The Association Between Marital Conflict and BMI Among African American Married Couples

by

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Abstract

Research has repeatedly noted the link between marriage and weight gain, but to date, there has been no satisfactory explanation for those findings. This dyadic study of African American married couples examines one specific process, marital conflict, and its association with subsequent increases in Body Mass Index (BMI). No direct effects were found, but results showed one significant transactional effect – an association between husbands' reports of marital conflict at the first wave of the study and the wives' increase in BMI by Wave 2. The finding of a transactional effect suggests the importance of using a dyadic study design in future research of marital processes and BMI.

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INTRODUCTION

As the obesity epidemic rapidly spreads across America (Slentz et al., 2004), obesity-related illnesses such as heart disease, diabetes, and high blood pressure are cited as the combined number one cause of death in America (Flegal, Graubard, Williamson, & Gail, 2007). The Centers for Disease Control (2009) place the annual price tag of obesity at $147 billion and growing. Within the past three decades, the prevalence of obesity in America has more than doubled, an increase that disproportionately affects the African American population, with non-Hispanic blacks having a 51% greater prevalence of obesity than their non-Hispanic white counterparts (Centers for Disease Control & Prevention [CDC], 2009; Kuminyaka, 1993). The increased rate of obesity and obesity-related disease is only one of the health disparities between African Americans and European Americans, part of a grim picture of greater illness and higher risk of morbidity among African Americans (Ferraro & Farmer, 1996).

The physiological explanations for obesity are clear: sedentary lifestyles, genetic tendencies to weight gain, and simple arithmetic (too many calories in minus too few calories out) (Jacobson, Torgerson, Sjostrom, & Bouchard, 2006; Slentz et al., 2004), but researchers maintain the root cause of the epidemic is still unknown (Jeffery & Utter, 2003). As for obesity in the African American population, studies have examined a range of explanations from the behavioral, such as lower rates of physical activity (Carpenter et al., 1998; Pereira et al., 1999) and higher caloric intake (Carpenter et al.), to the cultural,

such as less concern over body image and less motivation to lose weight (Kumanyika, 1993). Results of obesity research in general bear out the belief that to some extent, obesity is a social and cultural condition (Sobal, 2001). Attitudes, income, and education levels are all predictors for obesity (Kuczmarski, 1992; Kumanyika, 1993; Sobal, 2001). All of these factors are of interest to health professionals and sociologists. But there is another group that has a stake in exploring the causes of obesity – marriage researchers. Marriage has a surprising and counterintuitive connection with obesity. Though marriage has been shown to protect and benefit health (Kiecolt-Glaser & Newton, 2001; Renne, 1971), it has also been linked to weight gain. Studies have shown that a change in marital status leads to a change in weight, with entry into marriage typically leading to a weight increase and exit out of marriage to a weight decrease (Wood, Goesling, & Avellar, 2007; Lee et al., 2005; Sobal, Rauschenbach, & Frongillo, 2003), and married people, as a whole, weigh more than their unmarried counterparts (Jeffery & Rick, 2002). A similar study also found that becoming married was associated with major weight gain in African American men and women (Kahn & Williamson, 1991). Kahn, Williamson, and Stevens (1991) found that African American women who became married had greater weight gain during a ten year period than did African American women who stayed married or whose marriages ended, and that African American women typically gained more than European American women. Moreover, married African American women, on average, weigh more than married European American women.

Researchers have examined some of the potential influences on the weight change associated with marriage. The increase in "shared meals" may be a factor, as more calories are consumed by individuals who eat with others, findings not separated by racial

or ethnic categories (Stoebele & DeCastro, 2004). Another contributing element may be the sacrifice of personal exercise to allow more time for commitment to marriage (Wood et al., 2007). Income and education are two demographic factors linked to obesity (Sarlio-Lahteenkorva & Lahelma, 1999), and African Americans, with incomes sixty percent lower and college graduation rates roughly half that of European-Americans (US Bureau of the Census, 1998), might be expected to show higher rates of obesity based on demographics alone. These factors, however, are compounded in marriage, with partner's income and education linked to lower or higher BMI in the spouse (Merkus, Mathus-Vliegen, Broekhoff, & Heijnen, 1995). One area that has not been researched, either among European Americans or African Americans, is the influence of marital processes, particularly as measured by marital conflict, on weight change.

