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Risk for Obesity: Contribution of Socioeconomic Status Factors and Potential Mediators

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RISK FOR OBESITY: CONTRIBUTION OF SOCIOECONOMIC STATUS FACTORS AND POTENTIAL MEDIATORS

by

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Under the Direction of Mathew Gayman

ABSTRACT

Current estimates indicate that nearly 67 percent of all U.S. adults are overweight or obese. To assist public health efforts aimed at reducing obesity, this study examines the independent relationships between adult obesity and three primary indicators of SES (education, occupation, income). This study also investigates potential mediators in the relationship between SES and obesity, and whether the SES – obesity relationship varies by physical disability status. Logistic regressions are employed; results indicate that contrary to those with a physical disability, education and income are each independently associated with overweight/obesity for those without a physical disability, while occupational prestige is not independently associated with overweight/obesity for those without a physical disability. Among those with a physical disability, the relationship between occupational prestige and overweight/obesity is partially explained by race-ethnicity and smoker status. Among those without a physical disability, results underscore the importance of education and income for overweight/obesity risk.

INDEX WORDS: Obesity, Socioeconomic status, SES, Mediate, Physical disability, Logistic regression

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DEDICATION

I would like to dedicate this work to my father, the Caldwells, and the Hansards.

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I would like to thank the MA Thesis Committee members Dr. Donald Reitzes and Dr. Lesley Reid for their contributions to this work.

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1. INTRODUCTION

Obesity is defined as the condition of excess body fat to the extent that health is impaired (World Health Organization 2000). Recognized as a growing epidemic in many industrialized societies, morbidity associated with obesity is nearly equivalent to death linked to smoking and poverty (Chapman et al. 2009). Indeed, between the 1960s and 2004 the prevalence of obesity among adults in the United States has increased from 13 percent to 32 percent (Wang and Beydoun 2007). This perilous public health condition has become the second leading preventable cause of disease and death in the United States among persons younger than 70 years of age, subsequent only to tobacco smoking (Danaei et al. 2009; Office of the Surgeon General 2001). Numerous diseases and metabolic abnormalities have been found to be associated with obesity, including hyperinsulinemia, insulin resistance, type 2 diabetes, hypertension, dyslipidemia, coronary heart disease, gallbladder disease, and certain cancers (Pi-Sunyer 2002). Obesity is expected to continue to increase and become the foremost preventable cause of disease and death if no successful approaches to quelling it can be implemented (Wang and Beydoun 2007). In order to direct public health efforts aimed at curbing this epidemic, research is needed to identify risk factors for obesity.

Given the extensive body of literature demonstrating the link between lower socioeconomic status (SES) and poorer health and higher mortality (Marmot 2004), SES represents a promising starting point for prevention-intervention efforts. Indeed, Link and Phelan (2010) have argued that SES not only represents a risk factor for poor health, but may serve as a fundamental cause of health problems and health disparities. The fundamental cause argument proposes that the resilience of the association between SES and health is a result of the resources embodied in one's social status, such as financial assets, knowledge, prestige, and favorable social connections that invariably help preserve health. Although SES is recognized as a key risk factor for obesity (Burdette and Hill 2008; Matheson, Moineddin, and Glazier 2008; Brunner, Chandola, and Marmot 2007; George et al. 2005; McLaren 2007; Wang and Beydoun 2007; Marmot and Wilkinson 2006; Sobal and Stunkard 1989) prior research has largely focused on a single SES indicator (Williams, Bhopal, and Hunt 1994; George et al. 2005; Wiczinski et al. 2009; Winkleby, Gardner, and Taylor 1996; Burke et al. 1990) or a composite measure including education,

occupation, and/or income (Burdette and Hill 2008; Matheson, Moineddin, and Glazier 2008; Brunner, Chandola, and Marmot 2007; Godley and McLaren 2010; Hazuda et al. 1991; Wardle, Waller, and Jarvis 2002). However, because research demonstrates that the association between SES and obesity varies according to the particular SES indicator under investigation (Wardle, Waller, and Jarvis 2002; Ball and Crawford 2005; Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; McLaren 2007; Flegal, Harlan, and Landis 1988; Roskam and Kunst 2008; Winkleby et al. 1992), our current understanding of the relationship between SES and obesity may be limited. With few exceptions (Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; Singh et al. 2011), a paucity of empirical studies on adult obesity have assessed the independent roles of education, occupation, and income.

In addition to the role of SES, obesity is patterned by other social statuses, such as disability status. For example, results from a national survey (NHANES III 1988-1994) reveal that 30 percent of people with a physical disability are also obese compared with 23 percent of people without a physical disability (Liou, Pi-Sunyer, and Laferrere 2005; Centers for Disease Control and Prevention 2002). While physical disability may increase risk for obesity, the role of disability status for the SES-obesity relationship has not been examined in prior empirical studies that have assessed the distinct relationships between the three primary SES indicators and adult obesity (Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; Singh et al. 2011). An understanding of the role of disability status for the SES-obesity relationship may provide additional key insights to inform targeted obesity prevention efforts. As a double-burden living situation, persons with both low SES and a physical disability may be at increased risk for obesity. Thus, research is needed to investigate whether the respective associations between the three primary SES indicators and adult obesity varies by physical disability status.

In addition to identifying risk factors for obesity, research is also needed to shed light on the factors that mediate the link between SES and obesity. Recent studies have demonstrated that the SES-health relationship is partially mediated by behavioral factors including physical activity (Rogers, Hummer, and Everett 2013; Jeffrey et al. 1991; Borodulin et al. 2012). Two studies particularly focusing on obesity as a health outcome, concluded that physical activity partially explained the SES-obesity

relationship (Jeffrey et al. 1991; Borodulin et al. 2012). However, another recent study found that behavioral factors including physical activity did not mediate the SES-obesity relationship (Ward et al. 2007). Due to the scarcity of research and conflicting findings, further research is needed to examine the potential mediating role of physical activity in addition to other socially modifiable factors , such as coping resources and chronic stress exposure, for understanding the SES – obesity relationship.

Stress Process theory (Pearlin et al. 1981) underscores the protective role of psychosocial coping resources and the risk associated with chronic stressors for poor health and health inequalities. This framework posits that SES translates into health through the availability of coping resources and exposure to social stress. Studies have shown that the SES-health relationship is partially explained by social support and self-esteem (Brand et al. 2007; Liu, Hermalin, and Chuang 1998; Marmot et al. 1997; Wamala et al. 1999; Vahtera et al. 1999; Gallo et al. 2007; Schnittker 2004; Wamala, Wolk, and Orth-Gomer 1997) and stress exposure (van Oort, van Lenthe, and Mackenbach 2005; Khang and Kim 2005; Lantz et al. 2005; Wamala, Wolk, and Orth-Gomer 1997). One recent study focusing on obesity as a health outcome, concluded that both self-esteem and stress exposure partially mediated the SES-obesity relationship (Wamala, Wolk, and Orth-Gomer 1997). While this research provides an important first step in identifying linking mechanisms between SES and obesity, further research is needed to investigate the potential mediating roles of these socially modifiable factors for directing obesity prevention-intervention efforts (Ball and Crawford 2006; Everson et al. 2002).

The current investigation uses data from a community-based sample of Miami-Dade County, FL residents (N=1,712) to assess the distinct role of three SES factors for obesity. Specifically, this study advances current knowledge by attempting to disentangle the relationship between adult obesity and the three primary indicators of SES (education level, occupational prestige, household income). Because this investigation employs data that strategically oversampled persons with a physical disability, this study also builds on prior work by assessing whether the SES – obesity relationship varies by disability status. Finally, in attempts to identify socially modifiable factors that may serve as mediators in the relationship

between SES and obesity, this study examines whether physical activity, psychosocial coping resources (social support, self-esteem), and chronic stress exposure attenuate the SES – obesity relationship.

