiency, both individually and in combination. Paper III employs the framework of the Behavioral Model for Vulnerable Populations to assess predisposing, enabling and need factors predicting the incidence of dental visits.

Results: Only 41.8% of the women had a dental visit within the past year. Cross-sectional analyses indicated that depressed women had lower odds of having a dental visit within the past year (OR=0.71, 95%CI=0.53-0.94). Emotional social support attenuated the effect of depression on dental visits. Women with high levels of perceived discrimination and those with food insufficiency were less likely to have dental visits in the past year (OR=0.65, 95%CI=0.44-0.95, and OR=0.64, 95%CI=0.44-0.93, respectively). Depression and perceived discrimination were also associated with less preventive visits. When psychosocial stressors were combined, they acted synergistically to lower the odds of having dental visits, including preventive and treatment visits. Longitudinal analyses of the data identified significant interactions between dental insurance and perceived discrimination (P =0.02) and between dental insurance and having a dental home (P =0.04). Experiencing pain in the teeth or gums was also a significant predictor of future dental visits.

Conclusions: Our findings indicate the importance of considering psychosocial factors when studying dental care utilization among low-income African-American women. Our findings also suggest that establishing dental homes, graduating culturally competent dental providers, and providing emotional support resources might improve dental care utilization among these women.

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INTRODUCTION

Oral health is an integral element of overall health and wellbeing. The health status of the mouth and oral apparatus is noticeably reflected on general health. In fact, many systemic conditions and diseases arise with oral signs and symptoms. Moreover, several research studies have suggested that chronic oral infections are related to other medical conditions such as cardiovascular and lung diseases, diabetes and unfavorable pregnancy outcomes (US Department of Health and Human Services, 2000; Humphrey et al., 2008; Vargas and Arevalo, 2009; Borgnakke et al., 2013).

Despite the efforts to improve oral health across the nation, many Americans are still suffering the undue burden of oral diseases. Recent national data indicate that more than 90% of US adults have dental caries and about 1 in every 4 adults has untreated lesions (Dye et al., 2015). In addition, more than 47% of US adults aged 30 and older had some form of periodontal disease in 2009-2010 (Eke et al., 2012). The most common oral diseases i.e. dental caries and periodontal diseases are cumulative in nature. If left untreated, these oral infections can progress and compromise one's vital functions such as eating, talking and smiling. The impact of dental diseases does not simply influence a person's physical health; it can also extend to affect psychological health, social wellbeing and quality of life (Feldens et al., 2016; Petersen et al., 2005; Slade and Spencer, 1994). Hence, routine dental visits can be very beneficial in maintaining a better oral health, in lessening the burden of oral diseases as well as in early detection of oral and pharyngeal tumors (Thomson et al., 2010; Karimalakuzhiyil Alikutty and Bernabé, 2016; Holmes et al., 2003).

Lack of access to oral health care services adds to the disparities in oral health especially among low-income and minority populations, who need to overcome many impediments in order to obtain these services (Institute of Medicine and National Research Council, 2011). Though access to dental care services has improved among children, an opposite trend has been observed among adults. Data from the National Health Interview Survey (NHIS) has shown that the rate of dental visits among adults has progressively decreased from 2000 through 2010 (Wall et al., 2012). While financial barriers, such as lack of dental coverage, are important in determining access to dental care (Han et al., 2015; Vujicic and Nasseh, 2014), research has shown that financial factors are not the sole predictors of dental care use. The availability of reduced cost or even free dental care services doesn't guarantee better utilization of dental care services (Davidson and Andersen, 1997; Maserejian et al., 2008).

The decision to obtain healthcare is a more complex behavior. In the late 1960s, Andersen developed the Behavioral Model of Health Services Utilization to understand predictors governing families' use of health care services. Andersen's model suggests that people's health care-seeking behavior is the result of their predisposition, enabling factors and their need for care (Andersen, 1995). A number of predisposing factors can suggest the likelihood of an individual using health care services. Predisposing characteristics precede the onset of illness. They include demographic and psychological characteristics, social structure and health beliefs and attitudes. Enabling factors are the individual and community resources available to utilize health care services. Income, insurance, availability of health care providers and transportation means are among the

enabling factors. The Need for Care component represents the perceived need as well as the actual symptoms and level of illness. Andersen's health care utilization model also proposes that the type of service affects the potential of the predisposing, enabling and need factors to explain the use of health services. Services with more discretion, such as dental care, are likely to be more associated with predisposing and enabling factors (Andersen, 1995; Andersen et al., 1983).

Andersen's Behavioral Model was expanded in order to incorporate access challenges particularly pertinent to vulnerable and disadvantaged populations. The Behavioral Model for Vulnerable Populations (figure 0-1) has vulnerable domains in addition to the traditional predisposing, enabling and need factors (Gelberg et al., 2000). The vulnerable domains include factors such as psychological resources, hunger, and living conditions (Gelberg et al., 2000). Considering such vulnerable domains when studying dental care utilization among vulnerable and impoverished populations could shed light on some important determinants of access to dental care among these populations. Former studies on different vulnerable populations have highlighted several barriers that were significantly associated with their use of oral health care (DiMarco et al., 2010; Finlayson et al., 2014; Muirhead, Quiñonez, Figueiredo and Locker, 2009b). However, the majority of these studies have targeted children and elderly populations and only a few have focused on adults' dental care utilization.

Research on dental care utilization has repeatedly documented that African Americans report considerably fewer dental visits compared to whites regardless of their socioeconomic characteristics (Manski and Magder, 1998; Gilbert et al., 2002; Zhang,

2015). The low use of dental care services among African Americans emphasizes the presence of distinctive barriers affecting dental care utilization in this population. A number of studies have investigated predictors of dental care use among African Americans. Several financial barriers to dental care access were reported among African Americans living in the Central Harlem neighborhood of New York City such as lack of dental insurance coverage, insufficient coverage, inability to find a dentist accepting their insurance and perceived low quality of care (Schrimshaw et al., 2011). Among adult Black men in Indiana, having a higher educational level, higher household income, health insurance and high levels of social support were associated with better dental care utilization (Stapleton et al., 2016). Although previous studies have provided valuable information about determinants of dental care use among African Americans, the role of psychosocial, familial and situational factors in predicting dental care use among African Americans has not been given adequate consideration. Furthermore, the factors suggesting the pattern of use of dental services among African Americans and whether they would visit the dental office for prevention purposes or only when treatment is needed are still not clear. To the best of our knowledge, no study has comprehensively explored determinants of dental care use among low-income African Americans women.

Given the complexity of the dental care-seeking behavior and the unique determinants governing access to dental care among individuals from different circumstances, there is a need to thoroughly investigate predictors of dental attendance in a relatively homogenous population. This would help to understand the within-group variations contributing to the differences in dental care utilization within that population.

Therefore, the aim of this dissertation is to expand the knowledge about the determinants of dental care utilization among low-income African Americans using data from a prospective cohort epidemiological study, which was carried out by the Detroit Center for Research on Oral Health Disparities, in Detroit, Michigan. This project targets African-American female caregivers of young children, living in Detroit households with an annual income below 250% of the federal poverty level in 2000. The dissertation is composed of three studies sharing common characteristics, but each study is answering distinct research questions. The first study investigates the cross-sectional association between depression on dental attendance among low-income African-American women and the moderating role of social support on this association. The second study examines the cross-sectional association between psychosocial stressors and dental care utilization among low-income African-American women. The third study investigates the longitudinal influence of predisposing, enabling and need predictors on dental care visits among this population of African-American women.

Figure 0-1: The Behavioral Model for Vulnerable Populations**.**

LITERATURE REVIEW

Racial disparities impacting the burden of oral diseases have been reported in several studies (Garcia et al., 2008). African Americans tend to be more impacted by oral diseases compared to whites (Gilbert et al., 2003; Hudson et al., 2007; Dye et al., 2015). Data from the National Health and Nutrition Examination Survey (NHANES 2011-2012) indicated that more than 90% of adults aged 20 to 64 years had dental caries and 27% had untreated lesions. The likelihood of untreated dental caries among African Americans was almost double that among non-Hispanic Whites and Asians. African-American adults were also less likely to retain their teeth compared to Hispanic, non-Hispanic White and Asian adults (Dye et al., 2015). Using data from a prospective cohort of African-American and non-Hispanic white adults aged 45 years and older in Florida, it was shown that African Americans had fewer teeth and worse oral health at baseline. Furthermore, they experienced more tooth loss at the 48-month follow-up compared to non-Hispanic whites (Gilbert et al., 2003).

Access to dental care services is very important in controlling oral diseases and maintaining oral health. Studies have linked regular dental visits among adults to a lower dental caries experience, fewer missing teeth due to caries and lower levels of periodontal disease (Thomson et al., 2010; Karimalakuzhiyil Alikutty and Bernabé, 2016). In addition, regular dental visits turn out to be of tremendous importance for detection of oral and pharyngeal tumors. Many asymptomatic cancer lesions are identified by dental providers in the course of a routine dental exam, which enables diagnosis of such lesions

at an earlier stage, thus improving the 5-year survival rate of patients (Holmes et al., 2003).

Unfortunately, the rates of dental visits among adults are declining. Data from the Medical Expenditure Panel Survey (MEPS) from 2001 through 2010 revealed that, while children's dental care utilization has increased notably within that period, dental care utilization among adults has decreased significantly (Vujicic and Nasseh, 2014). Similarly, evaluating the trend of dental care utilization from 1997 to 2010, data from the National Health Interview Survey (NHIS) found that dental visits for children aged 2 to 20 years increased steadily from 71.6% in 1997 to 77.0 % in 2010. Conversely, the rate of dental visits among adults aged 21 to 64 years showed a gradual decrease from 66.8% in 2000 to 61.8% in 2010. This decrease in the rate of dental visits occurred primarily among low-income adults (Wall et al., 2012).

In spite of the unmet need for dental care among African Americans, studies have continually demonstrated their low utilization of dental care services. A cross-sectional study using data from the Medical Expenditure Panel Survey (MEPS 2012) on adults aged 18-85 years, showed that even after controlling for demographic and socioeconomic characteristics, non-Hispanic blacks were less likely to report a dental visit compared to non-Hispanic whites (OR= 0.52, 95%CI= 0.48-0.56) (Zhang, 2015). Similar findings were observed using data from the 1989 National Health Interview Survey. African Americans were significantly less likely to report a dental visit in the past year compared to whites, even after accounting for other demographic and socioeconomic characteristics (Manski and Magder, 1998). Results from a study on adults, aged 18 to 69 years, from

the Detroit tri-county area also revealed that African Americans had lower odds of having regular dental visits compared to whites (OR= 0.45, 95%CI= 0.25-0.80) (Sohn and Ismail, 2005). Moreover, longitudinal data from the Florida Dental Care Study showed that African Americans are less likely to use dental services compared to non-Hispanic whites regardless of their predisposing, enabling and need characteristics (Gilbert et al., 2002). Collectively, these findings indicate the presence of barriers to dental care use that are particularly pertinent to African Americans.

The Influence of Psychosocial Factors on Dental Care Utilization

Psychosocial factors are those related to the interplay between personal psychological traits and the social environment (Theorell, 2007). Studies have demonstrated that higher levels psychosocial stressors are more common among low-income populations (Sanders and Spencer, 2005; Caron and Liu, 2010). A growing body of research has shown that psychosocial factors impact oral health. Psychological distress was significantly associated with poor self-rated oral health among Indigenous Australian adults (OR= 2.74, 95%CI= 1.25-6.00) (Amarasena et al., 2015). In another study, perceived stress was linked to low self-rated oral health (Sanders and Spencer, 2005). Similarly, data from the National Survey of American Life (NSAL) indicated that adults with depressive symptoms and higher levels of chronic stress are more likely to report fair to poor oral health (OR= 2.25, 95%CI= 1.33-3.81 and OR= 1.19, 95%CI= 1.08-1.30, respectively). The same study also demonstrated that psychosocial resources such as self-esteem, attending religious services regularly and having more neighborhood resources significantly reduced the likelihood of having fair or poor self-rated oral health

(Finlayson et al., 2011). Psychosocial factors have also been shown to exert an effect on oral health behavior. Former studies have suggested that psychosocial factors such as dental anxiety, depression and dental fear are associated with lower utilization of dental care services (Anttila et al., 2006; Sohn and Ismail, 2005; Bernson et al., 2013; Siegel et al., 2012). Nonetheless, the findings from previous research on the role of psychosocial factors on dental care use are generally inconsistent.

Depression is among the most common psychosocial stressors. The influence of depression on oral health behavior has been investigated in a number of studies. Among 31-year-old adults born in Northern Finland, individuals with a higher number of depressive symptoms reported less frequent tooth brushing and a lower frequency of dental visits compared to those with no or only a few depressive symptoms (Anttila et al., 2006). Similar results were reported from a national sample of Korean adults aged 19 years and older. In this study, regardless of sociodemographic factors, participants with a reported history of depression as well as those with present depression were less likely to brush their teeth (OR = 0.77, 95%CI= 0.61-0.97) and less likely to obtain dental treatment when needed (OR = 0.69, CI: 0.60-0.81) (Park et al., 2014). Moreover, a study using data from the household component of the Medical Expenditure Panel Survey (MEPS) revealed that serious psychological distress (SPD), as measured using Kessler Psychological Distress Scale, was significantly associated with lower adherence to regular dental visits. Longitudinal analysis of these data demonstrated that SPD was associated with greater future dental expenditures; however, SPD did not predict subsequent total dental visits (Xiang et al., 2015). Data from 2010 Behavioral Risk Factor

Surveillance System (BRFSS) also showed no association between depression and dental visits in the past year among pregnant women (Silveira et al., 2016). Furthermore, Depression was not associated with dental visits in a study of Turkish adults (Alkan et al., 2015).

The effect of perceived discrimination on health and health-related behavior has also been described in the literature. Research has related the perception of discrimination to lower involvement in healthy behaviors and more involvement in risky behaviors (Pascoe and Smart Richman, 2009). Perceived discrimination is experienced frequently by ethnic minorities and disadvantaged populations (Casagrande et al., 2007; Ajrouch et al., 2010). Data from 2001 Survey on Disparities in Quality of Health Care indicated that African-American, Asian and Hispanic adults perceive more provider discrimination compared to non-Hispanic whites (C Lee et al., 2009). Findings from a meta-analysis revealed that perceived discrimination negatively impacts both mental and physical health (Pascoe and Smart Richman, 2009). In addition, perceived discrimination is an important determinant of depression as well as mental and physical health among African Americans (Monk, 2015). Several studies have shown that perceived discrimination is associated with delays in seeking medical care (Casagrande et al., 2007; C Lee et al., 2009). Only a few studies investigated the effect of perceived discrimination on dental care use. An exploratory study using data from Wave III subjects of the Aboriginal Birth Cohort study found that self-reported discrimination was associated with lack of access to dental care (OR= 3.79, 95%CI= 1.18-12.06) (Jamieson et al., 2013). Moreover, results from focus groups of Medicaid-insured children caregivers' in North Carolina identified

discrimination among the barriers to obtaining dental care for their children. Caregivers perceived that they were discriminated against as a result of their Medicaid enrollment. In addition, racial discrimination was reported in all African-American focus groups (Mofidi et al., 2002). However, a survey of parents in Genesee County, Michigan showed that experienced discrimination among parents is not associated with lack of past year dental visit among their children (Kruger et al., 2015).