Despite the lack of research on the influence of marital conflict on BMI, numerous studies have identified other negative health consequences of conflict in marriage (Choi & Marks, 2008; Dopp, Miller, Myers, & Fahey, 2000; Kiecolt-Glaser et al., 1993, 2005; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Malarkey, Kiecolt-Glaser, Pearl, & Glaser, 1994; Miller, Dopp, Myers, Stevens, & Fahey, 1999; Robles & Kiecolt-Glaser, 2003). Marital conflict has been linked to unhealthy changes in blood pressure, cortisol levels, heart rate, and immune function (Miller et al., 1999). Researchers have suggested a marriage high in conflict could pose a risk for negative health outcomes in the long-term (Kiecolt-Glaser et al., 2002; Robles & Kiecolt-Glaser, 2003). The implications of this may be more serious for African Americans, with 18% of African American husbands in one study reporting major conflict in the early years of

marriage, compared to 10% of European American husbands in the same study (Mackey & O'Brien, 1998).

African Americans face an additional challenge to physical and psychological health in the pervasive presence of personal and institutional discrimination. The resulting mundane extreme environmental stress (M.E.E.S.), a pressure that is at once commonplace, destructive, and enveloping, has been linked to both unhealthy cardiovascular changes and emotional reactivity in African Americans (Carroll, 1998; Williams & Williams-Morris, 2000). Depressive symptoms have been associated with discriminatory encounters, experiences African Americans are five times more likely to have than European Americans (Ren, Amick, & Williams, 1999). Some researchers have suggested the oppression of societal racism and the resulting attack on self-concept may explain, in part, the more confrontational conflict style of African American males in their family interactions (Mackey & O'Brien, 1998; Williams & Williams-Morris, 2000). Choi and Marks (2008) found marital conflict and depressive symptoms produced a positive feedback loop, with increased psychological distress leading to marital conflict, which in turn produced more depressive symptoms, findings that were not separated by race or ethnicity.

Whatever stressors and influences may be involved, evidence indicates African American marriages score lower in satisfaction and happiness and higher in conflict than European American marriages (Broman, 1993, 2005; Bulanda & Brown, 2007; Dixon, 2009; Mackey & O'Brien, 1998; Orbuch, Veroff, Hassan, & Horrocks, 2002; Renne, 1971). Additionally, research shows that African Americans are the population most affected by the obesity epidemic (CDC, 2009), and suffer from poorer health and higher

rates of chronic diseases, many of them obesity-related, than European Americans (Carpenter, et al., 1998; Ferraro & Farmer, 1996; Williams, Neighbors, & Jackson, 2003).

The goal of the current study is to investigate the link between marriage and obesity in African Americans. To accomplish this, the study will explore two potential pathways through which marriage may affect obesity. The first pathway is the effect a partner has on an individual. Studies show that demographic factors linked to obesity, like income and education levels, may influence not only the individual but the spouse (Merkus, et al., 1995; Sarlio-Lahteenkorva & Lahelma, 1999). Therefore, it is not just the status of being married that affects a person's health. In choosing a partner, one is also choosing a lifelong health influence, for better or for worse (Burman & Margolin, 1992). As previously noted, income and education levels are lower among African Americans, making the partner effect of particular interest in this population.

The second pathway to explore is the effect of marital conflict on weight change. Conventional wisdom, expressed by comedians and popular fiction, as well as by some researchers (Jeffery & Rick, 2002), is that married people "let themselves go" once a match is secured and they no longer feel the pressure of being "on the market." This simplistic answer, however, may be countered by the numbers of married people who do not gain weight, or at least do not gain more than can be ascribed to the slowing metabolisms of increasing age (Smith, 2006). What, then, is going on? Is there a social/emotional component to the weight gain of married people that "outweighs" the healthier lifestyle influence of marriage? If marriage is consistently linked to weight gain, could there be specific processes within a marriage that encourage obesity? This study proposes that the stress of marital conflict may affect changes in BMI, and given

the higher incidence of both obesity and marital conflict among African Americans, will examine those influences among that population.