2. LITERATURE REVIEW

2.1 The Obesity Epidemic

The World Health Organization (WHO) classifies obesity as a disease and defines it as the condition of excess body fat to the extent that health is impaired (2000). Body Mass Index (BMI) is used extensively to assess obesity in large epidemiological studies (Guillaume 1999; WHO 2000; Kuczmarski et al. 2000). Numerous studies have linked BMI to increased risk for morbidity and mortality (WHO 2000) due to diseases and abnormalities including hyperinsulinemia, insulin resistance, coronary heart disease, gallbladder disease (Pi-Sunyer 2002); as well as type 2 diabetes, hypertension, and dyslipidemia (De Vriendt, Moreno, and De Henauw 2009; Bose, Olivián, and Laferrère 2009). Additional diseases and health problems associated with obesity include certain types of cancer (colon, breast, endometrial, gallbladder), congestive heart failure, stroke, gallstones, osteoarthritis, sleep apnea, menstrual abnormalities, impaired fertility, and increased pregnancy risks (Pi-Sunyer 1998).

Obesity has become a global public health challenge that will produce an increase in chronic diseases, and is therefore characterized as a global health crisis (Kraak and Story 2010; Office of the Surgeon General 2001; Ogden et al. 2006). Recent estimates show that nearly 67 percent of all U.S. adults are overweight or obese (National Center for Health Statistics 2010) and, if trends continue, this percentage may rise to over 80 percent by 2030 (Wang et al. 2008). Further, approximately 32 percent of U.S. adults are specifically obese (Wang and Beydoun 2007). More men than women are overweight or obese (68.8% vs. 61.6%) (Hedley et al. 2004), and minority groups (i.e. non-Hispanic Blacks and Mexican Americans) have a higher combined prevalence of overweight and obesity in comparison to non-Hispanic Whites. The corresponding prevalences are 76.1 percent (non-Hispanic Blacks) and 75.8 percent (Mexican Americans), versus 64.2 percent (non-Hispanic Whites) (Wang and Beydoun 2007). In addition to human suffering, estimates of the total cost of obesity in the United States, including direct (i.e. health

care) and indirect (i.e. lost productivity) costs, amount to nearly $100 billion per year (Finkelstein et al. 2003; Wolf and Colditz 1998). Given that obesity is endemic in the U.S. population, research identifying risk factors for obesity is warranted.

2.2 SES and Obesity

Low SES increases the risk of mortality and persons with low SES are more likely to endure a substantial amount of illnesses including coronary heart disease, cancer, and diabetes (Marmot 2004; Timm et al. 2006; Dalstra et al. 2005; Huisman et al. 2004; Lawlor et al. 2005; Ward et al. 2004; Everson et al. 2002; Helmert et al. 2002). Link and Phelan (2010) have argued that socioeconomic status (SES) is not simply a risk factor for health problems, but a fundamental cause of health problems and health disparities. The fundamental cause theory aims to elucidate the reason for the persistence of the association between SES and health despite substantial modifications in the risk factors and diseases that are purported to account for this association. This theory proposes that the resilience of the association between SES and health is a result of the resources contained in one's social status, such as financial assets, knowledge, prestige, and beneficial social connections that invariably help preserve health. SES may be a fundamental cause for obesity and low SES individuals may be at increased risk due to factors such as limited availability of affordable, nutritious foods, less nutrition knowledge, unsafe neighborhoods, and occupations that do not enable regular leisure-time physical activity. In support of this perspective, studies show that persons from low SES backgrounds consume nutritionally poorer diets than do those from higher SES backgrounds (Ball et al. 2004; De Irala-Estevez and Groth 2000; Johansson et al. 1999; Pryer et al. 2001) and that low SES individuals are less likely to participate in leisure-time physical activity than those from higher SES backgrounds (Britton et al. 2000; Crespo et al. 1999; Kuh and Cooper 1992). The substantial body of research demonstrating that SES is inversely associated with obesity (Roskam 2009; Moore and Cunningham 2012; McLaren 2007; Ball and Crawford 2006; Leigh, Fries, and Hubert 1992) supports the fundamental cause perspective.

While SES may serve as a fundamental cause of obesity, the SES—obesity relationship may vary across SES factors. Due to the strong correlation between the three primary SES factors of educational

attainment, occupational status, and income (Nocon, Keil, and Willich 2007), research on adult obesity often employs only one SES indicator (Williams, Bhopal, and Hunt 1994; George et al. 2005; Wiczinski et al. 2009; Winkleby, Gardner, and Taylor 1996; Burke et al. 1990), or a composite measure of two or three indicators (Burdette and Hill 2008; Matheson, Moineddin, and Glazier 2008; Brunner, Chandola, and Marmot 2007; Godley and McLaren 2010; Hazuda et al. 1991; Wardle, Waller, and Jarvis 2002). However, the use of only one SES indicator or a composite SES measure may present problems when attempting to determine the primary SES factor(s) that contributes to obesity (Nocon, Keil, and Willich 2007). For the purpose of formulating more targeted prevention/intervention recommendations, obesity research unpacking the SES components is warranted. Indeed, in order to maximize limited resources over the long term, it is vital to determine which SES indicator could be most beneficial in reducing obesity (Lemmens et al. 2008).

2.2.1 Education and Obesity

According to studies that have attempted to disentangle the respective relationships between the three primary SES indicators and adult obesity (Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; McLaren 2007), formal education level appears to be a strong (possibly the strongest) independent SES predictor for obesity. For example, one empirical study found that although low education, occupation, and income were each independently associated with excess weight, the association was strongest with education (Faeh, Braun, and Bopp 2011). Researchers have found that education enables individuals to integrate healthy behaviors into their lifestyle and provides them a sense of control over their health (Wardle, Waller, and Jarvis 2002). As formal education level increases, knowledge and skills to acquire valid information pertaining to healthy diet, nutrition and exercise may increase (Ball and Crawford 2006). Higher levels of formal education may also produce increased critical thinking skills and consumer skepticism regarding advertising and marketing techniques used to sell food and beverages, which may be protective against obesity. Thus, higher education may directly and/or indirectly protect against obesity.

2.2.2 Occupation and Obesity

Research has also often found occupational prestige level to be associated with risk for obesity (Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; McLaren 2007; Ball and Crawford 2005). By definition, low status occupations are associated with a lack of autonomy, which may cause a person to experience more difficulty with developing and/or maintaining a schedule that is conducive to a healthy lifestyle (Ball, Mishra, and Crawford 2002; Wardle, Waller, and Jarvis 2002). For example, low prestige occupations may decrease one's ability to structure her/his work schedule in order to allow for regular exercise and other physical health related activities.

2.2.3 Income and Obesity

Recent studies that have attempted to disentangle the separate relationships between the three primary SES indicators and adult obesity have found that income level does *not* appear to be a strong independent predictor for obesity (Nocon, Keil, and Willich 2007; McLaren 2007; Ball and Crawford 2005). For example, one empirical study concluded that while low education was strongly associated with obesity and low occupational status was associated with obesity, low income was not associated with obesity (Nocon, Keil, and Willich 2007). It is plausible that the monetary advantages of a high household income may not translate into regular exercise and other physical health related activities. For example, while greater income may provide an opportunity to engage in healthier lifestyle activities (e.g., exercise, proper nutrition, etc.), higher income can also allow persons to engage (or indulge) in unhealthy behaviors (e.g., alcohol consumption, excess food intake).

Consistent with the fundamental cause argument (Link and Phelan 1995) and prior research (Moore and Cunningham 2012; McLaren 2007), there is reason to anticipate that SES will significantly contribute to obesity risk. However, it remains unclear whether the nature of the SES-obesity relationship varies depending on the particular SES indicator (McLaren 2007; Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; Ball and Crawford 2005; Wardle, Waller, and Jarvis 2002; Flegal, Harlan, and Landis 1988; Roskam and Kunst 2008; Winkleby et al. 1992). Thus research assessing the independent contribution of various SES factors for obesity is needed.