Another psychosocial stressor potentially related to health and health-related behavior is food insufficiency (Chi et al., 2014; Muirhead, Quiñonez, Figueiredo and Locker, 2009a). Several studies have linked food insufficiency to poor oral health. Data from the National Health and Nutrition Examination Survey (NHANES 2007-2008) showed that, among children aged 5 to 17, living in low or very low food secure households was associated with higher odds of having untreated dental caries (Chi et al., 2014). In a study among working poor Canadians, food insecurity was associated with poorer self-reported oral health, more tooth pain within the past month, and denture wearing (OR 2.89, 95%CI= 2.00-4.19, OR= 1 .83, 95%CI=1.16-2.87, and OR= 1.82, 95%CI=1.10-3.00, respectively) (Muirhead, Quiñonez, Figueiredo and Locker, 2009a). Another study in the same population of poor Canadians found that giving up goods and services was associated with visiting a dental provider in the past year (Muirhead, Quiñonez, Figueiredo and Locker, 2009b). Data from the 2003 Health Care for the Homeless User Survey, indicated that food insufficiency was associated with unrealized medical care and mental care needs as well as unmet needs for prescription drugs;

however, food insufficiency was not associated with unmet needs for dental care among homeless people in this study (Baggett et al., 2010).

Social support is among the psychosocial resources commonly connected to health. Social support can attenuate the effect of stress either by the direct advantages of social connections or by acting to protect against the effects of stress (S Cohen and Wills, 1985). The role of social support in buffering life stresses has been investigated in previous studies. Instrumental social support was suggested to buffer the negative effects of everyday stress among low-income African-American women (Ajrouch et al., 2010). It was also reported that social support is negatively associated with parenting stress among mothers of infants in Oklahoma (Nam et al., 2015). A recent meta-analysis demonstrates that social support can attenuate the effect of depression (Gariépy et al., 2016). However, findings on the role of social support on health care utilization were inconsistent. Data from the 2003–2004 National Survey of Children's Health found that children whose parents reported receiving emotional support were more likely to receive a preventive health visit in the past year (OR= 1.20, 95%CI= 1.07-1.34) (Raphael et al., 2010). A survey of randomly selected parents in Genesee County, Michigan found that parents reporting lower neighborhood social capital were less likely to report taking their children to a dental visit in the past year (Kruger et al., 2015). Higher levels of social support were also positively associated having a dental visit within the past year among adult Black men in Indiana (Stapleton et al., 2016). Moreover, a recent review has shown that social support can enhance dental attendance (Rouxel et al., 2015). Nevertheless, some studies reported opposite results. Among adults aged 18-64 years in Los Angeles, higher levels

of neighborhood social support were associated with lower odds of having dental visits in the last year (Chi et al., 2014).

Predictors of Dental Care Utilization among Adults

Previous studies have attempted to identify factors governing the utilization of dental care services in different populations. The majority of these studies have focused on children and older adults. A number of cross-sectional studies have investigated factors associated with dental attendance among non-elderly adults. Such studies have shown that predictors of dental care use vary among different populations. In a population of adults aged 18 through 69 years from the Detroit tri-county area, several determinants of dental care use were identified including perceived oral health status, gender, race, dental insurance status and dental anxiety. Subjects' level of education was not a significant predictor in this study (Sohn and Ismail, 2005). Conversely, the role of education in dental care utilization has been documented in other studies showing that adults with higher educational attainment had higher odds of dental visits (Chattopadhyay et al., 2003; Mumcu et al., 2004; Guiney et al., 2011; Zhang, 2015; Wu et al., 2015). In a study among adults from nine provinces in Turkey, women and those with a higher educational attainment were more likely to have a dental visit within the past year (Mumcu et al., 2004).

The influence of economic factors on dental services use has been widely investigated; however, the results are variable. Using data from the 2010 Behavioral Risk Factor Surveillance System (BRFSS), dental care use among long-term caregivers of older adults was explored. It was found that caregivers with health insurance coverage

were more likely to use dental care (Wu et al., 2015). A national study of Canadian adults showed that low-income adults and those lacking dental insurance are more likely to report financial barriers to dental care access (Locker, Maggirias and Quiñonez, 2011a). Likewise, data from the New York Minority Health Survey revealed that adults with dental insurance had 2.5 times the odds of reporting a dental visit in the past year compared to those without dental insurance (Chattopadhyay et al., 2003). Among low-income mothers of young children, women with Medicaid insurance had significantly higher odds of having a dental visit compared to those with no insurance (Kuthy et al., 1998). Furthermore, data from the Medical Expenditure Panel Survey (MEPS 2006) showed that adults with private dental insurance were more likely to report visiting a dentist compared to those with public dental insurance or no insurance (Christian et al., 2013). Nevertheless, financial factors were not always positively associated with dental care utilization. The predisposing, enabling and need factors in a multiethnic sample of adults aged 21 years and older in Maryland were assessed in a survey. The survey included those who have experienced a dental problem or injury during the past year and had visited a physician's office, an emergency department or a dental office for care. The results showed that neither the income level nor the dental insurance or Medicaid eligibility of subjects were associated with obtaining treatment within 72 hours of the onset of symptoms (L Cohen et al., 2011). Moreover, among US adults who participated in the WHO International Collaborative Study of Oral Health Outcomes (ICS-II), it was demonstrated that having access to free or reduced cost dental care and owning dental

insurance were not significantly associated with better dental attendance (Davidson and Andersen, 1997).

Among the factors that were consistently related to dental care utilization is having a regular source of care, which was repeatedly associated with better access to care (Davidson and Andersen, 1997; Finlayson et al., 2010; Cruz et al., 2010). In a study on dental attendance among Hispanic adults in agricultural worker families in California's Central Valley, having a regular source of dental care and asking a dentist for advice were positively associated with prior dental care utilization (OR= 4.82, 95%CI= 2.46-9.43 and OR= 4.62, 95%CI= 2.25-9.50, respectively). However, having more self-reported dental symptoms was associated with a lower likelihood of past dental care utilization in this population (OR= 0.85, 95%CI= 0.76-0.94) (Finlayson et al., 2010).

Race was also a significant predictor of dental attendance. Racial differences were observed in many studies, even after accounting for socioeconomic status variables (Zhang, 2015; Sohn and Ismail, 2005; Gilbert et al., 2002). African Americans tend to report fewer dental visits compared to whites (Manski and Magder, 1998; Sohn and Ismail, 2005; Gilbert et al., 2002). A number of studies have investigated determinants of dental visits among African Americans. Data from the 2011 Black Men's Health Study, covering 11 counties in Indiana, highlighted several determinants that were positively associated with past year dental care utilization among adult Black men, including being married, having a higher household income, higher educational level, having health insurance and receiving higher levels of social support. However, employment was associated with a lower odds of having a past year dental visit (Stapleton et al., 2016).

Results from a sample of 118 African Americans living in the Central Harlem neighborhood of New York City have identified several financial barriers to dental care access among this population such as: lack of dental insurance coverage, insufficient coverage, lack of dental providers accepting their insurance and perceived low quality of care (Schrimshaw et al., 2011).

Data from the 2007 Irish Survey of Lifestyle, Attitudes and Nutrition were used to investigate predictors of dental care utilization among Irish adults. It was found that some predictors of dental attendance differ by gender. Employment was significantly associated with lower odds of having a dental visit among men; however, this association was not evident among women. Among the predictors that were significant among both men and women were higher education level, higher income, the location of residence, and brushing twice a day or more (Guiney et al., 2011). A cross-sectional study of working poor Canadians was conducted using the framework of the Behavioral Model for Vulnerable Population. The results showed that male gender, perceived need for treatment and receiving welfare in the past were among the factors associated with not visiting the dentist within the past year (Muirhead, Quiñonez, Figueiredo and Locker, 2009b).

A number of studies have examined predictors of dental services usage longitudinally. The incidence of dental visits as well as the predisposing, enabling and need factors affecting dental care access in a cohort of dentate African-American and non-Hispanic white adults in North Florida was studied. The results showed that among adults aged 45 years and older, race, gender, the ability to afford care and perceived need

for care were significant predictors of dental care use. Surprisingly, this study denoted that adults perceiving a need for care are more likely to not obtain dental care services (Gilbert et al., 1998). A more recent study using the same data highlights the racial differences in dental attendance between African-American and non-Hispanic white adults. African Americans had lower dental care utilization and they were inclined to visit the dentist only when encountering a dental problem. Important predictors among African Americans included the tendency to use a homemade remedy, frustration with past dental care and dental insurance (Gilbert et al., 2002). Data from the Longitudinal Survey of Immigrants to Canada (LSIC) were analyzed to identify predictors of unmet dental needs among immigrants to Canada. The results revealed that absence of dental insurance, low income, and Chinese or South Asian ethnicity were significant predictors of unmet dental needs among immigrant adults during the 3.5 year period post-immigration (Calvasina et al., 2014).

A review of the literature investigated international barriers to health care utilization among ethnic minorities. The review included different types of health services including prenatal care, primary health care and dental care. Several access barriers were identified at the level of the patient, provider and the healthcare system. Patient-related barriers, included but were not limited to, low-income, low socioeconomic status, lack of family and social support, insecure living conditions and language barriers. Provider-related barriers encompassed poor communication skills, discriminative attitudes and lack of knowledge about patients' culture. The issues related to the healthcare system were long waiting times, referral system problems and lack of

appropriate translated information and educating materials. The authors also highlighted that barriers to health care access tend to be related to the individual's specific situation (Scheppers, 2006).

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PAPER I

DEPRESSION, SOCIAL SUPPORT AND DENTAL ATTENDANCE AMONG LOW-INCOME AFRICAN-AMERICAN WOMEN

ABSTRACT

Objectives: To investigate the association between depression and dental attendance among low-income African-American women, and the moderating role of social support on this association. **Methods:** Data from the Detroit Dental Health Project (2002-2003) were used. Trained interviewers collected information from a representative sample of low-income African-American women (n=969). The main predictor was depressive symptoms, determined using CES-D ≥16. The main outcome was dental attendance within the past year. A series of logistic regression analyses were used to assess the association between depression and dental attendance, as well as the role of emotional and instrumental dimensions of social support as moderators. **Results:** 41.8 % of the women had a dental visit within the past year. After adjusting for confounders, women with depressive symptoms were significantly less likely to report a dental visit in the past year compared to non-depressed peers (OR=0.7, 95%CI= 0.5-0.9). Interaction analysis showed that emotional support buffered the negative effect of depression on dental attendance. Instrumental support was not a significant factor. **Conclusions:** Depression is associated with lower dental attendance among low-income African-American Women. Providing emotional support resources to these depressed women could improve their dental attendance.

INTRODUCTION

Mental health is closely related to overall health and well-being (World Health Organization, 2004). A growing body of research also shows that mental disorders can adversely impact oral health status and behavior (Alkan et al., 2015; Kisely et al., 2016). Depression is one of the most common mental disorders and it remains a significant public health concern. Over 300 million people worldwide are estimated to have depression (World Health Organization, 2017). In the US, national data shows that approximately 1 in every 13 Americans, aged 12 years and older, report having moderate or severe depressive symptoms in the past two weeks. Additionally, females and those living below the federal poverty level are significantly more likely to experience depressive symptoms (Pratt and Brody, 2014).

Depression contributes to the oral disease burden, and to poor self-reported oral health. Data from the National Survey of American Life indicates that adults experiencing depression within the past year were two times as likely to report fair to poor oral health compared to their non-depressed peers (Finlayson et al., 2011). Depression has been also associated with unfavorable oral health outcomes, with depressed individuals experiencing more tooth loss and having higher levels of dental caries (Kisely et al., 2016; Okoro et al., 2012; Hugo et al., 2012). Moreover, depressive symptoms may influence oral health behavior. The effect of depression on oral health behavior has been investigated in a number of studies (Okoro et al., 2012; Anttila et al., 2006; Park et al., 2014; Silveira et al., 2016); nonetheless, the results have been inconsistent. Depression was significantly related to less frequent dental attendance in

several studies (Okoro et al., 2012; Anttila et al., 2006; Park et al., 2014); however, other studies did not find this relationship (Silveira et al., 2016; Alkan et al., 2015).

Research shows that social support can constitute a valuable resource to attenuate the negative effects of depression on health and health behavior. Social support can lessen the effect of stress either through the direct benefits of social connections or indirectly by buffering the effects of stressful events (S Cohen and Wills, 1985). A recent meta-analysis demonstrates that social support protects against depression (Gariépy et al., 2016). High levels of social support were also positively associated with dental care use among African-American men (Stapleton et al., 2016). While prior studies have shown that social support is associated with better dental attendance (Burr and HJ Lee, 2012; Kruger et al., 2015), it remains unclear whether social support protects against the impact of depression on dental attendance.

Comprehending how depression influences dental attendance is important to understanding dental care services utilization disparities. This is especially true for vulnerable and impoverished populations, who tend to have less frequent dental attendance despite their high unmet oral health needs (Institute of Medicine and National Research Council, 2011).These populations are also more predisposed to experiencing depressive symptoms (Pratt and Brody, 2014).

Low-income women caring for young children are more prone to high levels of depressive symptoms (Belle and Doucet, 2003). The availability of suitable social support resources for these women could help offset some of the potential negative effects of depression on their oral health behavior. A previous study among low-income

African-American female caregivers in Detroit, Michigan noted that they have high depressive symptom scores (Ajrouch et al., 2010). To the best of our knowledge, no study has evaluated the role of social support in buffering the impact of depression on dental care utilization. Therefore, the objectives of this study are to investigate the association between depression and dental attendance among this population of low-income African-American women, and to assess the moderating role of social support on this association.

METHODS

Data from Wave I of the Detroit Dental Heath Project (DDHP), funded by the National Institute of Dental and Craniofacial Research (NIDCR) was used. The DDPH targeted African American families with at least one child under the age of 6, living in Detroit households, with an annual income below 250% of the federal poverty level in 2000. A detailed description of the DDHP was published previously (Ismail et al., 2008). A representative sample of low-income African American caregivers and their children was obtained using a two-stage area probability sample. Participants came to a central facility in Detroit, where trained interviewers collected information on their dental visit history, psychosocial factors, and sociodemographics. A total of 1021 caregiver-child dyads completed the data collection at baseline. The combined interviewing and screening response rate was 73.7%. Since the study sample included few male caregivers (n=52), the present study focuses on female caregivers resulting in a final sample of 969.

Measures:

Our outcome variable was dental attendance history, defined as whether participants reported having a dental visit within the past year or not.

Predictor variables: Our main independent variable was depression, assessed using the Center for Epidemiological Studies Depression Scale (CES-D)(Radloff, 1977). The CES-D is a self-report, 20-item scale that evaluates the presence of depressive symptoms within the past week. Participants rated the items of the CES-D on a four-point scale from "not at all or less than 1 day last week" to "5-7 days last week". The range of the CES-D score was from 0 to 60, with higher scores denoting more depressive symptoms.

Cronbach's alpha in this sample was 0.9. We chose the standard cutoff of 16 to categorize the women in our sample into non-depressed women (CES-D score < 16) and those with depressive symptoms (CES-D score ≥ 16).