The mechanics of such an influence may be examined in future studies. Whether weight change is the effect of poor health choices (comfort eating after a fight, sedentary escapes from a disapproving spouse) or physiological responses (heightened cortisol levels inducing a tendency to put on weight) will not be addressed in the present study. The current study will focus solely on establishing a potential link between marital conflict and weight, as expressed in Body Mass Index (BMI), among African American couples. The groundwork is laid – the link between marriage and weight has been verified numerous times. It is time to open the research to specific processes and influences, to see just what it is about marriage that contributes to the development of obesity.

Insights into a link between marital conflict and obesity could benefit African Americans, and point to potential avenues of research among a broader U.S. population. Additionally, a link between marital conflict and obesity could help shape priorities in public health spending. If marital conflict does increase an individual's BMI, public policy aimed at reducing obesity among African Americans should include services that might reduce marital conflict, whether through counseling, education, or other support systems. The growing epidemic of obesity, and the price paid by African Americans and the nation in health costs, loss of life, and emotional suffering, can only be stopped if the root causes are identified and examined. It is time to look at marital conflict as a possible factor in the African American marriage—BMI connection.

LITERATURE REVIEW

Obesity

Obesity has been characterized as an "extensive" dilemma (Kuczmarski, 1992), a "major public health problem" (Allison, Fontaine, Monson, Stevens, & VanItalie, 1999), and an "epidemic" with an unknown cause (French, Story, & Jeffery, 2001; Jeffery & Utter, 2003). This condition affects millions and has serious and painful implications. In a comparison of six U.S. studies, Allison et al. concludes that obesity is responsible for 280,000 deaths each year and more than 80% of the deaths determined to be obesity-related occurred in those with a BMI of 30 kg/m^2 or more. Additionally, the Centers for Disease Control (2009) estimate medical costs attributed to obesity to be nearly $147 billion per year, much of it covered by Medicare and Medicaid. The CDC reports significant costs to individuals, as well, with the obese spending about 40% more for health care each year than average-weight persons.

The Centers for Disease Control and Prevention (2009) identified several negative outcomes associated with obesity: greater risk of premature death, higher health-care costs, and reduced quality of life. The report cites coronary heart disease, hypertension, stroke, type 2 diabetes, and certain cancers as common causes of death related to obesity. Flegal et al. (2007) confirm that the obese are more likely to die from cardiovascular disease, some cancers, or from a combination of diabetes/kidney disease.

The physical and financial toll is only part of the story. The psychological and emotional price of obesity has startled even the researchers who measure it (Rand & Macgregor, 1991). Surveying 47 subjects who had successfully lost 100 pounds and kept it off for three years or more, Rand and Macgregor (1991) asked participants to choose between obesity and a variety of other conditions. Most studies using this method of questioning found a large majority of respondents chose the disability they already suffered from, but this was not the case with obesity. When the choices were obesity or deafness, diabetes, or heart disease, 100% of those familiar with obesity chose the alternative disease. Given a choice between being an obese multimillionaire or being of normal weight without wealth, not one patient expressed a preference for the wealth. Clearly, obesity causes emotional pain that goes beyond loss of physical function and risk of morbidity.