2.3 SES, Obesity, and Disability Status

Although two reviews (McLaren 2007; Ball and Crawford 2005) and three previous empirical studies (Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007; Singh et al. 2011) have attempted to disentangle the respective relationships between the three primary SES indicators and adult obesity, no studies additionally examined the role of disability status for the SES-obesity relationship. Results from a national survey (NHANES III 1988-1994) reveal that 30 percent of people with a physical disability are also obese compared with 23 percent of people without a physical disability (Liou, Pi-Sunyer, and Laferrere 2005; Centers for Disease Control and Prevention 2002). While physical disability may increase risk for obesity, it is unclear if (or how) the relationship between the SES factors and obesity varies by physical disability status. An understanding of the role of disability status for the SES-obesity relationship may elucidate additional key insights to inform targeted obesity prevention efforts.

2.3.1 Education, Obesity, and Disability Status

As a double-hardship situation, persons with both a low formal education and a physical disability may be at increased risk for obesity. For example, individuals who have a physical limitation may not be able to benefit from the knowledge and skills gained from education to utilize exercise health information for weight maintenance. Disabled persons who are able to obtain a higher education level may nevertheless encounter a barrier as they may not be able to engage in regular physical activity due to their condition. Therefore, it is plausible that the knowledge and skills gained from education that would enable a physically active lifestyle may essentially be limited to persons who do not have a physical limitation.

2.3.2 Occupation, Obesity, and Disability Status

As a similar double-disadvantage, persons who have low occupational prestige in addition to a physical disability may be at increased risk for obesity. For example, individuals who have a physical limitation may not be able to have a highly physically active lifestyle with the increased autonomy and time management privileges granted with higher occupational prestige jobs. Particular health oriented advantages of higher prestige occupations may include the ability to use scheduled time to engage in

exercise at home, the ability to use a gym membership or gym equipment, and possible availability of workplace gyms. Therefore it is conceivable that the greater autonomy and schedule control privileges that would enable a physically active lifestyle and that are granted with higher occupational prestige may virtually be limited to employees who do not have a physical limitation.

2.3.3 Income, Obesity, and Disability Status

Additionally a double-burden situation, persons who have a low income and a physical disability may be at increased risk for obesity. For example, persons who have a low income and a physical disability may need to allocate a substantial portion of their income to expenses incurred from medical appointments, examinations and prescriptions related to their condition in comparison to individuals who do not have a physical disability. Similar to the occupational prestige factor, due to their physical condition, disabled persons may not be able to utilize certain exercise health related benefits of a high income level such as available funds to purchase a gym membership or the services of a personal fitness trainer to help prevent the development of obesity. Based on these theoretical rationales, research is needed to investigate whether the respective associations between the three primary SES indicators and adult obesity varies by physical disability status.

2.4 Mediating Factors

In order to better understand the link between SES and obesity, research identifying socially modifiable factors that may mediate the SES-obesity relationship is also needed. Research detecting mediators is important for the identification of pathways through which SES becomes translated into obesity risk. Recent work has started to uncover potential mediators that include behavioral factors, psychosocial coping resources and stress exposure.

2.4.1 Behavioral Factor: Physical Activity

As a behavioral factor, physical activity has been shown to be associated with SES (Britton et al. 2000; Crespo et al. 1999; Kuh and Cooper 1992) and obesity (Lahti-Koski et al. 2002; Martinez et al. 1999; Fine et al. 2004; Hu et al. 2003; Healy et al. 2008; Jakes et al. 2003), which is a requirement for mediation effects. Persons with lower SES may not be able to engage in regular exercise and other

physical health related activities and thus be at increased risk for poorer health. Studies have shown that the SES-health relationship is partially explained by behavioral factors including physical activity (Rogers, Hummer, and Everett 2013; Jeffrey et al. 1991; Borodulin et al. 2012). Two studies specifically focusing on obesity as a health outcome, concluded that physical activity partially mediated the SES-obesity relationship (Jeffrey et al. 1991; Borodulin et al. 2012). However, another recent study found that physical activity did not mediate the SES-obesity relationship (Ward et al. 2007).

Particular limitations are present in the samples and in the methodological choices of the two most recent studies (Borodulin et al. 2012; Ward et al. 2007). Both of these studies used only education and income as indicators of SES; the researchers did not include a measure for occupational prestige in their analyses. In addition, the demographic characteristics of race-ethnicity and disability status were not examined in these two studies. For example, one of the study samples consisted solely of subjects from the Finnish adult population stratified by age and gender (Borodulin et al. 2012). Moreover, the authors of one of the studies disclose that the measurement properties of the instrument utilized to collect data on physical activity is not known (Ward et al. 2007). Given the inconsistent findings and the limitations present in these previous studies, further research is needed to examine the potential mediating role of physical activity for understanding the SES-obesity relationship. The current study improves upon these prior studies by including occupational prestige as a primary indicator of SES, as well as a demographic control variable for race-ethnicity. This study also builds on prior work by assessing whether the SES – obesity relationship varies by disability status.

2.4.2 Psychosocial Coping Resources

One pathway through which SES may translate into health outcomes is through the availability of coping resources (Brand et al. 2007; Liu, Hermalin, and Chuang 1998; Gallo et al. 2007; Schnittker 2004). Theory and research based within the Stress Process framework (Pearlin et al. 1981) underscores the protective role of psychosocial coping resources such as social support and self-esteem for health (Berkman and Glass 2000; Cutler and Lleras-Muney 2010; Pampel et al. 2010; House 1981; Turner 1983; Wethington and Kessler 1986; Kaplan 1975, 1980; Kaplan and Pokorny 1969; Pearlin and Lieberman

1979; Rosenberg 1985; Wylie 1979). Research has demonstrated that persons with lower SES report lower social support and lower self-esteem (Duncan, Duncan, and Strycker 2005; Turner and Lloyd 1999). Research has also demonstrated that both low social support and low self-esteem are associated with obesity (Hovik, Goen, and Amason 2012; Rubinstein 2006). In reach of fewer coping resources to overcome life difficulties, persons with lower SES may be at increased risk for developing poor health, including obesity.

2.4.2.1 Social Support

Perceived social support is conceptualized as the sense that one is appreciated and loved by others, and is able to rely on others in a time of need (Cobb 1976). This form of social support is identified as the most potent and consistent indicator pertaining to health outcomes (House 1981; Turner 1983; Wethington and Kessler 1986). Indeed, perceived social support is linked to mortality and a vast range of physical and psychological morbidities (Cohen and Syme 1985; House 1987; House, Umberson, and Landis 1988; Vaux 1988). Research has demonstrated that lower SES is associated with less social support (Mirowsky and Ross 2003; Duncan, Duncan, and Strycker 2005) and lower support is linked to higher risk of obesity (Hovik, Goen, and Amason 2012). Recent studies have also shown that the SES-health relationship is partially mediated by social support (Brand et al. 2007; Liu, Hermalin, and Chuang 1998; Marmot et al. 1997; Wamala et al. 1999; Vahtera et al. 1999). While this research provides an important initial step in identifying linking mechanisms between SES and health generally, further research is needed to investigate the potential mediating role of social support for understanding obesity and for directing obesity prevention efforts (Ball and Crawford 2006; Everson et al. 2002). With less access to various beneficial functions of social support that affect weight management such as instrumental support; emotional support; informational support; and companionship (Fischer Aggarwal, Liao, and Mosca 2008; Thornton et al. 2006; Wright et al. 2010), lower SES persons may be at increased risk for obesity.