To examine the role of social support as a moderator, two dimensions of social support were evaluated. Emotional support was assessed as a dichotomous variable, measured by asking participants if there is someone they could count on to give them encouragement and reassurance if they really needed it. Instrumental support was measured using the instrumental support index described previously by Ajrouch et al. (Ajrouch et al., 2010) The instrumental support index assesses the availability of 4 forms of instrumental support: errand support, financial support, transportation, and childcare when needed. It ranges from 0 (no instrumental support) to 4 (all forms of instrumental support were available). Cronbach's alpha of the instrumental support index in this sample was= 0.7. Instrumental support was further dichotomized into low instrumental support (0-2 areas of instrumental support available) and high instrumental support (3-4 areas of instrumental support available). Emotional and instrumental dimensions were assessed separately in the regression models to distinguish their individual effects on the association between depression and dental attendance.

Other independent variables with potential influence on dental attendance were included as well. We measured perceived oral health status by asking participants to rate the current condition of their mouth and teeth on a five-point scale. Responses ranged from "excellent" and "very good" to "good", "fair", and "poor". Due to small frequencies, "excellent" and "very good" responses were combined for analysis. The

availability of a regular dental clinic was assessed by asking participants if they have a dental clinic to go to when they need dental care (yes or no). The type of dental insurance was also evaluated and was classified as private, Medicaid, or no dental insurance. Sociodemographic variables included in the analyses were: age, educational attainment (categorized as less than high school, high school diploma, and some college or more), annual household income (categorized as less than $10,000, $10,000 to $19,999, and $20,000 or higher), and the number of people in the household.

Statistical analyses were conducted using SAS version 9.4 (SAS Institute Inc, Cary, NC) while accounting for the complex survey design. All analyses were adjusted with the appropriate weight to account for non-response and uneven selection probabilities. Weighted frequency distributions of sample characteristics were calculated. Bivariate associations between each independent variable and dental attendance were evaluated using Chi-square tests. Multivariate analyses were done using a series of multivariate logistic regression models to assess the effect of depressive symptoms on dental attendance, the effect of the social support of interest on the model, and eventually, the effect of the interaction between depressive symptoms and each social support variable. Models incorporating both dimensions of social support were also evaluated. Statistical significance was determined at alpha <0.05. Diagnostic statistics (Variance inflation factor) were used to test for multicollinearity between independent variables.

RESULTS

A total of 969 women were included in the analyses. The mean age of the participants was 28.9 ± 0.3 years. Only 41.8% of the participants reported visiting a dentist within the past year, while the majority (58.2%) reported not having a dental visit. The mean CES-D score of the participants was 14 ± 0.4. Based on the CES-D cutoff of 16, approximately 34% of the women in this sample had depressive symptoms.

Table 1-1 presents the results of bivariate associations between dental attendance and the sample characteristics. Slightly more of the non-depressed women had a dental visit within the past year (44.1%) compared to those with depressive symptoms (37.4%), (P value= 0.06). Women receiving emotional support were more likely to report a dental visit within the past year, but the association was not statistically significant. Instrumental support was also not significantly associated dental attendance in this sample. Women who had obtained more education, had private dental insurance, or who have a regular dental clinic to attend were more likely to have seen a dental provider within the past year. Perceived oral health was also significantly associated with dental attendance (P value= 0.001), with women who perceived having better oral health being more likely to report a dental visit within the past year. Age, household income, and household size were not significantly associated with dental attendance.

The results of multivariate logistic regression analysis are demonstrated in Table 1-2. After controlling for age, education, dental insurance, availability of a regular dental clinic, household size, and perceived oral health status, women with depressive symptoms had lower odds of having a dental visit within the past year (OR=0.7, 95%

CI=0.5-0.9). Education and having a regular dental clinic remained significant predictors of dental attendance. Women with at least some college, and those who have a regular dental clinic to go to were more likely to have a dental visit within the past year, (OR= 1.7, 95%CI= 1.1-2.6 and OR= 3.7, 95%CI= 2.5-5.3 respectively). Women with no dental insurance had a significantly lower dental attendance compared to those with private insurance (OR= 0.4, 95% CI= 0.2=0.6), while Medicaid-insured women had a lower, but not statistically different, dental attendance compared to those with private insurance (OR= 0.8, 95%CI= 0.5-1.4). Compared to women reporting excellent to very good perceived oral health, those perceiving having poor oral health status were significantly less likely to have a past-year dental visit, (OR= 0.4, 95%CI= 0.3-0.8). We investigated possible interactions between predictors in this model, however only the depression-education interaction was marginally non-significant (P value= 0.07). Results with the depression-education interaction are demonstrated in supplemental Table1-1. This interaction was not significant after adding the interaction between depression and emotional support to the model.

Table 1-3 shows the logistic regression models evaluating the main and interaction effects of each social support dimension on the association between depression and dental attendance, while adjusting for the covariates in the previous model. When the main effect of emotional support is included in the model (Table 1-3, Model 1), the odds of dental attendance among depressed women remained low compared to those without depressive symptoms, however this association was borderline significant (OR= 0.7, 95%CI= 0.5- 1.0). Women having emotional support had higher,

non-significant odds of having a dental visit (OR= 1.2, 95%CI= 0.6-2.2). In the Instrumental support main effects model (Table 1-3, Model 3), depression was a significant predictor for lower dental attendance (OR= 0.7, 95%CI= 0.5-0.9), however Instrumental support was not significantly associated with dental attendance (OR= 0.8, 95%CI= 0.5-1.2). Both main effect models showed significant likelihood ratio tests and slightly higher R^2 compared to the model without social support variables.

The effect of including the depression-emotional support interaction is shown Table 1-3, Model 2. This model provided a significant likelihood ratio test and an improved and R^2 value; and detected a significant interaction between depression and emotional support (P value= 0.002). Table 1-3, model 4 assesses the depression-instrumental support interaction, which was not statistically significant (P value =0.36).

The interaction effect of emotional support and depression on dental attendance is illustrated in Figure 1-1. In general, the odds of having a dental visit within the past year is lower among women with depressive symptoms compared to non-depressed women, but the decrease in the odds of dental attendance was much steeper among women with no emotional support compared to the slight reduction detected among those receiving emotional support. This indicates that emotional support buffers the influence of depression on dental attendance among these women.

To further investigate this relationship, a variable comprising all possible depression-emotional support combinations was designed. Chi-square tests showed that this depression-emotional support variable was significantly associated with dental attendance (P value =0.01). Women who experienced depressive symptoms and lacked

emotional support were the least likely (20.8%) to report a dental visit within the past year, followed by those with depressive symptoms and emotional support (40.5%), those without depressive symptoms but with emotional support (43.5%) and those with neither depressive symptoms nor emotional support (56.8%).

The depression-emotional support variable was used in a multivariate logistic regression model controlling for sociodemographics, dental insurance, the availability of a regular dental clinic, instrumental social support, and perceived oral health status (detailed model is presented in Supplemental Table 1-2). Figure 1-2 illustrates the adjusted odds ratios and 95% confidence intervals of having a dental visit within the past year at different depressive symptoms-emotional support combinations. Compared to non-depressed women with emotional support, the odds of dental attendance among non-depressed women with no emotional support and depressed women receiving emotional support were not statistically significant (OR=1.9, 95%CI= 1.0-3.7 and OR =0.8, 95%CI= 0.6-1.1, respectively). However, depressed women without emotional support had significantly lower odds of dental attendance (OR= 0.3, 95%CI= 0.1-0.7).

DISCUSSION

This study investigated the influence of depressive symptoms on dental attendance among low-income African American women caring for young children. Our results indicate that depressive symptoms are negatively associated with dental attendance in this population. Our findings also suggest that emotional social support offers some protection against the adverse effect of depression on dental attendance among these women.

After controlling confounding, women experiencing depressive symptoms were 30% less likely to utilize dental care services within the past year compared to their non-depressed peers. This finding is consistent with the results from several previous studies, which linked depression to lower dental care utilization (Okoro et al., 2012; Anttila et al., 2006; Park et al., 2014). In a study using a national sample of Korean adults, Park et al. showed that adults with lifetime depression were 30% less likely to seek dental treatment in spite of having dental problems (Park et al., 2014). Okoro et al. also indicated that adults with current depression were 18% less likely to use dental care services within the past year (Okoro et al., 2012). In another study, Silveira et al. reported did not find a significant association between depression and dental attendance among US pregnant women. However, they suggested that this might be due to the small sample size in their study (Silveira et al., 2016).

A notable finding in this study is the role of emotional social support in attenuating the negative effect of depression on dental attendance among low-income African American women. Several studies have indicated that social support moderates

the effect of life stressors. Taylor et al. found that kin social support moderates the association between financial distress and depressive symptoms among low-income African-American mothers and adolescents (Taylor et al., 2014). Another study showed that social support attenuates the influence of depression on obtaining help among college students (Kenny et al., 2016). To the best of our knowledge, our study is the first to assess the moderating effect of social support on the association between depression and dental attendance among low-income African Americans.

While our study demonstrated that emotional support was able to moderate the influence of depression, it did not detect a similar effect for instrumental support. This finding is in agreement with the results from Cohen and Wills, which indicated that the availability of emotional support can buffer various stressful events, however instrumental support has to be closely related to the stressor in order to act as a buffer (S Cohen and Wills, 1985). Furthermore, a recent meta-analysis demonstrated that emotional social support provides more reliable protection against adult depression (Gariépy et al., 2016). However, it is interesting to note that previous research using this sample of low-income African American women showed that, while emotional support was associated with lower mean depressive symptoms, it did not buffer the depressive symptoms associated with everyday discrimination (Ajrouch et al., 2010). This might suggest that the ability of social support to lessen the burden of stressors is determined by the nature of the stressful event (Jacobson, 1986).

Interestingly, non-depressed women who lack emotional support in our study had higher odds of having a dental visit relative to non-depressed women with emotional

support, though this difference was not statistically significant. A possible explanation for this observation is that non-depressed women who lack emotional support do not need emotional support resources, while non-depressed women receiving emotional support sought emotional support due to other life stressors.

In accordance with previous studies (Wu et al., 2015; Zhang, 2015), this study also found that more highly educated women had significantly better dental attendance. Our study also showed that women who lack dental insurance were less likely to have a dental visit within the past year compared to those with private insurance. Similar findings were reported by Locker et al. using a national sample of Canadian adults, with low-income and those lacking dental insurance being more likely to report financial barriers to dental care access (Locker, Maggirias and Quiñonez, 2011b).

One noticeable predictor of dental attendance for low-income African American women was having a regular dental clinic to go to when they need dental care. The availability of a regular dental clinic was associated with an almost fourfold increase in dental attendance for this population. This finding is consistent with the results from multiple prior studies, which indicate that having a regular source of care is associated with better dental attendance (Cruz et al., 2010; Finlayson et al., 2010).

Our study has some limitations. Our analyses are cross-sectional in nature, which impedes inferring any causal relationship between depression and dental attendance. This also prevents assessing the temporal sequence between the occurrence of depression and social support. In addition, the data about the dental visit history and availability of social support were self-reported. Although trained interviewers collected the information, it is

still possible some participants did not recall their dental visit history accurately. Our study is also based on a sample of low-income African American women living in Detroit and thus our results may not be generalizable to other populations with different characteristics. Nonetheless, due to the complexity of health care seeking behavior, it is essential to comprehend the within-group variations in determinants of dental care utilization to be able to tailor public health programs based on the specific population needs.

Despite these limitations, this study provides useful information about the influence of depressive symptoms on dental attendance. Our results support the notion of including psychosocial factors when considering determinants of oral health care utilization among vulnerable populations. Low-income mothers of young children are prone to suffering from depression, which may negatively impact their dental care utilization. This is a significant problem as the adverse effects of caregivers' depressive symptoms can extend to affect their children's dental attendance. Research has shown that caregivers' depressive symptoms are associated with low dental care utilization among their children (Kruger et al., 2015; Kavanaugh et al., 2006).

This study also calls attention to the possible role of emotional social support in lessening the adverse influence of depressive symptoms on dental attendance. While further studies are needed to improve the understanding of the role of emotional support, our study suggests that providing emotional support resources to depressed women can enhance their dental care utilization. Although the majority of the women in our study reported receiving emotional social support, the availability of social support resources to

these women is not guaranteed, especially when greatly needed. Encouraging social connections and providing emotional support resources to depressed low-income African-American women could improve their dental care utilization.

Table 1-1: Bivariate associations between characteristics of low-income African American women and having a dental visit within the past year (N= 969).

Variable	n	% of women with a dental visit* + SE[1]	P value
Depressive Symptoms			
No	637	44.1 ± 2.4	0.06
Yes (CES-D≥16)	332	37.4 ± 3.3	
Emotional support			
No	79	33.8 ± 6.1	0.22
Yes	890	42.6 ± 2.4	
Instrumental support index			
0	26	35.9 ± 11.4	0.79
1	64	37.9 ± 6.7	
2	90	46.9 ± 6.8	
3	151	44.2 ± 3.4	
4	638	41.3 ± 2.5	
Age			
14-24 years	328	41.6 ± 3.0	0.84
25- 34 years	443	41.3 ± 2.8	
≥ 35 years	198	43.7 ± 3.7	
Education			
Less than high school	456	36.9 ± 2.7	0.004
High school diploma	304	42.6 ± 3.1	
Some college or more	209	51.5 ± 4.3	
Household income			
< $10,000	434	39.8 ± 2.8	0.44
$ 10,000 – $19,999	262	45.5 ± 3.9	
≥ $ 20,000	273	41.6 ± 3.5	
Household size (Number of people)			
2	224	38.3 ± 3.1	0.22
3 or 4	453	45.1 ± 2.9	
≥ 5	292	39.1 ± 4.0	
Do you have a dental clinic to go to?			
Yes	571	54.6 ± 2.7	<0.0001
No	398	23.1 ± 3.0	
Dental Insurance			
Private	103	54.7 ± 5.4	<0.0001
Medicaid	626	44.9 ± 2.5	
No insurance	240	26.7 ± 2.2	
Perceived oral health status			
Excellent/ Very good	80	60.0 ± 5.9	0.001
Good	203	44.0 ± 4.2	
Fair	415	42.9 ± 3.0	
Poor	271	33.1 ± 3.8	

*Weighted row percentage. [1] Standard error of the proportion.

Table 1-2: Multivariate logistic regression model predicting the likelihood of having a dental visit within the past year among low-income African American women (N= 969) [1].

Predictors	Adjusted OR	95% CI
Depressive symptoms		
No	Ref.	Ref.
Yes (CESD ≥ 16)	0.7	(0.5 – 0.9)*
Age		
14-24 years	Ref.	Ref.
25- 34 years	1.1	(0.8 – 1.6)
≥ 35 years	1.3	(0.8 – 2.1)
Education		
Less than high school	Ref.	Ref.
High school diploma	1.2	(0.9 – 1.7)
Some college or more	1.7	(1.1 – 2.6)*
Do you have a dental clinic to go to?		
No	Ref.	Ref.
Yes	3.7	(2.5 – 5.3)***
Dental Insurance		
Private	Ref.	Ref.
Medicaid	0.8	(0.5 – 1.4)
No insurance	0.4	(0.2 – 0.6)***
Perceived oral health status		
Excellent/ Very good	Ref.	Ref.
Good	0.6	(0.3 – 1.1)
Fair	0.6	(0.3 – 1.1)
Poor	0.4	(0.3 – 0.8)**
Household size		
2	Ref.	Ref.
3 or 4	1.1	(0.7–1.6)
≥ 5	0.8	(0.5-1.4)

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] Model c statistic = 0.72, Max rescaled $R^2 = 65.0$.

Table 1-3: Adjusted odds ratios and 95% confidence intervals for the association between depression, social support and dental visits among low-income African American women (N=969) [12].