According to the Centers for Disease Control and Prevention (2009), those who are obese have a body mass index (BMI) greater than 30, calculated as (weight [kg] / height [m^2]). Kuczmarski (1992) calculated the BMI for males and females using the National Center for Health Statistics definitions of "overweight" and "severe overweight." Males are considered overweight when their BMI is ≥ 27.8 and are severe overweight when their BMI is ≥ 31.1. Women are considered overweight when their BMI is ≥ 27.3 and are severe overweight when their BMI is ≥ 32.3. Kuczmarski also identified the BMI for those morbidly obese as approximately ≥ 39.0 or 40.0. Based on these definitions, he categorizes the United States population as follows: "~ 13 million persons have a BMI of 30.0 – 34.9; ~ 4 million persons have a BMI of 35.0 – 39.9; 1 million persons have a BMI of 40.0 – 44.9; and ~ 558,000 have a BMI of ≥45" (p. 498S).

The Centers for Disease Control and Prevention (2009) survey found 35.7% of African Americans are obese, compared to 23.7 % of European Americans and 28.7% of Hispanic Americans. They conclude that African Americans have a 51% greater incidence of obesity and Hispanic-Americans have a 21% greater incidence of obesity when compared with European Americans.

Health Benefits of Marriage

Studies confirm that the married are emotionally and physically healthier and live longer than the unmarried (Lillard & Waite, 1995; Simon, 2002; Waldron, Weiss, & Hughes, 1997). Simon (2002) found clear emotional benefits of marriage for both men and women, though the benefits took different forms – lower depression for women, lower rates of substance abuse for men. Paradoxically, obesity – with all of its detrimental health effects – has also been clearly linked to marriage (Jeffery & Rick, 2002; Sobal, Rauschenbach, & Frongillo, 1992; Umberson et al., 2009). It is counterintuitive to think an institution that has been shown to improve overall health would also play a part in weight gain, which is widely seen as a health hazard. Smith (2006) suggests that men, younger adults, and those with low levels of education are specifically at risk for obesity within marriage, yet the married have lower morbidity and mortality rates even despite increased risks due to lower levels of education (Trovato & Lauris, 1989; Goldman, 1993). Somehow, even with an increase in BMI, married people are living longer and healthier than their single counterparts. Lipowicz et al. (2002) suggest three possible reasons why this paradox may exist: (1) though obesity is a risk factor, the quality of life achieved in marriage extends the life span, (2) the unhealthy habits (drinking and smoking) prevalent among the unmarried may reduce their life

spans, and (3) married couples have more resources and therefore can economically afford a healthier lifestyle. It might reasonably be expected that the economic factors protecting married people would be of less benefit to African American couples, whose incomes are on average 60% lower than European Americans', and who typically have lower levels of education than their European American counterparts (US Bureau of the Census, 1998).

Waldron, Hughes, and Brooks (1996) found that marriage provides a social support that encourages better health. They propose that the marriage relationship may increase each partner's internal motivation to remain healthy, and Burke, Giangiulio, Gillam, Beilin, Houghton, and Milligan (1999) posit that the social support couples enjoy facilitate weight loss (lower BMI). The infrastructure of the marital relationship can encourage healthier eating habits and create a positive environment for change (Burke et al., 1999; Kemmer, Anderson, & Marshall, 1998; Anderson, Marshall, & Lea, 2004). This very relationship, however, can become detrimental when dealing with temptation. Fattening or unhealthy foods (Kemmer et al., 1998) or alcoholic drinks (Anderson et al., 2004) an individual can resist when alone may become irresistible when one partner partakes. Furthermore, encouragement of healthy habits breaks down when there is a significant level of marital conflict – in such marriages, health monitoring behavior is perceived as criticism, and becomes an additional marital stressor (Fekete et al., 2006; Sandberg et al., 2009).

Marriage-BMI Link

Jeffery and Rick (2002) suggest that couples experience a considerable two-year weight gain when they marry and a major two-year weight loss when they divorce;

however, Smith (2006) did not find that exiting a marriage significantly affected BMI. There is also an increase in BMI among women who remarry (Lee et al., 2005). Lipowicz et al. (2002) found a significant relationship between marital status and BMI as long as demographic variables, such as income and education, were excluded. When these variables were controlled, there was no relationship between marital status and BMI for women, but the relationship persisted for men. For men 25-60 years old, marital status was the second most important factor influencing BMI (after age).