2.4.2.2 Self-Esteem

Self-esteem is conceptualized as a person's self-assessment of worth (Rosenberg 1979). Studies have consistently identified a relationship between self-esteem and health (Kaplan 1975, 1980; Kaplan and Pokorny 1969; Pearlin and Lieberman 1979; Rosenberg 1985; Wylie 1979). Research has also demonstrated that lower SES is associated with lower self-esteem (Turner and Lloyd 1999; Gecas and Seff 1990, 1989; Mortimer and Finch 1986; Kohn and Schooler 1983; Wylie 1979) and lower self-esteem is linked to higher risk of obesity (Rubinstein 2006). Thus, self-esteem may serve as a linking mechanism between SES and obesity. Low SES persons who have low self-esteem may attempt to manage their distress with maladaptive coping mechanisms such as overeating.

While prior studies have shown that self-esteem plays a role in the SES–health relationship, self-esteem only partially mediates this link (Gallo et al. 2007; Schnittker 2004; Wamala, Wolk, and Orth-Gomer 1997). In one prior study in which self-esteem was found to partially mediate the SES-obesity relationship (Wamala, Wolk, and Orth-Gomer 1997), limitations are present in the sample and in the authors' methodological decisions. This prior study used an aggregate of education and occupation as the measure for SES; the researchers did not include an indicator for income for the SES measure in their analyses. In addition, the sample for this earlier study included solely Swedish women; the researchers did not include demographic control analyses by gender, race-ethnicity or disability status. Given the scarcity of prior research and the limitations present in this previous study, further research is needed to examine the potential mediating role of self-esteem for understanding the SES-obesity relationship (Ball and Crawford 2006; Everson et al. 2002). The current study improves upon this prior study by including income as a primary indicator of SES, as well as demographic control variables for gender and race-ethnicity. This study also builds on prior work by assessing whether the SES – obesity relationship varies by disability status.

2.4.3 Stress Exposure

Stress Process research (Pearlin et al. 1981) additionally underscores the risk associated with chronic stressors for poor health and health inequalities (Pearlin 1989; Pearlin et al. 1981). Research has

demonstrated that lower SES is associated with higher social stress (Burdette and Hill 2008; Sugathan, Soman, and Sankaranarayanan 2008; Williams, Bhopal, and Hunt 1994) and higher social stress is linked to higher risk of obesity (Bose, Olivián, and Laferrère 2009; Anagnostis et al. 2009; Nieuwenhuizen and Rutters 2008). Thus, levels of stress may attenuate the link between SES and obesity. Low SES persons who have high levels of stress may not have the opportunity to plan healthy meals and times for grocery shopping, and they may also need to allocate exceedingly limited funds to most imperative living costs such as rental payments, utility payments, and an essential food supply. While studies have shown that the SES-health association is partially mediated by stress exposure (van Oort, van Lenthe, and Mackenbach 2005; Khang and Kim 2005; Lantz et al. 2005; Wamala, Wolk, and Orth-Gomer 1997), few studies have specifically examined the mediating role of stress exposure in the SES-obesity relationship. In one study, stress exposure was found to partially mediate the SES-obesity relationship (Wamala, Wolk, and Orth-Gomer 1997). However, this prior work includes the previously described limitations and furthermore did not employ chronic stress exposure as the measure for the stress mediation variable.

2.5 Research Hypotheses

Based on theory and prior research, the following hypotheses are tested separately for those with and without a physical disability as the benefits from higher SES on obesity are theorized to be greater for those without a physical disability:

H1(additive): Each SES indicator (education, occupational prestige, and income) will all be additive in predicting obesity, and education will be the strongest predictor.

H2(mediation): Physical activity, psychosocial coping resources, and chronic stress exposure will mediate the link between SES and obesity.

3. METHOD

3.1 Sample

The data employed in this research are from a community based study of Miami Dade County residents that included a substantial oversampling of individuals with a self-reported physical disability. Described in detail previously (Turner, Lloyd, and Taylor 2006), a total of 10,000 randomly selected households were screened with respect to gender, age, ethnicity, disability status, and language preference. Using this sampling frame, the study sample was drawn such that there were even numbers of women and men, even numbers of people screened as having a physical disability and those not, and equivalent numbers of the four major ethnic groups comprising more than 90% of all Miami-Dade County residents (non-Hispanic Whites, Cubans, non-Cuban Hispanics, and African Americans). The presence of disability status was established in response to the question: "Do any adults in the household have a physical health condition or physical handicap that has resulted in a change in their daily routine or that limits the kind of or amount of activity they can carry out?" A total of 1,986 interviews were completed in years 2000-2001, with a success rate of 82%. Included were 1,086 adults who screened as having no physical disability and 900 individuals who screened as having a disability. Of the 900 who, within the screening process, were reported by a family member as having activity limitations, only 559 confirmed this status within the actual interview. In all likelihood, this discrepancy arose from differing views regarding the level of activity limitation that defines disability (Turner, Lloyd, and Taylor 2006). This study was determined to be 'Not Human Subjects Research' due to the use of de-identified secondary data, by the Institutional Review Board at Georgia State University and was approved (1/23/2014).

A total of (N=1712) study participants provide valid data across all study variables. The final analytic sample includes 917 females (54%), 354 non-Hispanic Whites (21%), 419 Cuban-Americans (25%), 396 non-Cuban Hispanics (23%), and 543 African-Americans (32%). The sample distribution by physical disability status is 489 confirmed disabled (29%) and 1,223 screened non-disabled (71%). The average age of respondents is 57 years (SD = 17 years; range = 18 - 93 years).

3.2 Measures

3.2.1 Dependent Variable: Obesity

Obesity is operationalized using the Body Mass Index (BMI), one's weight divided by height, which has been used in both national and international research (Guillaume 1999; WHO 2000; Kuczmarski et al. 2000). While some researchers suggest that alternative measures of body mass and body fat should be utilized, e.g. for various race/ethnic groups (Stevens and Nowicki 2003), BMI does serve as a proxy for obesity and is an efficient measure for estimating large-scale group trends in overweight and obesity (Himes 2000; Rogers, Hummer, and Krueger 2003; Stewart 1982). In addition, although BMI does not measure body fat directly, BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry (DXA) (Wang 2004; Mei et al. 2002; Garrow and Webster 1985). Respondents were asked, "About how much do you weigh?" and "How tall are you?" for this measure. Based on the formula supplied by the Centers for Disease Control and Prevention, BMI is measured by the equation: [weight (lbs)/[height (in)]²] x 703. In sum, this formula calculates BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.

According to the Centers for Disease Control and Prevention , the standard weight categories associated with BMI ranges for adults are BMI<18.5 kg/m^2 = Underweight; 18.5 $kg/m^2 \leq$BMI<25.0 kg/m^2 = Normal Weight; 25.0 $kg/m^2 \leq$BMI<30.0 kg/m^2 = Overweight; BMI$\geq$30.0 kg/m^2 = Obese (WHO Expert Committee 1995; WHO 2000; NIH 2000). Using this criteria, a dichotomous BMI measure is constructed. Values are assigned such that BMI Level = 0 if Normal Weight (NW) and BMI Level = 1 if Overweight/Obese (OB). Because only 18 cases met criteria for being underweight, these individuals are not included in this study.

3.2.2 Independent Variables

3.2.2.1 Education

The first independent variable for this investigation is respondent education level. Respondents were asked, "What is the highest grade of school or year of college you successfully completed?" for this

measure. The respondents were then able to select from a year completion range of "0" to "20+" years of education, with the years 13 through 16 specified in the survey range as college years. As with each of the three SES variables, scores for education are standardized in order to maintain consistency in interpretation.

3.2.2.2 Occupational Prestige

The second independent variable for this investigation is the occupational prestige of the job held for the longest period of time by the respondent. The continuous range of possible values includes all numbers between 0 and 100 (Hollingshead 1957). Respondents were asked, "Now I want you to tell me about the job that you held for the longest period of time. What was that job called? What was the job title?" in addition to the question "What kind of work did it involve?" The respondent was then able to write out a response to each of these two questions.