	Model 1	Model 2	Model 3	Model 4
	Emotional support		**Instrumental support**	
Predictors	**Adjusted OR (95% CI)**			
Depressive symptoms				
No	Ref.	Ref.	Ref.	Ref.
Yes (CESD≥ 16)	0.7 (0.5-1.0)*	0.2 (0.1-0.4)***	0.7(0.5-0.9)*	1.0 (0.5-2.1)
Social support				
No	Ref.	Ref.	Ref.	Ref.
Yes	1.2 (0.6-2.2)	0.4 (0.3- 0.8)**	0.77(0.50-1.19)	1.0 (0.5-1.2)
Interaction (CESD≥ 16) x social support	_____	5.6 (1.9-16.9)**	_____	0.6 (0.2-1.7)
Max-rescaled R^2	65.1	67.3	65.4	65.7
-2 log likelihood	7878.6	7815.5	7868.7	7859.4
Degrees of freedom	14	15	14	15
C statistic	0.72	0.72	0.72	0.72

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] Models 1and 3 include social support main effect, and models 2 and 4 include depression-social support interaction.

[2] All models are adjusted for age, education, dental insurance, availability of a regular dental clinic, household size, and perceived oral health status.

SUUPL Table 1-1: Multivariate logistic regression model predicting the likelihood of having a past year dental visit among African American women at different depression education levels (N= 969) [1].

Variable	Adjusted OR	95% CI
Depressive symptoms x Education		
No depression/ some college or more education	Ref.	Ref.
No depression/ high school diploma	0.9	(0.5 – 1.4)
No depression/ less than high school education	0.8	(0.5 –1.2)
Yes depression/ some college or more education	1.4	(0.7 – 2.8)
Yes depression/ high school diploma	0.6	(0.7 – 2.8)
Yes depression/ less than high school education	0.4	(0.2 – 0.8)**
Age		
14-24 years	Ref.	Ref.
25- 34 years	1.1	(0.8 – 1.6)
≥ 35 years	1.3	(0.8 – 2.2)
Do you have a dental clinic to go to?		
No	Ref.	Ref.
Yes	3.8	(2.6 – 5.5)***
Dental Insurance		
Private	Ref.	Ref.
Medicaid	0.8	(0.5 – 1.3)
No insurance	0.4	(0.2 – 0.6)***
Perceived oral health status		
Excellent/ Very good	Ref.	Ref.
Good	0.6	(0.3 – 1.1)
Fair	0.6	(0.4 – 1.1)
Poor	0.4	(0.2 – 0.8)**
Household size		
2	Ref.	Ref.
3 or 4	1.1	(0.7–1.6)
≥ 5	0.8	(0.5-1.3)

$P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] Model c statistic = 0.72, Max rescaled $R^2 = 66.3$.

SUPPL Table 1-2: Multivariate logistic regression model predicting the likelihood of having a past year dental visit among African American women at different depression emotional support levels (N= 969) [1].

Variable	Adjusted OR	95% CI
Depressive symptoms x Emotional support		
No depression/ emotional support available	Ref.	Ref.
No depression/ no emotional support	1.9	(1.0 – 3.7)*
Depression/ emotional support available	0.8	(0.6 – 1.1)
Depression/ no emotional support	0.3	(0.1 – 0.7)**
Age		
14-24 years	Ref.	Ref.
25- 34 years	1.1	(0.8 – 1.5)
≥ 35 years	1.2	(0.7 – 1.9)
Education		
Less than high school	Ref.	Ref.
High school diploma	1.2	(0.8 – 1.7)
Some college or more	1.7	(1.1 – 2.6)*
Do you have a dental clinic to go to?		
No	Ref.	Ref.
Yes	3.8	(2.6 – 5.5)***
Dental Insurance		
Private	Ref.	Ref.
Medicaid	0.8	(0.5 – 1.3)
No insurance	0.4	(0.2 – 0.6)***
Perceived oral health status		
Excellent/ Very good	Ref.	Ref.
Good	0.6	(0.3 – 1.1)
Fair	0.6	(0.3 – 1.1)
Poor	0.4	(0.2 – 0.8)**
Household size		
2	Ref.	Ref.
3 or 4	1.1	(0.7 – 1.7)
≥ 5	0.8	(0.5 – 1.4)
Instrumental support index		
Low	Ref.	Ref.
High	0.7	(0.5 – 1.2)

$P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] Model c statistic = 0.72, Max rescaled $R^2 = 67.8$.

Figure 1-1: Interaction effect of emotional support and depression on having a dental visit within the past year among low-income African American women

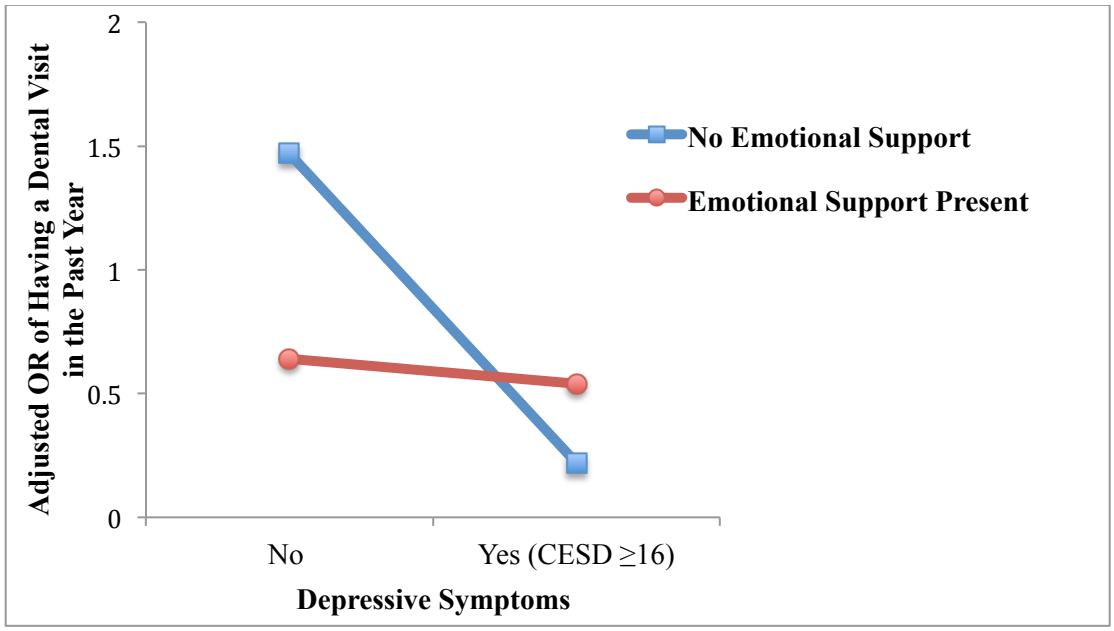
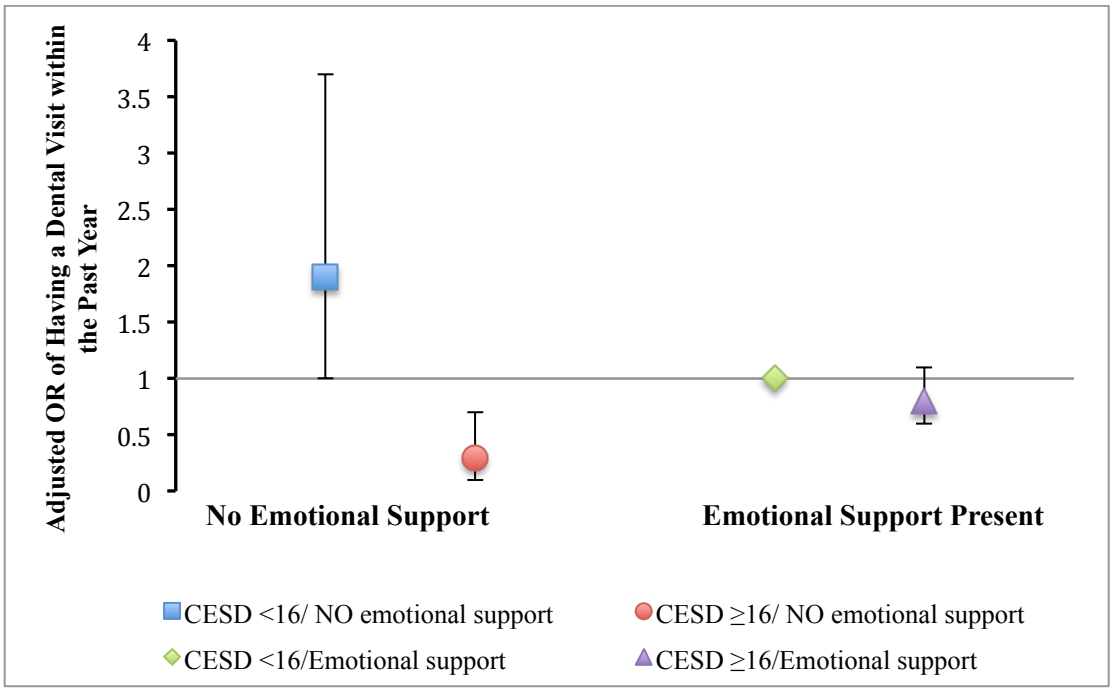


Figure 1-2: Adjusted odds ratios and 95% CI of having a dental visit within the past year among low-income African American women at different depressive symptoms-emotional support interaction levels[12]



[1]CESD <16/emotional support present is the reference category.

[2] Model is adjusted for age, education, dental insurance, availability of a regular dental clinic, household size, instrumental social support and perceived oral health status.

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PAPER II

PSYCHOSOCIAL STRESSORS AND DENTAL CARE UTILIZARION AMONG LOW-INCOME AFRICAN AMERICAN WOMEN

ABSTRACT

Objectives: To investigate the association between psychosocial stressors and dental care utilization among low-income African-American women. **Methods:** Data from a representative sample of low-income African-American women (n=969), obtained from the Detroit Dental Health Project (2002-2003) were analyzed. The main outcomes were past-year dental visit and the reason for the last dental visit. The main predictors were depression, perceived discrimination, and food insufficiency, assessed both individually and in combination. **Results:** Depression, perceived discrimination, and food insufficiency were associated with lower odds of having a dental visit (OR= 0.71, 95%CI= 0.53-0.94, OR= 0.65, 95%CI= 0.44-0.95, and OR= 0.64, 95%CI= 0.44-0.93, respectively). Depression and perceived discrimination were also significantly associated with the reason for the last dental visit. Experiencing concurrent psychosocial stressors was associated with lower odds of having dental visits as well as lower odds of having preventive or treatment visits compared to no visits. **Conclusions:** Psychosocial stressors are negatively associated with dental care utilization among low-income African-American women. Programs designed to improve dental care use among these women should consider allocating resources to alleviate the adverse impact of psychosocial stressors.

INTRODUCTION

Disparities in the burden of oral diseases and the utilization of dental care services are well established in the literature (Garcia et al., 2008; Zhang, 2015). Despite the attempts to improve oral health and enable an equitable use of dental services, oral health inequalities are still profound across the nation. Recent national data on US adults showed that the prevalence of untreated dental caries was dramatically higher among African Americans and Hispanics, compared with non-Hispanic whites. Moreover, African American adults were significantly less likely to retain their teeth compared to other racial groups (Dye et al., 2015).

Although socioeconomic factors have a significant influence on the use of dental care services, studies have repeatedly indicated the lower use of dental care services by African Americans irrespective of their socioeconomic characteristics (Manski and Magder, 1998; Gilbert et al., 2002; Zhang, 2015). Data from the 2012 Medical Expenditure Panel Survey showed that, even after controlling for sociodemographic characteristics, non-Hispanic black adults were significantly less likely to report a dental visit compared to non-Hispanic whites (Zhang, 2015). Similarly, in a sample of adults from three counties in Detroit, African Americans had considerably lower odds of having regular dental visits compared to Whites (Sohn and Ismail, 2005). These findings suggest the presence of some distinctive factors affecting the decision of African Americans to obtain dental care services.

A number of studies have investigated predictors of dental care utilization among African Americans. In a sample of African Americans residing in the Central Harlem

neighborhood of New York City, lack of dental insurance, inadequate coverage, and the perceived low quality of care were among the reported financial barriers to dental care access (Schrimshaw et al., 2011). In another study, higher household income, higher educational level, having health insurance, and higher levels of social support were positively associated with dental care utilization among adult Black men (Stapleton et al., 2016). While previous studies have improved the understanding of some determinants of dental care use among African Americans, the effect of psychosocial and situational factors on dental care utilization in this population is still not well understood.

Recently, an expanding body of knowledge has emphasized the influence of psychosocial factors on health and health-related behavior. Psychosocial factors are those pertaining to the interplay between personal psychological traits and the social environment (Theorell, 2007). Research has related the psychosocial environment to health inequalities (Siegrist and Marmot, 2004). Moreover, psychosocial stressors have been linked to adverse oral health outcomes. Depression, material hardship, and chronic stress were associated with poorer perceived oral health (Finlayson et al., 2011). Depression and food insecurity were also linked to adverse oral health outcomes (Muirhead, Quiñonez, Figueiredo and Locker, 2009a; Okoro et al., 2012; Kisely et al., 2016). The impact of psychosocial stressors could also extend to affect dental care utilization. However, the findings on the influence of psychosocial stressors on the use of dental services are variable. For instance, depression was associated with lower usage of dental care services in some studies (Okoro et al., 2012; Anttila et al., 2006; Park et al., 2014). Nonetheless, such association was not evident in other studies (Silveira et al.,

2016; Alkan et al., 2015). Likewise, self-reported discrimination was significantly associated with a lack of access to dental care among Aboriginal Australians (Jamieson et al., 2013). On the other hand, the experience of discrimination among parents was not associated with a lack of dental visits among their children (Kruger et al., 2015).

Collectively, these findings underline the complexity of dental care-seeking behavior. Therefore, there is a need to comprehensively study the potential influence of psychosocial stressors on dental care utilization among African-American adults, a population that is considerably stricken by oral diseases, yet inclines to exhibit low use of dental care services. Furthermore, it remains unclear whether the concurrent experience of more than one psychosocial stressor creates a more pronounced impact on dental care utilization in this population. This study focuses on the role of psychosocial stressors on dental care use among low-income African-American female caregivers of young children. Our analysis concentrates on three psychosocial stressors: depression, perceived everyday discrimination, and food insufficiency. These stressors are particularly common among low-income African-Americans (Belle and Doucet, 2003; Ajrouch et al., 2010; Feagin, 1991; Coleman-Jensen et al., 2016). In addition, each of these selected stressors signifies a different aspect of psychosocial stress. Depression is more related to an individual's attributes, while perceived discrimination is related to their interaction with the social environment, whereas food insufficiency denotes material hardship. The objectives of this study are to investigate the association between psychosocial stressors, both individually and in combination, on dental care utilization among low–income African-American women.

METHODS

Data from the first wave of the Detroit Dental Heath Project (DDPH) collected in 2002-2003 were analyzed. Participants were sampled from 39 census tracts in Detroit, which were selected to include the largest proportion of low-income African-American households. To be eligible to join the DDPH, participants must have at least one child under the age of 6 years, and must be living below 250% of the federal poverty level in the year 2000. A more thorough description of DDPH is available in a previous article (Ismail et al., 2008). Using a 2-stage area probability sample, a representative sample of low-income African-American children and their caregivers was selected. The families were invited to a Dental Assessment Center to complete interviewer-administered questionnaires in addition to oral clinical examinations. The overall interviewing and examination response rate was 73.7%. At wave I, 1021 caregiver-child pairs completed the data collection. This present study concentrates on a total sample of 969 women female caregivers.