Researchers have proposed a variety of theories to explain the link between marriage and BMI. Umberson et al. (2009) found that marital transitions instead of marital status *per se* significantly affect weight change. They suggest that leaving marriage is a greater trigger than entering marriage, and that widowhood signals a permanent weight loss contrasted to the temporary weight change associated with divorce. Jeffery and Rick (2002) suggest that since marriage is desirable, the divorced may lose weight in order to increase their prospects for marriage; conversely, the married may gain weight because the motivation to attract a partner is no longer a factor. Obesity deters or limits opportunities for marriage; the biggest difference in BMI among younger adults is between the never married (higher BMI) compared to those who are married or cohabitating (Lipowicz et al., 2002; Smith 2006; Sobal et al., 1992). Sobal et al. (1992) use social role theory to examine obesity within marriage. They suggest that assuming the important role of spouse can impact weight gain through diet, exercise, and social values. Couples eat most of their meals together, and assuming the marital role encourages regular meals (Sobal, 2001). These stable eating patterns are conducive to weight gain, as eating with others increases the amount consumed (Stoebele & DeCastro, 2004).

Spouses tend to consume more calories because of the marital role obligation to eat together (Sobal, 2001). Married men who fulfill their spousal role eat often and abundantly; hence, they are more obese than their unmarried counterparts (Sobal et al., 1992). The time commitment of a marital role can also limit physical activity; personal exercise time is often sacrificed for marital obligations (Wood et al., 2007).

None of these theories address what happens in marriages high in conflict, where traditional roles and behaviors may be altered. Marital conflict is predictive of increased depressive symptoms, which in turn can lead to more marital conflict, more depression, and functional impairment, not only in fulfilling marital roles but in protecting personal health (Choi & Marks, 2008). Balag, Janszky, Leineweber, Blom, Wamala, and Orth-Gomer (2003) suggest that marital stress in women is related to depression but does not suggest these symptoms affect BMI. They do posit, however, that healthier women experience less marital stress and less depression, and Smith (2006) theorizes that women respond to depression by eating more, while men may eat less. The focus of the current study is whether a marriage high in conflict can be linked to changes in BMI.

Influencing Factors in the Marriage–BMI Connection

Culture

A number of factors influence and increase the tendency toward obesity, and additional research is clearly needed to understand them (French et al., 2001; Jeffery & Utter, 2003). Sobal (2001) discusses the impact of culture – what he identifies as the most significant element shaping a person's body weight because a person's culture or ethnicity greatly impacts eating preferences and patterns as well as activity level. Kahn et al. (1991) found that weight gains were greater in African American women than

European American women, even after controlling for age, height, and duration of follow-up. In addition, research has found that losing weight is more challenging for African American women than European American women (Kahn & Williamson, 1991). Kumanyika (1993) posits that perhaps high obesity rates occur because African American women have different attitudes that prevent weight loss. For instance, eating disorders and a preoccupation with weight loss are reported less frequently among African American women. She also found that African American women are less likely to perceive that they are overweight and more likely to have other attitudes conducive to weight gain and antithetical to weight loss. Kahn and Williamson (1991), similarly, found that decreased levels of concern over weight may contribute to decreased rates of weight loss in African American women, as compared to weight loss in European American women.

Income

Sobal (2001) explains that income is strongly linked to obesity because diet and exercise levels are affected by the availability of money. His research suggests that though higher incomes are often associated more sedentary jobs, higher incomes allow people to live in better neighborhoods where jogging and walking around the block are safe activities, thus higher income women, in particular, are less likely to be obese. Sobal added that low income levels also add to stress which may do two things: (1) cause the body to store more fat and (2) tempt the individual to emotionally overeat as he or she seeks comfort. The link between lower income and obesity is born out in the African American population, where poorer living conditions and obesity both run higher than in the European American population (CDC, 2009; Kahn, et al., 1991; Kuczmarski, 1992;

Kumanyika, 1987; Lin, Huang, and French, 2004). African American women with low income have a 1.63 higher BMI than their European American or Hispanic American counterparts (Lin et al., 2004). In a discussion of the social environment experience for African Americans, Williams (1998) explains that African Americans live in urban areas, which are more marginalized and have a more limited availability of resources, thus increasing the everyday costs of groceries, housing, and insurance. Kahn et al. (1991) state that getting married and living in a low-family income home are the strongest indicators of a major weight gain, and African American women typically gain more than European American women.