For cases with missing values on the longest held job occupational prestige variable, the values for the current job occupational prestige, if available for these respondents, are imputed. For cases with neither valid responses to longest held job or current job, the values for the most recent job occupational prestige, if available for these respondents, are imputed. As with each of the three SES variables, scores for occupation are standardized in order to maintain consistency in interpretation.

3.2.2.3 Income

The third independent variable for this investigation is household income. For households with only one occupant, personal income is used for total household income. Respondents were asked, "Would you please read to me the number of the category that gives the best estimate of your personal annual income before taxes?" The respondents were then able to select from a range of increasing levels of income. For example, the number 0 represented "no personal income," and the highest number, 15, represented "$135,000 and above." For cases with missing data on personal income at wave 1, wave 2 data values are imputed when available. Next, for remaining respondents who still show unavailable values for personal annual income, a "0" score is imputed for respondents who had answered "No" to the survey question, "Have you ever had paid employment?" and who had answered "No" to the survey

question, “Are you currently receiving income other than from employment?” To construct the household income level measure, respondents were also asked “Using the same categories, would you please tell me the number that gives the best estimate of your total annual household income before taxes.”

For respondents who show unavailable values for the household income question in the wave 1 data, wave 2 data values for household income, if available for these respondents, are imputed. As with each of the three SES variables, scores for income are standardized in order to maintain consistency in interpretation.

3.2.3 Separate Analyses: Physical Disability

Physical disability status is based on responses to: “Earlier someone in your household [or the respondent] told us that you had a condition or physical health problem that limits the kind or amount of activity that you can carry out (such as work, housework, school, recreation, shopping, or participation in social or community activities). I just want to confirm with you now whether that is correct.” Respondents who answered affirmatively are coded as 1 for disability; those who did not are coded as 0.

3.2.4 Demographic and Behavioral Controls

Age is measured in years as a continuous variable. Gender is coded 1 for females and 0 for males (reference group). Race-ethnicity is measured using a set of dummy indicators for non-Hispanic Whites (reference group), Cubans, non-Cuban Hispanics, and African Americans. The cases involving the “other” race-ethnic category are excluded from analysis. Smoker status is measured using a set of dummy indicators for ‘Never a smoker’ (reference group), ‘Former smoker,’ and ‘Current smoker.’

3.2.5 Mediation Variables

3.2.5.1 Physical Activity

A continuous measure for physical activity is constructed based on responses to: “How often do you do strenuous exercise such as running, basketball, aerobics, tennis, swimming, biking, and so on?” The respondent choices were 0= “Never”; 1= “Once a month”; 2= “About twice a month”; 3=“About once a week”; 4=“Three times a week”; 5= “More than three times a week”; 6=“Every day.” A 0=

"Never" score was imputed for respondents who were directed in the survey instrument not to answer this question.

3.2.5.2 Social Support

Perceived social support is measured separately for family and friends using the Provisions of Social Relations Scale, for which evidence of both reliability and construct validity is available (Turner, Frankel, and Levin 1983) and that has been employed in a previous large-scale community study (Turner and Lloyd 1999; Turner and Marino 1994). Items included "Your family [friends] often let you know that they think you are a worthwhile person" and "No matter what happens you know that your family [friends] will always be there for you." Response categories for family support (16 items) were 1 = very true for you to 4 = not at all true for you; responses for friend support (8 items) were 1 = very true for you to 4 = not at all true for you. All responses are coded so that higher values equate to greater support. The continuous measures for family support and friend support are each averages of reported scores of support on the items.

3.2.5.3 Self-Esteem

A subset of Rosenberg's (1979) measure is employed in order to assess self-esteem. Respondents are presented with six items that include statements such as, "You feel that you have a number of good qualities" and "All in all, you are inclined to feel that you are a failure." Response categories range from "strongly agree" to "strongly disagree" on a 5-point scale. All responses are coded so that higher values equate to greater self-esteem. The continuous measure for self-esteem is the average of reported scores of self-esteem on the items.

3.2.5.4 Social Stress

Stress exposure is measured using one indicator of perceived social stress: chronic stress. The chronic stress measure is an adaptation of Wheaton's (1994) scale, modified to better encapsulate the types of stressful experiences older persons are likely to encounter (Turner, Lloyd, and Taylor 2006). This index includes 39 items (0-1 scale; range = 0-39) relating to general experiences, employment/ unemployment, intimate partnerships/no partnerships, children, recreation, and health concerns.

3.3 Plan of Analysis

Preliminary analysis showed no significant mean differences exist on the SES measures between the two BMI categories "overweight though not obese" and "obese;" therefore these two categories are collapsed into a single "overweight/obese" category. Descriptive statistics are provided for study variables by disability status and weight categories (normal weight and overweight/obese) (Table 1). For corresponding significance tests, in instances where the one-tailed p-value has a stronger significance level than the two-tailed p-value, the one-tailed p-value is reported. Second, correlation analysis is provided to assess the bivariate relationships among continuous independent, dependent and mediating variables for respondents with a physical disability (Table 2) and for respondents without a physical disability (Table 3). Logistic regressions are employed in order to assess whether each SES indicator is additive in predicting BMI for respondents with a physical disability (Table 4) and for respondents without a physical disability (Table 5). Models I-III step in each SES factor separately; education in Model I, occupational prestige in Model II, and income in Model III. All three SES indicators are simultaneously entered into Model IV. Model V includes study controls (age, gender, race-ethnicity, smoker status) in order to further assess the independent relationships between the SES factors and BMI. Models VI-IX introduce the mediating variables individually. Sobel tests are used to assess statistical significance of mediation effects (Sobel 1982). There is no indication of a multicollinearity violation regarding the three SES variables (mean VIF=1.33). Analysis showed no significant mean differences exist on the dependent weight variable between missing SES and non-missing SES cases.

4. RESULTS

4.1 Descriptive Statistics

Table 1 provides descriptive statistics for study variables by disability status and weight categories. Beginning with the SES independent variables, at the bivariate level, T-test results indicate that education is linked to obesity among those who identify as *not* having a physical disability. Specifically, those in the "normal" weight category report significantly more education (m=.22) than those in the overweight/obese group (m=.05) (t=2.90, p= .002). However, for those self-identifying as having a physical disability, those in the "normal" weight category do not report significantly more education than those in the overweight/obese group. Regarding occupational prestige, for disabled respondents significant mean differences exist between the normal weight group (m=.04) and the overweight/obese group (m=-.14) (t=1.76, p= .039). Specifically, the disabled normal weight group has higher occupational prestige compared to the disabled overweight/obese group. However, occupational prestige did not vary by weight category for those without a physical disability. For income, results indicate no significant mean differences between the normal weight group and the overweight/obese group for both the disabled respondents and the non-disabled respondents. Together these findings indicate that, at the bivariate level, education is the one SES factor significantly associated with overweight/obesity risk among persons *without* a disability, and occupation is the one SES factor significantly associated with overweight/obesity risk among persons *with* a disability.

Concerning the potential mediating variables, while physical activity was not linked to obesity among those *with* a physical disability, results indicate that the non-disabled normal weight group reports more physical activity (m=1.67) than the non-disabled overweight/obese group (m=1.25) (t=3.60, p= .000). For family support, results indicate that no significant mean differences exist between the normal weight group and the overweight/obese group for both the disabled respondents and the non-disabled respondents. However, for both those with and without a physical disability, those in the normal weight category reported significantly more friend support than those in the overweight/obese category. Specifically, for the disabled respondents, significantly more friend support was reported by the normal

weight group (m=3.40) compared to the overweight/obese group (m=3.24) (t= 1.73, p= .042). For the non-disabled respondents, significantly more friend support was reported by the normal weight group (m= 3.38) compared to the overweight/obese group (m=3.29) (t=1.81, p= .036). Together these findings provide evidence to indicate that physical activity and friend support may be potential mediators between SES and overweight/obesity among persons *without* a disability. These findings also provide evidence to indicate that friend support may serve as a potential mediator between SES and overweight/obesity among persons *with* a disability.