Measures:

Our outcome variables were having a dental visit within the past year, as well as the reason for the last dental visit. To assess if participants had a dental visit within the past year, they were asked about the time since their last dental visit. We categorized responses into: a dental visit within the past year or no dental visit. Participants were also asked about the reason for their last dental visit. The responses were grouped into a prevention only visit, a treatment visit, or no visit. If the participants' last dental visit was more than five years ago, it was considered as no visit.

Our primary independent variables were the following psychosocial stressor variables: depression, perceived everyday discrimination, and food insufficiency. The presence of depressive symptoms was assessed using the Center for Epidemiological Studies Depression Scale (CES-D) developed by Radloff (Radloff, 1977). The CES-D scale evaluates the presence of depression symptoms and depressive mood during the past week by means of 20 items (Cronbach's alpha in this sample was 0.9). Higher CES-D scores indicate worse symptoms. We selected the standardly used cutoff point of 16 to differentiate between depressed women (CES-D $\geq$ 16) and non-depressed women (CES-D <16).

Perceived discrimination was measured using an 11-item version of the Everyday Discrimination scale (Williams et al., 1997). This scale consists of items such as "I was treated with less courtesy than others", "I received poorer service than others", and "I was threatened or harassed". The responses were measured on a 6-point scale ranging from "never" to "almost every day". The Cronbach's alpha in this study was 0.85. Similar to a previous study (Ajrouch et al., 2010), we built a perceived discrimination variable with 3 categories: "no discrimination", "less than 5 areas of discrimination reported a few times per month", or "5 or more areas of discrimination reported a few times per month or more". The "never" and "less than 5 areas of discrimination" groups were collapsed to create a dichotomous discrimination variable in order to differentiate women perceiving high levels of discrimination from those perceiving low or no discrimination.

Food insufficiency was assessed using the USDA food sufficiency-screening question "What best describes the food eaten in your household in the last 12 months?"

Responses were either: always have enough, enough but not what we want, sometimes not enough, or often not enough (Bickel et al., 2000). We dichotomized the responses into: “always enough” and “not what we want/ not enough”.

To evaluate the combined effect of experiencing depression, perceived discrimination, and food insufficiency, we created a summed psychosocial stressors variable from these three variables, with categories ranging from 0 (not suffering depression, discrimination or food insufficiency) to 3 (experiencing all 3 psychosocial stressors).

Other predictor variables potentially related to dental care utilization were incorporated into the analyses. Sociodemographic characteristics included were: age, educational level (less than high school, high school diploma, and some college or more), annual household income (less than $10,000, $10,000 to $19,999, and $20,000 or higher), employment (yes or no) and the number of people in the household. Two dimensions of social support were also assessed: emotional social support was evaluated by asking participants: “is there someone you can count on to give you encouragement and reassurance when you really need it?” Responses were either “yes” or “no”. Instrumental social support was evaluated using the instrumental support index, which was used previously by Ajrouch et al. and showed an acceptable reliability in this sample (Cronbach’s alpha in this sample was 0.7) (Ajrouch et al., 2010). The instrumental support index measures the availability of errand support, monetary support, help with childcare and transportation help when needed. It ranges from 0 (no support) to 4 (all areas of instrumental support available).

We also assessed the type of dental insurance the participants have (categories were: private, Medicaid, and no insurance) and whether they have a dental clinic to go to when needed. The need for dental treatment was assessed using perceived oral health status and the number of untreated cavitated tooth surfaces. Perceived oral health was measured by asking participants to rate the current condition of their mouth and teeth. Responses were categorized into "excellent/very good", "good", "fair", or "poor". The number of untreated caveated surfaces was determined by four calibrated dentists using the International Caries Detection and Assessment System (ICDAS). More information about the reliability of the DDPH examiners was published previously (Ismail et al., 2007). In this study, we categorized the number of untreated cavitated surfaces into 3 categories based on the 25% and 75% quartiles.

Statistical analyses were conducted using SAS version 9.4 (SAS Institute Inc, Cary, NC). We calculated weighted frequency distributions for the sample characteristics. Chi-square tests were used to assess bivariate associations between predictor variables and each of the two outcome variables. Binary logistic regression and multinomial logistic regression analyses were used to predict having a past year dental visit and the reason for the last dental visit, respectively. Initially, separate multivariate models were built for depression, perceived discrimination and food insecurity with each outcome to evaluate their individual associations. Then we used the combined psychosocial stressors variable in the models to investigate their simultaneous effect. Statistical significance was tested at the conventional 0.05 level, and all analyses were adjusted with the appropriate weight to account for the complex survey design. Multicollinearity between predictor

variables was tested using the variance inflation factor. We also assessed potential interactions in models and evaluated the possible moderation of psychosocial stressors by social support variables; however, no meaningful results were found.

RESULTS

Of the 969 women included in the study, only 41.8% reported visiting a dental provider within the past year. About 33.6% of the women in this sample had depressive symptoms (CES-D ≥16) and 20.9% had high levels of perceived discrimination. Slightly more than half of the participants (53.7%) reported not having enough food all the time.

Bivariate associations between having a dental visit within the past year and sample characteristics are presented in Table 2-1. Women experiencing depressive symptoms were less likely to report a dental visit within the past year; however, the association was only borderline non-significant (P value= 0.058). Women perceiving high levels of everyday discrimination and those reporting food insufficiency were significantly less likely to have a dental visit (P value= 0.012 and P value= 0.032, respectively). Higher levels of education as well as the availability of a regular dental clinic were positively associated with dental visits. Dental insurance was also associated with having a dental visit, with privately insured women being more likely to have a dental visit, followed by women with Medicaid insurance. Women lacking dental insurance were the least likely to report a dental visit in the past year. In addition perceived oral health status was significantly related to having a dental visit, with women rating their oral health poorly being less likely to visit a dentist. Age, household income, household size, employment, social support variables, and the number of untreated cavitated teeth surfaces were not significantly associated with dental care utilization within the past year.

Almost half of the study participants had seen a dentist in the past year for treatment purposes (52.2%), while 26.8% of the participants had a preventive visit, and 21.0% had no visit. Table 2-2 demonstrates the bivariate analyses between the reason for the last dental visit and independent variables in our study. The association between depressive symptoms and the reason for the last dental visit was borderline significant (P value= 0.046). Depressed women were less likely to have preventive dental visits and more likely to have no visits, compared to non-depressed women. However, depressed women had slightly more treatment dental visits. Perceived discrimination was significantly associated with the reason for dental visits (P value <0.0001). Women perceiving high levels of discrimination were almost half as likely to have preventive dental visits, compared to those perceiving low or no discrimination. Women with high levels of perceived discrimination were also more likely to report not having dental visits. Although women experiencing food insufficiency were less likely to have preventive visits and more likely to have no visits, food insufficiency was not significantly associated with the reason for last dental visit (P value= 0.22).

Women receiving emotional social support had more preventive visits, and were less likely to have treatment visits (P value= 0.04). Moreover, women with less than high school education, women lacking dental insurance, and those without a regular dental clinic were less likely to have preventive, or treatment visits, and more likely to have no visits. Women with poorer perceived oral health, and those with a higher number of untreated cavitated surfaces had fewer preventive visits, but more treatment visits.

Instrumental social support, household income, and household size were not significantly associated with the reason for the last dental visit.

Table 2-3 shows the results from the multivariate logistic regression models predicting the likelihood of having a dental visit within the past year, incorporating each psychosocial distress variable individually. After adjusting for confounders, depression, high levels of perceived discrimination, and food insufficiency were negatively associated with the likelihood of having a dental visit in the past year (depression OR= 0.71, 95%CI= 0.53-0.94, perceived discrimination OR= 0.65, 95% CI= 0.44-0.95, and food insufficiency OR=0.64, 95%CI= 0.44-0.93). The three psychosocial stressors had comparable effects on dental care use within the past year.

The results from multinomial logistic regression analyses predicting the reason for the participants' last dental visit are presented in Table 2-4. Depression, perceived discrimination, and food insufficiency were included as the main predictors individually. All three models were adjusted for age, education, dental insurance type, the availability of a regular dental clinic, emotional support, and the number of untreated cavitated surfaces. Compared to non-depressed women, women with depressive symptoms had 46% lower odds of having preventive visits than no visits (OR= 0.54, 95%CI= 0.32-0.91). However, depression status was not significantly related to obtaining dental treatment. As model 2 demonstrates, women with high perceived discrimination were significantly less likely to have a preventive dental visit or a treatment visit than no visit, compared to women perceiving no or low discrimination (OR= 0.37, 95%CI= 0.22-0.61 and OR= 0.56, 95%CI= 0.35-0.89, for preventive and treatment visits respectively). Food

insufficiency was not significantly associated with the reason for the last dental visit (OR=0.72, 95%CI= 0.47-1.12 for preventive visits and OR= 0.82, 95%CI= 0.55-1.23 for treatment visits, compared to no visits).

After evaluating the individual effect of depression, perceived discrimination, and food insufficiency, we built a combined variable to simultaneously assess the effect of experiencing one or more of these psychosocial stressors. Overall, 31.8% of the women reported not experiencing any of these psychosocial stressors, 37.6% reported having one psychosocial stressor, 21.1% reported experiencing two and 9.5% experienced all three psychosocial stressors. Table 2-5 shows the crude and adjusted associations between psychosocial stressors and dental care utilization outcomes. Results from simple logistic regression (model 1) indicated that psychosocial stressors were negatively associated with dental visits (P value= 0.017). Women reporting 3 stressors were significantly less likely to have a dental visit within the past year when compared to those with no stressors. In the multivariate analysis (model 2), psychosocial stressors remained a significant predictor of dental care use. Women experiencing one or two stressors had 36% lower odds of having a dental visit compared to those with no stressors (OR= 0.64, 95%CI= 0.40-1.04 and OR= 0.64, 95%CI= 0.43-0.97, for women with 1, and 2 stressors respectively). When the number of stressors increased to three, the likelihood of having a dental visit in the past year decreased considerably (OR=0.34, 95% CI= 0.17-0.67).

Models 3 and 4 present the crude and adjusted effect of psychosocial stressors on the reason for the last dental visit. Psychosocial stressors were significantly related to the reason for the last dental visit in crude analysis (model 3). This relationship remained

after accounting for confounders (model 4). Generally, results from both simple and multivariate multinomial logistic regression analyses suggest that the higher the number of stressors, the lower the odds of having preventive visits or treatment visits, compared to no visits. Compared to women with no psychosocial stressors, women experiencing one stressor had lower non-significant odds of having preventive or treatment visits. Experiencing two concurrent stressors resulted in a significant reduction in the odds of having preventive visits (adjusted-OR=0.51, 95%CI= 0.27-0.95). The likelihood of treatment visits was also reduced; however, this was not statistically significant (adjusted-OR=0.66, 95% CI= 0.38-1.17) Experiencing all three psychosocial stressors concurrently resulted in a noticeable significant reduction in the odds of having preventive visits as well as treatment visits (preventive adjusted-OR= 0.20, 95%CI= 0.09-0.46 and treatment adjusted-OR= 0.47, 95%CI= 0.24-0.90).

DISCUSSION

This study investigated the effect of psychosocial stressors on dental care utilization among low-income African-American female caregivers in Detroit. Our findings indicate that depressive symptoms, perceived discrimination, and food insufficiency are individually associated with lower odds of having a dental visit within the past year in this population. Depressive symptoms and perceived discrimination were also significantly associated with fewer preventive dental visits. Moreover, our results indicate that the higher the number of psychosocial stressors experienced by low-income African-American women, the lower their odds of having a dental visit, including preventive and treatment visits. To the best of our knowledge, our study is the first to evaluate the effect of the number of simultaneously occurring psychosocial stressors on dental attendance in a vulnerable population.

Our findings are in agreement with several previous studies that showed that depression is linked to a lower use of dental services (Anttila et al., 2006; Okoro et al., 2012). Okoro et al. reported similar results using data from the 2008 Behavioral Risk Factor Surveillance System. Their results showed that adults with current depression have lower odds of having a dental visit or cleaning within the past year (Okoro et al., 2012). Contrary to our findings, Alkan et al. did not detect a significant association between depression and dental visits among Turkish adults (Alkan et al., 2015). However, their population was considerably different than our study population as they enrolled participants from patients who presented to a periodontal clinic.

Our study also showed that high levels of perceived discrimination have an adverse effect on dental care utilization. The negative influence of perceived discrimination on dental care utilization has been reported in a few studies. Mofidi et al. indicated that racial discrimination was a major reported barrier preventing African American caregivers from obtaining dental care services for their Medicaid–insured children (Mofidi et al., 2002). Using data from wave III of the Aboriginal Birth Cohort study, an exploratory study by Jamieson et al. also showed that subjects perceiving discrimination were significantly less likely to have had a dental visit (OR= 0.26, CI: 0.08-0.86) (Jamieson et al., 2013). Moreover, a study of low-income blacks in rural Georgia indicated that the perceiving racism is among the barriers to preventive health services in this population (J Strickland and DL Strickland, 1996).

While our study found that women reporting food insufficiency had significantly lower odds of having a dental visit in the past year, it was not significantly associated with having preventive or treatment visits, compared to no visits. Although several studies have linked food insufficiency to poor oral health (Chi et al., 2014; Muirhead, Quiñonez, Figueiredo and Locker, 2009a), the effect of food insufficiency on dental care use has been sporadically investigated. Muirhead et al. assessed the association between food insecurity and oral health disparities among working poor Canadians. Their results indicated that being food insecure is associated with an inability to afford dental services (Muirhead, Quiñonez, Figueiredo and Locker, 2009a). In another study, the same authors explored the influence of competing needs on dental care utilization among working low-income Canadians. They suggested that poor individuals may need to sacrifice necessary

goods or services in order to obtain dental care (Muirhead, Quiñonez, Figueiredo and Locker, 2009b). In a study using data from the 2003 Health Care for the Homeless User Survey, Baggett et al. showed that food insufficiency was associated with unrealized medical care and mental care needs; however, food insufficiency was not associated with unmet need for dental care in that study (Baggett et al., 2010).

A central finding in this study is the negative effect of experiencing concurrent psychosocial stressors on dental visits, including having preventive or treatment visits. Our findings suggest that psychosocial stressors act synergistically to impact dental care utilization. It appears that as two psychosocial stressors accumulate, preventive dental visits are adversely affected. The negative impact of psychosocial stressors becomes more obvious on treatment visits when three stressors are experienced concurrently. Schneiderman et al. indicated that the stressors' number influences the effect of psychosocial stressors on health. They also discussed that multiple stressors can act collaboratively resulting in more powerful stress response (Schneiderman et al., 2005).

We designed a psychosocial stressor variable by summing depression, perceived discrimination, and food insufficiency, rather than individually controlling for stressors in one model. While this approach would provide useful information, the combined psychosocial stressors variable used in our study enabled the assessment of whether concurrent stressors would act jointly to affect dental care utilization. It is interesting to observe that food insufficiency by itself was not significantly related to having preventive visits or treatment visits compared to no visits, however, when combined with depression and perceived discrimination (three psychosocial stressors), the odds of having a

preventive visit or a treatment visit were significantly lower compared to women with no stressors.