In reference to self-esteem, results demonstrate that the non-disabled normal weight group reported higher self-esteem (m=4.70) than the non-disabled overweight/obese group (m=4.61) (t=2.43, p= .008), but no differences in self-esteem were found across the weight categories among those with a physical disability. Regarding chronic stressors, the non-disabled normal weight group reported fewer chronic stressors (m=3.30) than their non-disabled overweight/obese counterparts (m=4.19) (t=-3.12, p= .001), but no differences in chronic stress were found between normal weight and overweight/obese among those with a physical disability. Together the findings indicate that self-esteem and chronic stress may serve as potential mediators in the relationship between SES and overweight/obesity risk but only among persons *without* a disability.

Concerning the socio-demographic controls, the non-disabled normal weight group is younger (m=53.74) than the non-disabled overweight/obese group (m=55.65) (t= -1.78, p= .038). Results indicate that, among those without a physical disability, males (72%) are more likely than females (63%) to be overweight/obese (χ^2=12.64). Next, statistically significant relationships exist between race-ethnicity and overweight/obesity for both the disabled respondents and the non-disabled respondents. Among those with a physical disability, African Americans (79%) are more likely than Non-Cuban Hispanics (74%), Cubans (70%), and Non-Hispanic Whites (62%) to be overweight/obese (χ^2= 10.44). Likewise for those without a physical disability, African Americans (77%) are more likely than Non-Cuban Hispanics (68%), Cubans (67%), and Non-Hispanic Whites (54%) to be overweight/obese (χ^2=33.64). Finally,

among those with a physical disability, ex-smokers (77%) are more likely than those who have never smoked (74%) and current smokers (60%) to be overweight/obese (χ^2=9.70).

4.2 Correlations

Table 2 provides correlations among study variables for respondents *with* a physical disability; indicating significant bivariate associations between study variables. Based on the two-tailed correlation tests, none of the SES factors are associated with obesity. However, as noted in Table 1 one-tailed T-test results, the disabled normal weight group reported higher occupational prestige (m=.04) compared to the disabled overweight/obese group (m=-.14) (t=1.76, p= .039). Given that there is an expected direction in the relationship between each of the SES factors and obesity, the one-tailed test is a more appropriate test however STATA did not allow a one-tailed correlation test.

Also according to the two-tailed correlation tests, none of the potential mediators are associated with obesity. However, as noted in Table 1 one-tailed T-test results, those in the normal weight category reported significantly more friend support than those in the overweight/obese category (t= 1.73, p= .042). Regarding the relationships between the mediators and the SES factors, occupation and friend support are significant ($p \leq .05$); and occupation and self-esteem are significant ($p \leq .001$). Income and physical activity are significant ($p \leq .01$); and income and chronic stress are significant ($p \leq .001$). Together these findings provide evidence to indicate that friend support may be a potential mediator between SES and overweight/obesity among persons *with* a physical disability.

Table 3 provides correlations among study variables for respondents *without* a physical disability. Beginning with the relationships between each SES factor and obesity, only education has a significant association with obesity in the two-tailed correlation tests ($p \leq .01$). Regarding the relationships between the mediators and obesity, significantly associated with obesity are physical activity ($p \leq .001$); self-esteem ($p \leq .05$); and chronic stress ($p \leq .01$). Although friend support is not significantly associated with obesity in the two-tailed correlation test, as noted in Table 1 one-tailed T-test results, significantly more friend support was reported by the normal weight group (m= 3.38) compared to the overweight/obese group (m=3.29) (t=1.81, p= .036). Regarding the relationships between the mediators and the SES factors,

education is significantly associated with physical activity (p≤ .001); friend support (p≤ .001); self-esteem (p≤ .05); and chronic stress (p≤ .05). Occupation is significantly associated with physical activity (p≤ .001); family support (p≤ .001); friend support (p≤ .01); self-esteem (p≤ .001); and chronic stress (p≤ .001). Finally, income is significantly associated with physical activity (p≤ .001); family support (p≤ .05); friend support (p≤ .001); self-esteem (p≤ .001); and chronic stress (p≤ .001). Together these findings provide evidence to indicate that physical activity; friend support; self-esteem; and chronic stress may be potential mediators between SES and overweight/obesity among persons *without* a disability.

4.3 Multivariate Analysis

Table 4 presents nine logistic regression models predicting overweight/obesity among those *with* a physical disability. Models I-III step in each SES factor separately. While none of the SES factors appear to be significant, STATA produced results based on two-tailed tests. However, comparing the observed t-statistic for each SES indicator to a critical t-statistic in a t-distribution using a one-tailed test indicates that occupation (though not education nor income) is indeed significantly associated with overweight/obesity in a bivariate regression at the .05 level, which is consistent with the one-tailed t-test results.

Model IV includes all three SES indicators simultaneously. Occupational prestige is independently associated with overweight/obesity (b=-0.30, p= .015). Therefore on average and net of education and income, for each standard deviation increase in occupational prestige, the log odds of being overweight/obese (versus normal weight) decreases by .30. After adjusting for study controls (Model V), the relationship between occupational prestige and obesity is partially explained (1 - .22/.30 = 27% reduction). Also shown in Model V, African Americans are at greater risk for obesity, while current smokers have a lower risk for obesity. Other than friend support, the potential mediating variables included in the analysis in Models VI-IX (physical activity; family support; self-esteem; and chronic stressors) were not significantly associated with overweight/obesity and thus cannot mediate the relationship between occupational prestige and overweight/obesity. The potential mediating variable friend support is not significant in Model VII.

Table 5 presents logistic regressions predicting overweight/obesity among those *without* a physical disability. Education is independently associated with overweight/obesity (Model IV, b=-0.22, p= .003). On average and net of occupational prestige and income, for each standard deviation increase in education, the log odds of being overweight/obese (versus normal weight) decreases by .22. Income is also associated with overweight/obesity, however this is only after controlling for education and occupational prestige and the direction of the relationship is contrary to what was predicted (b=0.14, p= .039). Specifically, on average and net of education and occupational prestige, for each standard deviation increase in income, the log odds of being overweight/obese (versus normal weight) increases by .14. Thus income is only significant in predicting overweight/obesity for those without a disability after controlling for education and occupational prestige.

Adjusting for sociodemographic controls, approximately one-third of the relationship between education and obesity is explained, however the positive relationship between income and obesity remains largely unchanged after controlling for sociodemographics and potential mediators across Models V-VIII. Evidence of partial mediation (1 - .14/.17 = 18%) pertaining to income occurs when chronic stress is included in the final Model IX (Sobel = 2.63, p=.009). Chronic stress is significant (b=.05, p= .000); as expected this coefficient is positive. This coefficient depicts a positive relationship between chronic stress and overweight/obesity. On average and net of the other variables in this model, for each unit increase in chronic stress, the log odds of being overweight/obese (versus normal weight) increases by .05. Together these findings underscore the importance of education and income for overweight/obesity risk among those without a physical disability. Specifically, among those without a physical disability, more education is protective of overweight/obesity risk and higher income is a risk factor for overweight/obesity. In addition, for those without a physical disability, the relationship between SES (i.e. income) and overweight/obesity is partially mediated by chronic stress.

5. DISCUSSION

This study tested two research hypotheses regarding the relationship between SES and overweight/obesity risk. Analyses were conducted separately for those with and without a physical disability as the benefits from higher SES on obesity were theorized to be greater for those without a physical disability. The first hypothesis stated that each SES indicator (education, occupational prestige, and income) will all be additive in predicting overweight/obesity, and education will be the strongest predictor.

Among those *with* a physical disability, results indicated that occupational prestige is independently negatively associated with overweight/obesity. As one possible explanation for this result, persons *with* a physical disability in higher prestige occupations may aim to be particularly health-conscious with their weight due to medical reasons pertaining to their physical limitation. Therefore persons *with* a physical disability may more fully utilize possible health-related benefits of higher prestige occupations such as available healthy meal/dining options.