There are some limitations to this study. The analyses in this study are cross-sectional, which precludes evaluating the chronological sequence of events. Therefore, we cannot infer any causal associations between psychosocial stressors and dental care use. In addition, information about dental care utilization was self-reported and it is still possible that some participants did not remember their previous dental visits clearly. Our composite psychosocial stressor variable assumes equal weights to the individual stressors. Although individual psychosocial stressors might exhibit different weights, our focus was to assess the concurrent, cumulative effect of psychosocial stressors.

In spite of these the limitations, this study provides valuable information about the effect of psychosocial stressors on dental care utilization in vulnerable populations. Our analyses were based on a representative sample of low-income, inner-city African-American female caregivers, a vulnerable population susceptible to a variety of psychosocial stressors. The negative impact of these stressors appears to affect their utilization of dental services. It is important to note that this not just an issue for one generation, as caregivers' dental care utilization is shown to related to that of their children. In a previous analysis of this population, Sohn et al. showed the caregivers who reported having a preventive dental visit were significantly more likely to take their children to a dental visit (Sohn et al., 2007). While further research is necessary to better grasp the influence of psychosocial stressors, our findings highlight the importance of pondering the nature and number of psychosocial stressors impacting vulnerable

populations when studying their dental care utilization. Programs designed to improve dental care utilization among low-income African-American women should consider allocating resources to lessen the negative influence of psychosocial stressors on their oral health-seeking behavior.

Table 2-1: Bivariate associations between sample characteristics of low-income African American women and having a dental visit within the past year (N= 969).

Variable	n	% of women with a dental visit[1]	*P* value
Depressive symptoms			
No	637	44.1 %	0.058
Yes (CES-D≥16)	332	37.4 %	
Perceived discrimination			
No/Low	762	44.4 %	0.012
High	207	32.3 %	
Food insufficiency			
Always enough	454	47.3 %	0.032
Not what we want/ not enough	515	37.2 %	
Emotional support			
No	79	33.8 %	0.22
Yes	890	42.6 %	
Instrumental support			
0	26	35.9 %	0.79
1	64	37.9 %	
2	90	46.9 %	
3	151	44.2 %	
4	638	41.3 %	
Age			
14-24 years	328	41.6 %	0.84
25- 34 years	443	41.3 %	
≥ 35 years	198	43.7 %	
Education			
Less than high school	456	36.9 %	0.004
High school diploma	304	42.6 %	
Some college or more	209	51.5 %	
Household income			
< $10,000	434	39.8 %	0.44
$ 10,000 – $19,999	262	45.5 %	
≥ $ 20,000	273	41.6 %	
Household size (Number of people)			
2	224	38.3 %	0.22
3 or 4	453	45.1 %	
≥ 5	292	39.1 %	
Employment			
Yes	367	44.5 %	0.25
No	602	40.3 %	
Do you have a dental clinic to go to?			
Yes	571	54.6 %	<0.0001
No	398	23.1 %	

Dental Insurance			
Private	103	54.7 %	<0.0001
Medicaid	626	44.9 %	
No insurance	240	26.7 %	
Perceived oral health status			
Excellent/ Very good	80	60.0 %	0.001
Good	203	44.0 %	
Fair	415	42.9 %	
Poor	271	33.1 %	
Number of untreated cavitated surfaces[2]			
0	76	45.8 %	0.29
1-11	542	43.1 %	
≥ 12	235	37.8 %	

[1] Weighted row percentage.
[2] 16 subjects were edentulous.

Table 2-2: Bivariate associations between the reason for last dental visit and sample characteristics of low-income African American women (N= 969).

Variable	n	Prevention only %[1]	Treatment %[1]	No visit %[1]
Depression symptoms*				
No	637	29.8	50.8	19.3
Yes (CES-D≥16)	332	20.7	54.9	24.4
Perceived discrimination***				
No/ Low	762	29.5	52.5	18.0
High	207	16.6	50.9	32.4
Food insufficiency				
Always enough	454	29.5	51.7	18.8
Not what we want/ not enough	515	24.5	52.6	23.0
Emotional support*				
No	79	12.9	59.2	27.8
Yes	890	28.0	51.6	20.4
Instrumental support				
0	26	5.1	60.1	34.8
1	64	21.2	48.0	30.7
2	90	27.1	50.1	22.9
3	151	22.4	59.1	18.6
4	638	29.4	50.9	19.7
Age***				
14-24 years	328	36.2	40.6	23.2
25- 34 years	443	22.1	59.1	18.8
≥ 35 years	198	21.6	55.4	22.9
Education***				
Less than high school	456	23.4	49.0	27.6
High school diploma	304	28.3	55.5	16.2
Some college or more	209	31.9	54.4	13.7
Household income				
< $10,000	434	22.5	53.2	24.3
$ 10,000 – $19,999	262	29.6	51.6	18.8
≥ $ 20,000	273	31.0	51.2	17.8
Household size (Number of people)				
2	224	29.3	43.8	26.9
3 or 4	453	28.5	52.2	19.3
≥ 5	292	23.1	56.4	20.5
Employment				
Yes	367	30.0	50.4	19.5
No	602	24.9	53.2	21.9

Do you have a dental clinic to go to? * **				
Yes	571	31.8	56.3	11.9
No	398	19.4	46.1	34.4
Dental Insurance**				
Private	103	28.0	63.9	8.1
Medicaid	626	28.2	51.0	20.8
No insurance	240	22.1	49.9	28.0
Perceived oral health status***				
Excellent/ Very good	80	47.4	31.4	21.2
Good	203	35.4	47.6	16.9
Fair	415	26.5	52.4	21.0
Poor	271	14.5	61.6	23.9
Number of untreated cavitated surfaces[2]***				
0	76	39.1	39.0	21.9
1-11	542	28.7	51.7	19.6
≥ 12	235	15.0	62.6	22.4

* $P < 0.05$; ** $P < 0.01$; $P < 0.001$.
[1] Weighted row percentage.
[2] 16 subjects were edentulous.

Table 2-3: Multivariate logistic regression models predicting the likelihood of having a dental visit within the past year among African American women (N= 969). [1]

Predictors	Adjusted OR (95% CI)		
	Model 1	**Model 2**	**Model 3**
Depressive symptoms			
No	Ref.	_____	_____
Yes (CES-D ≥16)	0.71 (0.53-0.94)*		
Perceived discrimination			
No/Low	_____	Ref.	_____
High		0.65 (0.44-0.95)*	
Food Insufficiency			
Always enough	_____	_____	Ref.
Not what we want/ not enough			0.64 (0.44-0.93)*

*$P < 0.05$; ** $P < 0.01$.

[1]Models are adjusted for age, education, dental insurance type, household size, availability of a regular dental clinic and perceived oral health status.

Table 2-4: Multinomial logistic regression models predicting the reason for last dental visit among African American women (N= 953). [12]

Predictors	Adjusted OR (95% CI)		
	Prevention only	**Treatment**	**No visit**
		Model 1	
Depressive symptoms No Yes (CES-D ≥16)	Ref. 0.54 (0.32-0.91)*	Ref. 0.79 (0.50-1.26)	Ref.
		Model 2	
Perceived discrimination No/ Low High	Ref. 0.37 (0.22-0.61)***	Ref. 0.56 (0.35-0.89)*	Ref.
		Model 3	
Food Insufficiency Always enough Not what we want/ not enough	Ref. 0.72 (0.47-1.12)	Ref. 0.82 (0.55-1.23)	Ref.

* $P < 0.05$; ** $P < 0.01$; $P < 0.001$.
[1] 16 observations were removed due to missing values.
[2] Models are adjusted for age, education, dental insurance type, availability of a regular dental clinic, emotional support and number of untreated cavitated surfaces.

Table 2-5: Odds ratios for the association between psychosocial stressors and dental care utilization among low-income African American women.

Predictor	Dental Care Utilization	Reason for the Last Dental Visit	
	Model 1	**Model 3**	
	Dental visit within 1 year	**Prevention only**	**Treatment**
Psychosocial Stressors	**Crude OR (95% CI)**		
0	Ref.	Ref.	Ref.
1	0.64 (0.41-1.02)	0.56 (0.30-1.05)	0.78 (0.45-1.35)
2	0.63 (0.39- 1.00)	0.47 (0.25-0.88)*	0.70 (0.40-1.22)
3	0.37 (0.19-0.73)**	0.18 (0.08-0.42)***	0.49 (0.25-0.95)*
	Model 2[1]	**Model 4[23]**	
	Dental visit within 1 year	**Prevention only**	**Treatment**
Psychosocial stressors	**Adjusted OR (95% CI)**		
0	Ref.	Ref.	Ref.
1	0.64 (0.40-1.04)	0.60 (0.31-1.16)	0.75 (0.42-1.33)
2	0.64 (0.43-0.97)*	0.51 (0.27-0.95)*	0.66 (0.38-1.17)
3	0.34 (0.17-0.67)**	0.20 (0.09-0.46)***	0.47 (0.24-0.90)*

*$P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] Model 3 is adjusted for age, education, dental insurance, availability of a regular dental clinic, household size and perceived oral health status. (N= 969).

[2] 16 observations were removed due to missing values.

[3] Model 4 is adjusted for age, education, dental insurance, availability of a regular dentist, emotional support and number of untreated cavitated surfaces. No visit is the reference category. (N=953).

SUPPL Table 2-1: Multivariate logistic regression model predicting the likelihood of having a dental visit within the past year among low-income African American women (N= 969) [1].

Predictors	Adjusted OR	95% CI
Psychosocial stressors		
0	Ref.	Ref.
1	0.64	(0.40-1.04)
2	0.64	(0.43-0.97)*
3	0.34	(0.17-0.67)**
Age		
14-24 years	Ref.	Ref.
25- 34 years	1.15	(0.77-1.70)
≥ 35 years	1.30	(0.77-2.18)
Education		
Less than high school	Ref.	Ref.
High school diploma	1.14	(0.82-1.60)
Some college or more	1.62	(1.05-2.49)*
Do you have a dental clinic to go to?		
No	Ref.	Ref.
Yes	3.77	(2.61-5.44)***
Dental Insurance		
Private	Ref.	Ref.
Medicaid	0.84	(0.50-1.40)
No insurance	0.37	(0.23-0.61)***
Perceived oral health status		
Excellent/ Very good	Ref.	Ref.
Good	0.56	(0.27-1.17)
Fair	0.61	(0.33-1.13)
Poor	0.45	(0.25- 0.83)*
Household size		
2	Ref.	Ref.
3 or 4	1.12	(0.74-1.68)
≥ 5	0.82	(0.48-1.41)

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] Model c statistic = 0.72, Max rescaled $R^2 = 67.8$.

SUPPL Table 2-2: Multinomial logistic regression model predicting the reason for last dental visit among low-income African American women (N= 953) [1].

Predictors	Prevention only	Treatment
	Adjusted OR (95% CI)	
Psychosocial stressors		
0	Ref.	Ref.
1	0.60 (0.31-1.16)	0.75(0.42-1.33)
2	0.51 (0.27-0.95)*	0.66 (0.38-1.17)
3	0.20 (0.09-0.46)***	0.47 (0.24-0.90)*
Age		
14-24 years	Ref.	Ref.
25- 34 years	0.69 (0.40-1.18)	1.55 (0.95 – 2.53)
≥ 35 years	0.58 (0.29-1.17)	1.17 (0.68 – 2.01)
Education		
Less than high school	Ref.	Ref.
High school diploma	1.98 (1.15-3.41)*	1.95 (1.23-3.08)**
Some college or more	2.21 (1.17-4.19)*	1.94 (0.98-3.84)
Do you have a dental clinic to go to?		
No	Ref.	Ref.
Yes	4.38 (2.53-7.59)***	3.47 (2.41-5.01)***
Dental Insurance		
Private	Ref.	Ref.
Medicaid	0.41 (0.12-1.34)	0.33 (0.11-0.95)*
No insurance	0.26 (0.08-0.86)*	0.26 (0.08-0.76)*
Emotional social support		
No	Ref.	Ref.
Yes	1.83 (0.70-4.78)	0.92 (0.54-1.59)
Number of untreated cavitated surfaces		
0	Ref.	Ref.
1-11	1.01 (0.58-1.75)	1.81 (1.01–3.25)*
≥ 12	0.55 (0.29-1.05)	2.12 (1.03-4.34)*

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

[1] 16 observations were removed due to missing values.

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PAPER III

PREDICTORS OF DENTAL CARE UTILIZATION AMONG LOW-INCOME AFRICAN-AMERICAN WOMEN

ABSTRACT

Objectives: To identify factors predicting dental care visits among low-income African-American women, using the scheme of the Behavioral Model for Vulnerable Population. **Methods:** We used longitudinal data from the Detroit Dental Health Project collected in (2002-2003) and (2004-2005). Information was obtained from a representative sample of low-income African-American women living in Detroit, MI (n=736). Our main outcome variable was the incidence of a dental visit since the baseline measure. A series of logistic regression models were used to predict dental visits using baseline predisposing, enabling and need factors. **Results:** About 62% of the women had a dental visit since baseline. Younger women, and those experiencing pain were more likely to have dental visit. Significant two-way interactions were found between insurance and perceived discrimination (P value= 0.02), and insurance and having a regular dental clinic (P value=0.04). **Conclusion:** Several predictors influence dental care use among low-income African-American women. Our findings highlight the importance of establishing dental homes with culturally competent providers in improving dental care use among these women.

INTRODUCTION

Inequalities in the use of dental care services remain a significant nationwide problem. Data from a 1986 national telephone survey showed that poor individuals and those from ethnic minorities are considerably less likely to utilize dental care services in relation to the general population (Hayward et al., 1989). About three decades later, despite many efforts to improve dental care utilization, these disparities in dental care use remain (Zhang, 2015).

While dental care utilization among children is improving, the rates of dental visits among non-elderly adults are declining, particularly among low-income adults (Wall et al., 2012; Vujicic and Nasseh, 2014). Although monetary matters and dental insurance issues play a role in hindering access to dental care, studies have shown that the availability of free or reduced-fee dental care services is not always associated with better utilization (Davidson and Andersen, 1997; Maserejian et al., 2008). Obtaining dental care services is a more multifaceted decision.

Several models have been developed to explain and predict health care utilization. One of the most widely used models is Andersen's Behavioral Model of Health Services Utilization, which suggests that people's health care utilization is influenced by their predisposing characteristics, enabling factors, and need for care (Andersen, 1995). Predisposing factors arise before the start of the disease and include demographic and psychological characteristics, and health beliefs and attitudes. Enabling factors are the resources of the individual and community such as income, insurance, and availability of

health care providers. Need factors include the perceived need for care in addition to the actual symptoms and level of the disease (Andersen, 1995; Andersen et al., 1983).

Andersen's model has been expanded in order to take into consideration the utilization challenges facing vulnerable populations. The Behavioral Model for Vulnerable Populations incorporates additional predisposing, enabling and need factors that are particularly pertinent to vulnerable populations (Gelberg et al., 2000). Previous studies have used the framework of this Model to recognize determinants of health care utilization in different vulnerable populations such as homeless people, and those with substance abuse (Gelberg et al., 2000; Muirhead, Quiñonez, Figueiredo and Locker, 2009b; O'Toole et al., 2007). However, few studies have used it to predict dental care utilization (Muirhead, Quiñonez, Figueiredo and Locker, 2009b) .

One common finding in dental care utilization studies is the low use of dental care services among African-American adults (Sohn and Ismail, 2005; Gilbert et al., 2002). In spite of having a high burden of oral diseases compared to Whites (Gilbert et al., 2003; Hudson et al., 2007; Dye et al., 2015), African-American adults tend to have a lower dental care utilization, even after accounting for socioeconomic differences (Manski and Magder, 1998; Gilbert et al., 2002; Zhang, 2015). Data from 1989 National Health Interview Survey indicated that African Americans have lower odds of reporting a dental visit within the past year compared to Whites, regardless of other demographic and socioeconomic factors (Manski and Magder, 1998). Similar findings were obtained using data from the 2012 Medical Expenditure Panel Survey, which showed that non-Hispanic black adults were almost 50% less likely to report a dental visit compared to non-

Hispanic whites (Zhang, 2015). These observations indicate that there are some unique determinants influencing dental care use among African-American adults.

A number of predictors of dental care utilization among African-American adults were acknowledged in previous studies (Davidson and Andersen, 1997; Gilbert et al., 2002; Schrimshaw et al., 2011; Stapleton et al., 2016); however, the majority of these studies were cross-sectional in nature. There remains a need for longitudinal assessment of the factors predicting dental care use among African Americans, especially among those with low-income.

In general, the findings from previous research signify racial disparities in dental care utilization and the complexity of the behavior of seeking dental care. The decision to obtain dental care services seems to be a product of many determinants acting at different levels, and the relative importance of these determinants appears to vary among individuals living in different contexts. Therefore, the objective of this study is to use the framework of the Gelberg-Andersen Behavioral Model for Vulnerable Populations to investigate whether baseline predisposing, enabling, and need factors can predict the incidence of dental visits among a relatively homogenous population of low-income African-American women caring for young children.

METHODS

Our analyses used data from the Detroit Dental Center for Research on Oral Health Disparities, which targeted African-American children and their primary caregivers in Detroit. Thirty-nine census tracts in Detroit with the largest percentage of African-American households, having children younger than 6 years old and living below 200% of the federal poverty level in the year 2000 were identified. Using a stratified 2-stage area probability sample, a representative sample of low-income African-American children and their main caregivers, with an annual income below 250% of the federal poverty level, were selected. More details about the sampling process of the Detroit Dental Health Project were published previously (Ismail et al., 2008). A total of 1,021 caregivers-children dyads were enrolled and completed baseline data collection including interviewer-administered interviews and oral examinations in 2002–2003. The response rate at baseline was 73.7%. About 2 years later (2004-2005), 77.0% of the participants (n=790) returned to complete the interviews and receive clinical oral examinations. The current study focuses on female caregivers. We excluded male caregivers (n=38) as well as 16 female caregivers who did not participate in data collection at baseline, as they were not the main caregivers at that time. This resulted in a total sample of 736 women.

Measures:

Our outcome variable was the incidence of dental visits. Participants were asked whether they had a dental visit since baseline. Responses were either yes or no.

Independent variables: our independent variables were selected under the domains of predisposing, enabling, and need factors assessed at baseline data collection:

Predisposing factors: Predisposing factors included in the analyses were age in years, educational attainment (categories were less than high school, high school diploma, and some college or more), employment (yes or no), and the number of people in the household (grouped into 2, 3-4, and 5 or more people). Smoking history was evaluated by asking the participants if they have smoked at least 100 cigarettes or cigars in their entire life (yes or no). The frequency of tooth brushing per week was also measured (categories were 0-6 times/week, 7-13 times/week, and 14 or more times/week). Residential mobility was assessed by asking participants how many times they moved in the past 5 years (responses were categorized into 0 times, 1-2 times, and 3 or more times).

In addition, we evaluated the perceived availability of dental services by asking participants "how do you rate the availability of dental services/care for you and your family?" Responses were rated on a 6-point scale ranging from "excellent" and "very good" to "good", "fair', "bad", and "very bad". The "bad" and "very bad" categories were joined due to their low frequencies. We also assessed the frequency of attending religious services and perceived everyday discrimination. The frequency of attending religious services was evaluated by asking participants "how often do you attend religious services?" Responses were either: "nearly every day", "1-3 times/week", "1-3 times/month", or "less than once a year". Perceived discrimination was assessed using an 11-item scale adapted from the Everyday Discrimination scale (Williams et al., 1997). This scale consists of items of such as "I was treated with less respect than others", "people acted as if they were afraid of me", and "I was unfairly stopped, searched, or threatened by the police". The responses were gauged on a 6-point scale ranging from

"never" to 'almost every day". Cronbach's alpha in this study was 0.85. We categorized perceived discrimination into "never", "low discrimination" and "high discrimination", using the same approach described by Ajrouch et al. Furthermore, we created a binary perceived discrimination variable by combining the "never" and "low discrimination" categories to enable the assessment of the effects of experiencing high levels of discrimination compared to no or low discrimination.

Enabling factors: enabling factors were annual household income (grouped into less than $10,000, $10,000 to $19,999, and $20,000 or higher); food insufficiency was assessed using the USDA food sufficiency-screening question "What best describes the food eaten in your household in the last 12 months?" Responses were grouped into "always enough" and "not what we want/ not enough" (Bickel et al., 2000); dental insurance type was also assessed (categories were private, Medicaid, or no insurance). We also evaluated the availability of a dental home by asking participants: "do you have a dental clinic to go to when needed?" (Responses were yes or no).

Moreover, we evaluated the availability of social support, both emotional and instrumental. Participants were asked to respond with "yes" or "no" to 5 social support questions. Emotional social support was assessed by asking participants "Is there someone you could count on to give you encouragement and reassurance when they really need it?" Errand support, money support, support with childcare and transportation support were assessed by asking participants if they have someone they could count on to: run errands for them, lend them some money, watch their children, and lend them a car or give them a ride, respectively.

Need factors: Participants' need for care was evaluated by assessing their perceived oral health status, the presence of pain in their teeth or gums, and the number of untreated cavitated tooth surfaces. Perceived oral health status was measured by asking participants "how do you rate the current condition of your mouth and teeth?" Responses were "excellent", "very good", "good", "fair", or "poor". The "excellent" and "very good" categories were combined due to small frequencies. The presence of pain was evaluated by asking participants how much pain their teeth and gums caused them during the past 3 months (categories were no pain or little pain, some pain, and a great deal of pain). The number of untreated cavitated tooth surfaces was assessed using the International Caries Detection and Assessment System (ICDAS). Four calibrated dentists performed dental examinations. Detailed information about the reliability of the examiners was published elsewhere (Ismail et al., 2007). We used 25% and 75% quartiles to categorize the number of untreated caveated tooth surfaces into 3 categories (0 untreated cavitated surfaces, 1-11 surfaces, and 12 or more surfaces).

Statistical analyses were done using SAS version 9.4 (SAS Institute Inc, Cary, NC) while considering the complex survey design. Analyses were given the appropriate weight to account for uneven selection probabilities and non-response. Statistical significance was tested at the conventional 0.05 level. We calculated weighted frequency distributions of sample characteristics. Chi-square tests were used to assess bivariate associations between our outcome variable and each of the predisposing, enabling and need predictors. We used a cutoff of P value = 0.25 to enter predictors into Multivariate models. Multivariate analyses were conducted using a series of nested logistic regression

models. We started with a model predicting dental visits from predisposing factors, and then added enabling factors. Eventually, need factors were added to the model. Multicollinearity between predictor variables was evaluated using the variance inflation factor. Potential interactions between predictor variables were also assessed.

RESULTS

A total of 736 women were included in the analyses. The average age of the participants was 28.8 ± 0.3 years. More than half of the participants (62.1%) reported visiting a dentist since baseline, while 37.9% reported not having a dental visit. Table 3-1 shows the results of bivariate analyses between baseline predisposing characteristics of the low-income African-American women and the incidence of having a dental visit at wave II. In general, predisposing factors were not significantly associated with dental visits in bivariate analyses.

The bivariate associations between baseline enabling factors and having a dental visit at wave II are demonstrated in Table 3-2. The availability of a dental home at baseline was significantly associated with having a dental visit at wave II. Nearly 70% of the women having a regular dental clinic to go to when needed had a dental visit since baseline compared to about 51% of those who don't have a regular dental clinic (P value <0.0001). Women with a private dental insurance at baseline were most likely to have a dental visit (75.7%), followed by those with Medicaid dental insurance (62.7%). Women with no dental insurance were the least likely to visit a dental provider (54.2%; P value= 0.003). Borderline statistically significant relationships were detected for participants with a baseline annual household income less than $ 10,000, and those not receiving help with transportation were less likely to have a dental visit. Nevertheless, the associations were borderline non-significant (P value= 0.05, and P value= 0.07, respectively). Although women receiving baseline errands support, money support, and support with

childcare were more likely to visit a dental provider at wave II, the associations between having a dental visit and these types of support were not statistically significant.

Table 3-3 shows the bivariate associations between baseline need factors and the incidence of a dental visit at wave II. The presence of tooth pain or pain in the gums during the past 3 months was significantly associated with a having a dental visit at wave II (P value= 0.0005). About 76% of women who reported having a great deal of pain at baseline had a dental visit at wave II, compared to 67% and 57.8% among those with some pain and those with no or little pain, respectively. The number of untreated cavitated tooth surfaces at baseline was not significantly associated with having a dental visit at wave II (P value= 0.7). The baseline perceived oral health status was also not significantly associated with having a dental visit at wave II (P value= 0.57).

Multivariate analyses were performed utilizing a series of multivariate logistic regression models, using a cutoff of P value= 0.25 for entering and maintaining variables in the model. The initial model predicted dental visits from predisposing characteristics. After which, enabling factors were entered into the model, followed by need factors. When assessing possible interactions, we detected two significant interactions: perceived discrimination and dental insurance (P value= 0.02) and dental home availability and dental insurance (P value= 0.04). Both interactions remained statistically significant when simultaneously included in one model.

For a more thorough explanation of these interactions, we designed two variables incorporating all possible interaction categories. Each variable was separately assessed in a multivariate logistic regression model. Table 3-4 presents the final multivariate logistic

regression models predicting dental visits at wave II among low-income African American women. Model 1 examines the perceived discrimination-dental insurance variable and Figure 3-1 demonstrates the adjusted odds of having a dental visit at wave II at different dental insurance perceived discrimination levels. Among women perceiving no or low discrimination, women with Medicaid insurance and those with no dental insurance were considerably less likely to have a dental visit relative to privately-insured women (OR= 0.5, 95%CI= 0.3-1.0 and OR= 0.3, 95%CI= 0.2-0.6, for women with Medicaid and no insurance respectively). Perceiving high levels of discrimination had the most pronounced effect on Medicaid-insured women. Women with Medicaid insurance perceiving high levels of discrimination had significantly lower odds of visiting a dentist compared to privately insured women perceiving no or low discrimination (OR=0.3, 95%CI= 0.1-0.7). High levels of perceived discrimination did not significantly reduce the odds of having future dental visits among women with private insurance or among those with no insurance (OR= 0.3, 95%CI= 0.1-1.4 and OR= 0.6, 95%CI= 0.2-1.6, respectively).

Model 2 explores the dental clinic-dental insurance variable and Figure 3-2 shows the adjusted odds of having a dental visit at wave II at different dental insurance–dental home levels. In the absence of a dental home, the odds of having a future dental visit among women with Medicaid insurance and those with private insurance were not significantly different, relative to women with no insurance (OR= 1.9, 95%CI= 1.0-3.4, and OR= 2.4, 95%CI= 0.9-6.8, respectively). The availability of a dental home increased the odds of having a dental visit among all women, regardless of their dental insurance

status. However, this increase was not uniform across the types of insurance. Compared to women with no insurance and no dental home, privately insured women obtained the most benefit of having a dental home (OR= 6.9, 95%CI= 2.6-18.1), followed by women with no insurance (OR= 3.5, 95%CI= 2.2-5.8), and lastly women with Medicaid insurance (OR= 3.2, 95%CI= 1.9-5.3).

Multivariate logistic regression also indicates that pain is an independent motivator of dental visits. The greater the amount of pain reported at baseline, the more likely for women to report a dental visit at wave II. Compared to women with no or little pain, women feeling some pain and those feeling a great deal of pain were significantly more likely to have a dental visit (OR= 1.6, 95%CI= 1.0-2.3 and OR= 2.8, 95%CI= 1.7-4.6, respectively). Moreover, women aged 35 years and older at baseline were less likely to visit a dentist relative to women aged 14-24 years (OR= 0.9, 95%CI= 0.6-1.0).

DISCUSSION

This study investigated predictors of dental care utilization among African-American women caring for young children, and living in Detroit below 250% of the federal poverty level. Our study is among few others that employed the Gelberg-Andersen Behavioral Model for Vulnerable Populations to study dental care utilization. Several factors predicting the incidence of dental visits among low-income African-American women were identified.

While Andersen's model proposes that predisposing and enabling factors might be more central in predicting the utilization of dental care services (Andersen et al., 1983), our study found that predisposing factors were not strong predictors of having a dental visit. Kuthy et al. underscored a similar finding when studying the use of dental care services among low-income mothers of young children (Kuthy et al., 1998). This might be partially attributed to the relative homogeneity in predisposing characteristics in our population. For instance, all participants in our study were African-American women, which eliminates the effect of race and gender on dental care use.

In our study, women aged 35 years and older at baseline were less likely to report a dental visit at follow-up. Similar to our findings, Boggess et al. showed that women age 36 years and older were less likely to visit a dentist during pregnancy compared to younger women (Boggess et al., 2010).

In general, enabling factors were more prominent in predicting dental visits in our population. A noticeable finding in this study is the interaction between the effect of dental insurance and perceived discrimination, as well as the interaction between dental

insurance and of the availability of a dental clinic. Controlling for perceived discrimination and the availability of a dental clinic, women with private dental insurance were more likely to go to a dentist, followed by women with Medicaid insurance, and lastly by women with no insurance. Several studies have demonstrated similar results. Using data from the 2006 Medical Expenditure Panel Survey, Christian et al. indicated that women with private dental coverage are more likely to have a dental visit compared to those with public insurance, or no insurance (Christian et al., 2013). Kuthy et al. also showed that women with Medicaid coverage were more likely to visit a dentist compared to those with no insurance (Kuthy et al., 1998).

Our results also showed that perceived discrimination tapers the influence of dental insurance. Perceiving high levels of discrimination reduces the odds of dental visits particularly among women with Medicaid insurance. Previous studies have found a similar association between perceived discrimination and dental visits. In a study among Aboriginal Australians, Jamieson et al. indicated that self-reported discrimination is associated with higher odds of not having a dental visit (Jamieson et al., 2013). Mofidi et al. also reported that racial discrimination is an important barrier hindering African-American caregivers from taking their Medicaid–insured children to dental visits (Mofidi et al., 2002).

The availability of a dental home enhances dental visits among all low-income African-American women, particularly those with private insurance, and no insurance. Having a regular source of dental care has been associated with better dental care utilization in several studies (Davidson and Andersen, 1997; Finlayson et al., 2010; Cruz

et al., 2010). Finlayson et al. indicated that having a regular source of dental care is associated with higher odds of having a dental visit among Hispanic agricultural worker families. Likewise, Cruz et al. found that having a regular source of care is associated with increased the odds of visiting a dentist among a diverse group of immigrants in New York City (Cruz et al., 2010).

Among the need factors evaluated in this study, only pain was a significant predictor of future dental care use. Our results suggest that the greater the amount of pain at baseline, the higher the incidence of having a subsequent dental visit. Similar to our findings, Davidson et al. indicated that experiencing pain is associated with having a dental visit among adults from different ethnic backgrounds (Davidson and Andersen, 1997). Duncan et al. also suggested that experiencing tooth pain is linked to having a dental visit (Duncan et al., 2003).