For those *without* a physical disability, results indicated that education is independently negatively associated with overweight/obesity. This result is consistent with prior empirical research studies that have attempted to disentangle the respective relationships between the three primary SES indicators and adult obesity (Faeh, Braun, and Bopp 2011; Nocon, Keil, and Willich 2007). As formal education level increases, knowledge and skills to acquire accurate information pertaining to healthy diet, nutrition and exercise may increase. Higher levels of formal education may also produce increased critical thinking skills and consumer skepticism regarding advertising and marketing techniques used to sell food and beverages, which may be protective against obesity. Also among those *without* a physical disability, income is independently associated with overweight/obesity net of other SES factors, however the direction of the relationship is contrary to what was predicted. As a possible explanation for this finding, discretionary funds from a higher income may allow persons to engage (or indulge) in unhealthy behaviors that involve excessive calorie consumption (e.g., excessive alcohol consumption, excessive food intake, etc.).

In sum for the first hypothesis, contrary to those *with* a physical disability, education is independently associated with overweight/obesity for those *without* a physical disability. Also contrary to those *with* a physical disability, occupational prestige is not independently associated with overweight/obesity for those *without* a physical disability. Additionally contrary to those *with* a physical disability, income is independently associated with overweight/obesity for those *without* a physical disability. The contrasting results pertaining to education may be due to the notion that the knowledge and skills which would enable a physically active lifestyle may essentially be limited to persons *without* a physical limitation. The different results regarding occupational prestige may be due to the notion that disabled persons may more fully utilize possible health-related benefits of higher prestige occupations such as available healthy meal options. Regarding the differing findings pertaining to income, persons *with* a physical disability may need to allocate a substantial portion of their income to medical expenses incurred related to their condition in comparison to individuals *without* a physical disability. Therefore persons *with* a physical disability may not allocate funds from a higher income for engagement in unhealthy behaviors that involve excessive calorie consumption.

The second hypothesis stated that physical activity, psychosocial coping resources, and chronic stress exposure will mediate the link between SES and obesity. However, among those *with* a physical disability, results indicated that the relationship between occupational prestige and overweight/obesity was partially explained by race-ethnicity status and smoker status. Specifically, African Americans are at greater risk for obesity, while current smokers have a lower risk for obesity. The direct effect of occupational prestige and overweight/obesity remained largely unchanged after controlling for physical activity, psychosocial coping resources, and chronic stress exposure. Thus, among those with a physical disability, higher occupational prestige provides some protective effect for obesity risk. However, further research is needed to identify the potential linking mechanisms between the occupational prestige - obesity link among those with a physical disability.

Among those *without* a physical disability, the results underscored the importance of education and income for overweight/obesity risk. Specifically, more education is protective of overweight/obesity

risk and higher income is a risk factor for overweight/obesity. The findings also indicated that for those without a physical disability, the relationship between income and overweight/obesity is partially mediated by chronic stress. As a possible rationale, persons without a physical disability may be attempting to reduce their chronic stress levels by using funds from their income to engage in unhealthy behaviors that involve excessive calorie consumption (e.g., excessive alcohol consumption, excessive food intake, etc.). However, due to the considerably small size of this mediation effect (18%) further research is needed to identify the potential linking mechanisms between income and obesity among those without a physical disability.

6. LIMITATIONS AND CONCLUSION

Several limitations to the current investigation are notable. Firstly, this study is limited by the cross-sectional nature of the data. Therefore no claims are made regarding the nature or direction of causality. Secondly, BMI is used to operationalize obesity as opposed to alternative measures of body mass and body fat (e.g., waist circumference). However, BMI is used in both national and international research (Guillaume 1999; WHO 2000; Kuczmarski et al. 2000) and is an effective measure for evaluating large-scale group trends in overweight and obesity (Himes 2000; Rogers, Hummer, and Krueger 2003; Stewart 1982).

Despite these limitations, the present study builds on prior research in several paramount ways. Specifically, this study advances current knowledge by attempting to disentangle the relationship between adult obesity and the three primary indicators of SES (education level, occupational prestige, household income). In attempts to identify socially modifiable factors that may serve as mediators in the relationship between SES and obesity, this study also examines whether physical activity, psychosocial coping resources (social support, self-esteem), and chronic stress exposure attenuate the SES – obesity relationship. Lastly, as this investigation employs data that strategically oversampled persons with a physical disability, this study additionally builds on prior work by conducting analyses separately for those with and without a physical disability. Results from this study can be generalized to the community from which the sample was drawn. However, the total sample percentages of 'normal weight' respondents (31.37%) and 'overweight/obese' (68.63%) are consistent with national research (National Center for Health Statistics 2010).

In sum, the findings reveal that contrary to those with a physical disability, education is independently associated with overweight/obesity for those without a physical disability. Also opposed to those with a physical disability, occupational prestige is not independently associated with overweight/obesity for those without a physical disability. Additionally in contrast to those with a physical disability, income is independently associated with overweight/obesity for those without a physical disability. Among those with a physical disability, the relationship between occupational prestige

and overweight/obesity is partially explained by race-ethnicity status and smoker status. Specifically, African Americans are at greater risk for obesity, while current smokers are less likely to be overweight/obese. Thus further research investigating occupational prestige, race-ethnicity, smoking and obesity among those with a physical disability is warranted.

Among those without a physical disability, the results underscore the importance of education and income for overweight/obesity risk. Specifically, more education is protective of overweight/obesity risk and higher income is a risk factor for overweight/obesity. The relationship between income and overweight/obesity is partially mediated by chronic stress for those without a physical disability, however the small size of this mediation effect (18%) warrants further research to identify the potential linking mechanisms between income and obesity among those without a physical disability. Future studies should consider whether particular stress indicators may be more strongly associated with certain SES levels than others. Lastly, future studies can consider incorporating nutrition/diet related variables as controls or as possible mediators, as well as various indicators of physical activity, in the investigation of the potential linking mechanisms between SES factors and obesity among those with and without a physical disability.

Table 1. Variable and Sample Descriptives

	Total	Physical Disability			No Physical Disability		
		Normal 18.5≤ BMI<25 N= 136, 27.81%	Overweight/Obese[1] BMI≥25 N= 353, 72.19%	Sig. Test	Normal 18.5≤ BMI<25 N= 401, 32.79%	Overweight/Obese BMI≥25 N= 822, 67.21%	Sig. Test
SES							
Education[2]	.00 (1.00)	-.31 (1.14)	-.24 (.98)	t= -.62	.22 (.96)	.05 (.97)	t=2.90**
Occupational Prestige[3]	.00 (1.00)	.04 (1.00)	-.14 (.99)	t=1.76*	.09 (1.02)	.01 (.99)	t=1.27
Income[4]	.00 (1.00)	-.30 (.89)	-.29 (.92)	t= -.11	.08 (1.02)	.13 (1.01)	t=-.83
Mediators							
Physical Activity[5]	1.09 (1.83)	.43 (1.29)	.30 (1.06)	t=1.15	1.67 (2.08)	1.25 (1.90)	t=3.60***
Family Support[6]	3.46 (.57)	3.43 (.61)	3.42 (.62)	t=.16	3.49 (.58)	3.47 (.54)	t=.53
Friend Support[7]	3.31 (.83)	3.40 (.84)	3.24 (.93)	t= 1.73*	3.38 (.79)	3.29 (.81)	t=1.81*
Self-Esteem[8]	4.61 (.61)	4.59 (.57)	4.52 (.61)	t=1.17	4.70 (.53)	4.61 (.64)	t=2.43**
Chronic Stressors[9]	4.08 (4.81)	4.24 (4.90)	4.63 (5.17)	t= -.76	3.30 (4.32)	4.19 (4.82)	t=-3.12***
Socio-Demographics							
Age[10]	56.71 (17.19)	62.40 (17.52)	60.36 (13.89)	t=1.35	53.74 (20.53)	55.65 (16.14)	t= -1.78*
Males	46.44 (795)	29.25 (62)	70.75 (150)	χ^2= .38	27.79 (162)	72.21 (421)	χ^2=12.64***
Females	53.56 (917)	26.71 (74)	73.29 (203)		37.34 (239)	62.66 (401)	
Non-Hispanic White	20.68 (354)	38.32 (41)	61.68 (66)	χ^2= 10.44*	46.15 (114)	53.85 (133)	χ^2=33.64***
Cuban	24.47 (419)	30.48 (32)	69.52 (73)		32.80 (103)	67.20 (211)	
Non-Cuban Hispanic	23.13 (396)	26.39 (19)	73.61 (53)		32.41 (105)	67.59 (219)	
African American	31.72 (543)	21.46 (44)	78.54 (161)		23.37 (79)	76.63 (259)	

Never Smoked	57.77 (989)	25.94 (62)	74.06 (177)	χ^2=9.70**	34.53 (259)	65.47 (491)	χ^2=4.36
Ex-Smoker	26.52 (454)	22.88 (35)	77.12 (118)		27.91 (84)	72.09 (217)	
Current Smoker	15.71 (269)	40.21 (39)	59.79 (58)		33.72 (58)	66.28 (114)	

Notes: N=1712. Shown are means and percentages with SD and n's in ( ), respectively, comparing those who self-confirm a physical disability to those without a physical disability. Significance tests compare those who are normal weight to those who are overweight/obese.

[1] Overweight/Obesity measure: BMI (Body Mass Index). Total sample normal weight: 31.37%(n= 537). Total sample overweight/obese: 68.63%(n= 1,175).

[2] Standardized formal education measure (range = -2.84 - 1.88).

[3] Standardized occupational prestige measure (range = -1.59 - 2.00).

[4] Standardized household income measure (range = -1.53 - 2.60).

[5] Range = 0 - 6.

[6] Range = .31 - 4.

[7] Range = .25 - 4.

[8] Range = 1.67 - 5.

[9] Range = 0 - 28.

[10] Range = 18 - 93.

* p≤ 0.05; ** p≤ 0.01; *** p≤ 0.001.

Table 2. Correlations – Physical Disability

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1.Overweight/Obesity	1								
2. Education	.03	1							
3. Occupational Prestige	-.08	.46***	1						
4. Income	.01	.25***	.42***	1					
5. Physical Activity	-.05	.08	.01	.11**	1				
6. Family Support	-.01	-.02	-.03	.07	-.04	1			
7. Friend Support	-.08	.04	.09*	.08	-.06	.26***	1		
8. Self-Esteem	-.05	.07	.18***	.06	.04	.39***	.26***	1	
9. Chronic Stressors	.03	.02	.04	.21***	.04	-.30***	-.09*	-.15***	1

Notes: N=1712. Shown are two-tailed correlations between study variables.

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Table 3. Correlations – No Physical Disability

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1.Overweight/Obesity	1								
2. Education	-.08**	1							
3. Occupational Prestige	-.04	.45***	1						
4. Income	.02	.35***	.44***	1					
5. Physical Activity	-.10***	.19***	.12***	.18***	1				
6. Family Support	-.02	.05	.10***	.07*	-.04	1			
7. Friend Support	-.05	.11***	.08**	.09***	.00	.32***	1		
8. Self-Esteem	-.07*	.06*	.09***	.09***	.02	.48***	.28***	1	
9. Chronic Stressors	.09**	.06*	.12***	.15***	.00	-.17***	-.02	.01	1

Notes: N=1712. Shown are two-tailed correlations between study variables.

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Table 4. Logistic Regressions Predicting Overweight/Obesity among those with a *Physical Disability*

	I	II	III	IV	V	VI	VII	VIII	IX
Education	.06 (.10)			.17 (.11)	.13 (.12)	.15 (.12)	.13 (.12)	.13 (.12)	.14 (.12)
Occupational Prestige		-.18 (.10)		-.30* (.12)	-.22 (.13)	-.24 (.13)	-.20 (.13)	-.19 (.13)	-.22 (.13)
Income			.01 (.11)	.10 (.12)	.12 (.13)	.14 (.13)	.14 (.13)	.12 (.13)	.10 (.13)
Sociodemographic Controls									
Age					-.01 (.01)	-.02 (.01)	-.01 (.01)	-.01 (.01)	-.01 (.01)
Female[1]					-.03 (.22)	-.07 (.22)	.02 (.23)	-.04 (.22)	-.05 (.22)
Cuban[2]					.43 (.31)	.48 (.32)	.38 (.32)	.42 (.31)	.42 (.31)
Non-Cuban Hispanic[2]					.57 (.36)	.56 (.36)	.49 (.36)	.55 (.36)	.54 (.36)
African American[2]					.89** (.29)	.91** (.29)	.94** (.29)	.92** (.29)	.90** (.29)
Ex-Smoker[3]					.24 (.26)	.21 (.26)	.25 (.26)	.25 (.26)	.23 (.26)
Current Smoker[3]					-.84** (.28)	-.88** (.28)	-.88** (.28)	-.85** (.28)	-.85** (.28)
Mediators									
Physical Activity						-.16 (.09)			
Family Support							-.07 (.18)		
Friend Support							-.24 (.13)		
Self-Esteem								-.24 (.19)	
Chronic Stressors									.01 (.02)

Notes: N=1712. Logistic regression coefficients shown with standard errors in ( ). [1]Reference group: Males [2]Reference group: Non-Hispanic Whites [3]Reference group: 'Never a smoker'

* p<0.05; ** p<0.01; *** p<0.001.

Table 5. Logistic Regressions Predicting Overweight/Obesity among those with *No Physical Disability*

	I	II	III	IV	V	VI	VII	VIII	IX
Education	-.19** (.06)			-.22** (.07)	-.14 (.08)	-.12 (.08)	-.13 (.08)	-.13 (.08)	-.12 (.08)
Occupational Prestige		-.08 (.06)		-.05 (.07)	-.03 (.08)	-.03 (.08)	-.03 (.08)	-.02 (.08)	-.06 (.08)
Income			.05 (.06)	.14* (.07)	.17* (.07)	.18* (.07)	.17* (.07)	.18* (.07)	.14 (.07)
Sociodemographic Controls									
Age					.01* (.00)	.01 (.00)	.01* (.00)	.01* (.00)	.01* (.00)
Female[1]					-.43** (.13)	-.50*** (.13)	-.41** (.13)	-.43** (.13)	-.51*** (.13)
Cuban[2]					.73*** (.19)	.70*** (.19)	.71*** (.19)	.68*** (.19)	.72*** (.19)
Non-Cuban Hispanic[2]					.83*** (.20)	.81*** (.20)	.79*** (.20)	.77*** (.20)	.82*** (.20)
African American[2]					1.16*** (.19)	1.13*** (.19)	1.18*** (.19)	1.22*** (.19)	1.13*** (.19)
Ex-Smoker[3]					.29 (.16)	.28 (.16)	.31 (.16)	.31 (.16)	.24 (.17)
Current Smoker[3]					-.05 (.19)	-.05 (.19)	-.04 (.19)	-.01 (.19)	-.13 (.19)
Mediators									
Physical Activity						-.11** (.03)			
Family Support							-.08 (.12)		
Friend Support							-.12 (.09)		
Self-Esteem								-.35** (.11)	
Chronic Stressors									.05*** (.02)

Notes: N=1712. Logistic regression coefficients shown with standard errors in ( ). [1]Reference group: Males [2]Reference group: Non-Hispanic Whites [3]Reference group: 'Never a smoker'

* p<0.05; ** p<0.01; *** p<0.001.

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