There are some limitations to this study. The data about the incidence of dental visits were self-reported, which might result in some overestimation of the outcome due to social desirability. In addition, our results are based on a homogenous sample of low-income African-American women living in urban settings. Thus, our findings might not be applicable to other populations with different characteristics such as men, those living in rural areas, or women from different ethnic groups.

Despite these shortcomings, this study is one of few studies that comprehensively investigated predictors of dental visits among low-income African-American women. Targeting a relatively homogenous population allows understanding the within-group variation in dental care use in this population. Moreover, the longitudinal design of this

study allowed identifying predictors of dental visits while avoiding the drawbacks of cross-sectional data analyses. This study adds to the knowledge base pertaining to dental care utilization among low-income African-American women. Our results emphasize the complexity of dental care utilization among these women and the interconnections between predictors of future dental visits. Our findings on the influence of having a dental clinic and the impact of perceived discrimination highlight the importance of establishing dental homes and employing culturally competent dental providers in reducing disparities in dental care use among low-income African-American women.

Table 3-1: Bivariate associations between baseline predisposing characteristics of low-income African American women and the incidence of a dental visit at wave II (N= 736).

Predictor	n	% Women with a dental visit[1]	P value
Predisposing Factors			
Age			
14-24 years	255	64.7%	0.17
25- 34 years	334	63.2%	
≥ 35 years	147	54.4%	
Education level			
Less than high school	340	58.9%	0.23
High school diploma	239	65.8%	
Some college or more	157	63.8%	
Employment			
No	452	59.9%	0.08
Yes	284	65.8%	
Number of people in the household			
2	174	54.3%	0.25
3-4	351	65.1%	
≥5	211	61.8%	
Perceived Discrimination			
No/Low	577	63.2%	0.18
High	159	55.9%	
Perceived availability of dental services			
Excellent	110	67.0%	0.60
Very good	138	59.6%	
Good	210	58.8%	
Fair	197	63.2%	
Bad or very bad	81	66.2%	
Brushing frequency			
0-6 times/ week	157	61.6%	0.54
7-13 times/ week	365	60.5%	
14 or more times/week	214	65.1%	
Attending religious services			
Nearly every day	147	64.3%	0.76
1-3/ week	374	61.5%	
1-3/ month	123	65.5%	
Less than1/year	92	56.7%	
Smoked 100 cigarettes in life			
No	402	62.8%	0.75
Yes	334	61.4%	

How many times have you moved in the past 5 years?			
0	188	65.5%	0.58
1-2	379	60.2%	
≥ 3	169	62.7%	

[1] weighted row percentage.

Table 3-2: Bivariate associations between baseline enabling factors of low-income African American women and their incidence of a dental visit at wave II (N= 736).

Predictor	n	% Women with a dental visit[1]	P value
Enabling Factors			
Household income			
< $10,000	334	57.5%	0.05
$ 10,000 – $19,999	204	66.7%	
≥ $ 20,000	198	65.2%	
Dental home			
No	296	50.9%	<0.0001
Yes	440	69.8%	
Dental Insurance			
No insurance	186	54.2%	0.003
Private	80	75.7%	
Medicaid	470	62.7%	
Food insufficiency			
Not what we want/not enough	514	63.9%	0.41
Always enough	222	60.5%	
Emotional support			
No	52	60.2%	0.79
Yes	684	62.3%	
Errand support			
No	146	57.2%	0.38
Yes	590	63.4%	
Money support			
No	127	53.2%	0.16
Yes	609	64.1%	
Childcare support			
No	69	53.7%	0.18
Yes	667	63.1%	
Transportation support			
No	109	52.4%	0.07
Yes	627	64.0%	

[1] weighted row percentage.

Table 3-3: Bivariate associations between baseline need factors of low-income African American women and their incidence of a dental visit at wave II (N= 736).

Predictors	n	% Women with a dental visit[1]	P value
Need Factors			
Pain in teeth and gums during past 3 months			
No pain / little pain	475	57.8%	0.0005
Some pain	176	67.0%	
A great deal of pain	85	76.0%	
Perceived oral health status			
Excellent/ Very good	59	67.9%	0.57
Good	159	60.3%	
Fair	307	59.6%	
Poor	211	65.2%	
Number of untreated cavitated, missing and filled surfaces[2]			
0	137	60.5%	0.70
1-11	409	61.3%	
≥ 12	178	66.1%	

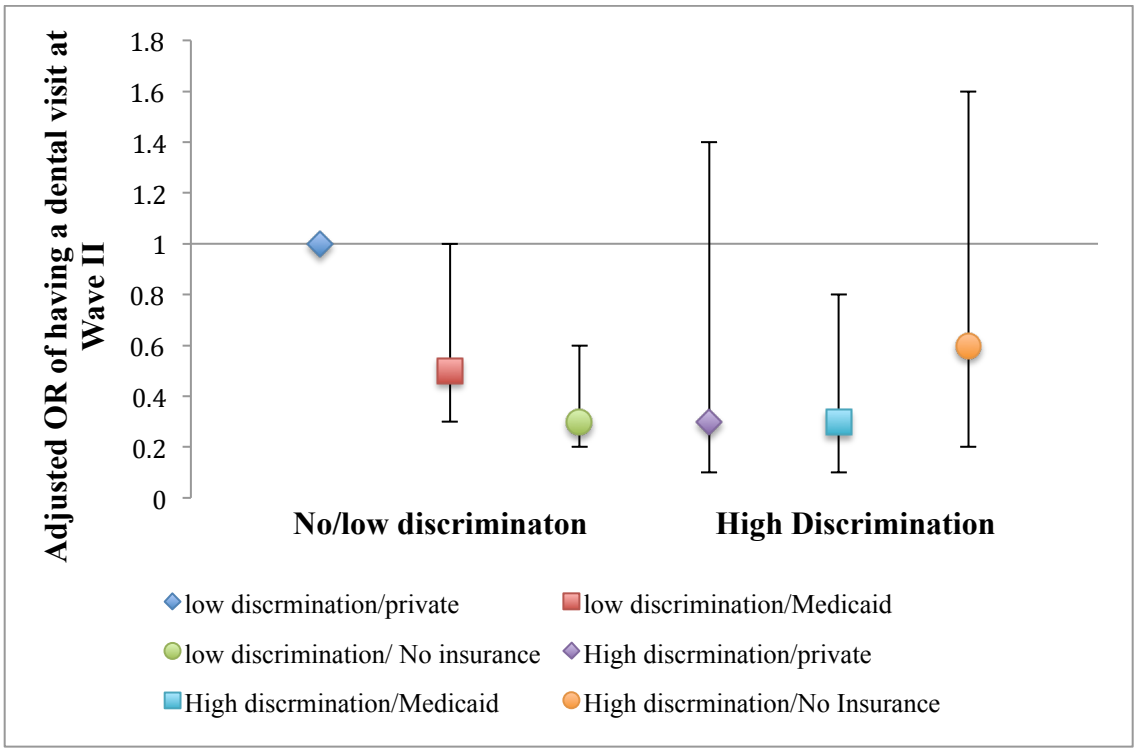
[1] weighted row percentage.
[2] 12 subjects were edentulous.

Table 3-4: Multivariate logistic regression models predicting the likelihood of having a future dental visit among low-income African American women (N=736) [1].

Predictors	Model 1	Model 2
	Adjusted OR (95% CI)	
Perceived Discrimination* Dental Insurance		
No/Low discrimination, Private insurance	Ref.	
No/Low discrimination x Medicaid insurance	0.5 (0.3-1.0)*	
No/Low discrimination x No insurance	0.3 (0.2-0.6)**	----------
High discrimination x Private insurance	0.3 (0.1-1.4)	
High discrimination x Medicaid insurance	0.3 (0.1-0.7)**	
High discrimination x No insurance	0.6 (0.2-1.6)	
Do you have a dental clinic to go to?		
No	Ref.	----------
Yes	2.2 (1.6-3.0)***	
Dental clinic*Dental Insurance		
No x No insurance		Ref.
No x Medicaid insurance		1.9 (1.0-3.4)*
No x Private insurance	----------	2.4 (0.9-6.8)
Yes x No insurance		3.5 (2.2-5.8)***
Yes x Medicaid insurance		3.2 (1.9-5.3)***
Yes x Private insurance		6.9 (2.6-18.1)***
Perceived Discrimination		
No/Low	----------	Ref.
High		0.7 (0.5-1.2)
Age		
14-24 years	Ref.	Ref.
25- 34 years	0.9 (0.6-1.4)	0.9 (0.6-1.3)
≥ 35 years	0.6 (0.4-1.0)*	0.6 (0.4-1.0)*
Education level		
Less than high school	Ref.	Ref.
High school diploma	1.3 (0.9-1.8)	1.3 (0.9-1.8)
Some college or more	1.1 (0.7-1.9)	1.2 (0.7-1.9)
Employment		
No	Ref.	Ref.
Yes	1.2 (0.8-1.7)	1.2 (0.8-1.7)
Transportation support		
No	Ref.	Ref.
Yes	1.6 (0.9-2.7)	1.5 (0.9-2.5)
Pain in teeth and gums during past 3 months		
No pain / little pain	Ref.	Ref.
Some pain	1.6 (1.1-2.3)*	1.6 (1.0-2.3)*
A great deal of pain	2.7 (1.7-4.3)***	2.8 (1.7-4.6)***

* P value <0.05, ** P value < 0.01, P value <0.001.
[1] C statistic for model 1, and model 2 = 0.7.

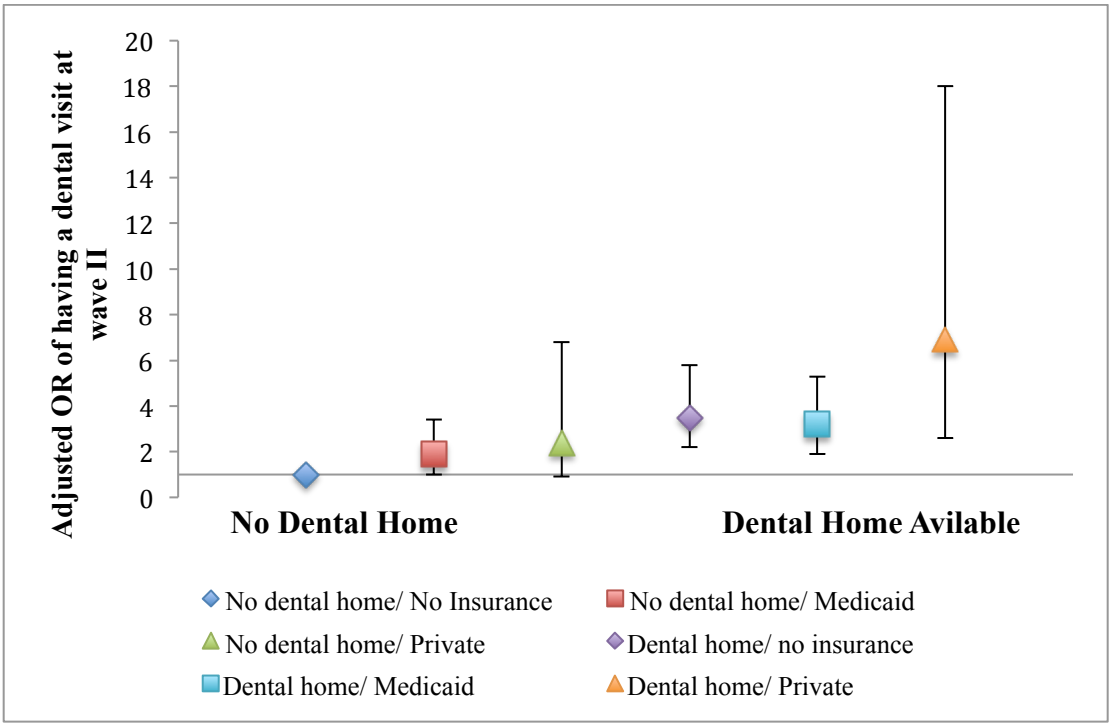
Figure 3-1: Adjusted odds ratios and 95% CI of having a dental visit at wave II among low-income African American women at different baseline dental insurance- perceived discrimination interaction levels[12]



[1] No/low discrimination / private insurance is the reference category.

[2] Model is adjusted for age, education level, employment, support with transportation, pain, and the availability of a dental clinic.

Figure 3-2: Adjusted odds ratios and 95% CI of having a dental visit at wave II among low-income African American women at different baseline dental insurance-dental home interaction levels[12]



[1] no dental home/ no dental insurance is the reference category.

[2] Model is adjusted for age, education level, employment, support with transportation, pain, and perceived discrimination.

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OVERALL CONCLUSION

This dissertation aims to enhance the knowledge about determinants of dental care utilization among low-income African-American women. We used data from wave I and wave II of the Detroit Dental Health Project, a prospective cohort study targeting low-income African-American children and their primary caregivers in Detroit, Michigan. The dissertation investigated determinants of dental care utilization at baseline and longitudinally, focusing on the influence of psychosocial factors and other predictors particularly relevant to low-income African-American women. The framework of the Behavioral Model for Vulnerable Populations was used in identifying potential predictors of dental care services utilization.

Baseline data analyses demonstrated the low use of dental care services in this population, with less than half of the women (41.8%) reporting a dental visit within the past year. Our findings suggest that psychosocial stressors have a negative impact on the use dental care services among low-income African-American women. Depression, perceived discrimination, and food insufficiency were associated with a lower likelihood of having a dental visit within the past year. Women experiencing depressive symptoms, and perceived discrimination were also less likely to have preventive dental visits compared no visits. A noticeable finding in this dissertation is the promising role of emotional social support in moderating the association between depression and dental visits. Our results suggest that emotional social support buffers the negative impact of depression on having dental visits among depressed women.

Our results also showed that the number of concurrent psychosocial stressors has an influence on dental care utilization. It appears that as psychosocial stressors accumulate, they act synergistically to impact dental care utilization. Experiencing two psychosocial stressors concurrently seems to have a more obvious negative effect on preventive dental visits; however, when three stressors accumulate even treatment dental visits are considerably impacted.

Analysis of the data longitudinally identified several predictors of dental care utilization among low-income African-American women. Experiencing pain in the teeth or gums was a significant predictor of future dental visits among these women. Dental insurance was also a significant predictor of having a dental visit. The effect of dental insurance on dental visits in this population was interconnected with the effect of perceived discrimination as well as the effect of having a dental home. Our findings showed that in the absence of a dental home and perceived discrimination, there is a gradient in the incidence of dental visits by dental insurance type, with privately-insured women being more likely to have a dental visit, followed by those with Medicaid insurance, and lastly women with no insurance. Perceiving discrimination seems to narrow the effect of dental insurance mainly by adversely impacting dental visits among women with Medicaid coverage. Furthermore, our results showed that the availability of a dental home outweighs the influence of dental insurance and increases the likelihood of having a future dental visit among women with all types of dental insurance especially among those with private insurance and no dental insurance.

Collectively, the findings from this dissertation emphasize the complexity of the decision of obtaining dental care services, even in a relatively homogenous population. Our findings support the notion of including psychosocial stressors and resources when studying dental care utilization in vulnerable populations. Our findings also suggest that efforts to reduce disparities in dental care use among low-income African-American women should provide emotional support resources for these women, and encourage establishing dental homes and training culturally competent dental providers.

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