Marital Status

The relationship between marriage, weight gain, and obesity is commonly accepted (Jeffery & Rick, 2002; Lipowicz, Gronkiewicz, & Malina, 2002; Smith, 2006; Umberson, Liu, & Powers, 2009; Wood et al., 2007). Married men and women have a higher BMI than those who never marry (Lipowicz et al., 2002; Smith, 2006). Smith found that overweight African Americans mirror their European American counterparts in prevalence of obesity among the different relationships – married, divorced, and never married – except that African Americans who cohabitate are more likely to be obese than their European American counterparts (Smith, 2006).

Gender

Sobal et al. (2003) suggest that women, but not men, are inclined to gain weight upon entering marriage, and Smith (2006) proposes that the weight gained upon entering marriage is more significant than the weight loss that occurs when marriage ends.

Umberson et al. (2009) suggest that the weight gain upon entering marriage is only short-term for European Americans, and of longer duration for African Americans.

Smith (2006) and Sobal et al. (2003) found that previously married men have a lower BMI than those who are married, but previously married women are more likely to be overweight or obese than married women. Smith suggests that men and women react differently when a marriage ends. Divorce or death of a spouse can trigger depression, but, as noted earlier, men tend to eat less when depressed and women tend to eat more. He adds that because women generally have custody of children, they may tend to be more obese because of single-parent stress and the availability of snack foods in their homes.

With regard to remarriage, the BMI for both men (Eng, Kawachi, Fitzmaurice, & Rimm, 2005) and women (Lee et al., 2005) appears to increase, though men tend to decrease and women tend to increase physical activity after remarriage. Lee et al. notes that their findings are not consistent with other researchers who report a decrease in women's physical activity after remarriage. Smith (2006) emphasizes that age is a significant issue with regard to the link between marriage and obesity. He suggests that adults tend to gain weight as they age; therefore, the BMI for older adults may increase upon entry into marriage or cohabitation but BMI will also increase for those in an ongoing marriage. Sobal and Rauschenbach (2003) indicate that divorced and separated men in their 50's are underweight in relation to married men of the same age, and widowed women in their 50's are more likely to be obese than married women of the same age. One reason health may decline when marriage ends through divorce or death is that the newly single stop eating as many vegetables, indicating a general trend toward

unhealthy diet (Eng et al., 2005; Lee et al., 2005). Umberson et al. (2009) discuss the different ways in which African Americans are affected by marriage transitions. African Americans are less likely to marry, but entering into marriage precipitates a significant weight loss. African Americans who remain divorced for a long period of time (15 years in their study) gain weight more rapidly than their European American counterparts, and widowhood brings an acceleration of weight loss.

Education

Research has also linked education level to obesity (Kuczmarski, 1992). Smith (2006) found that marriage may affect a man's BMI more than a woman's and identified a need for additional research to determine how education may impact these gender differences. Merkus et al. (1995) found that a woman's BMI is strongly associated with the educational level of her partner: the more education he has, the lower her BMI. They also found that no such relationship existed to their own educational level; however, Lipowicz et al. (2002) found that for women 25-60 years old, educational level was more important than marital status in influencing BMI.

The current study will control for both education and income, and will sort results by husbands and wives to determine if outcomes are affected by gender.

Approaching the Study of Marriage and Health

Partner Effects

Looking beyond the specific topic of marriage and BMI, the connection between marriage and health has been of interest to many researchers. Some studies have been undertaken to identify partner effects in the adoption of health habits, though researchers

agree that more knowledge is needed in the area (Franks, Wendorf, Gonzalez, & Ketterer, 2004; Sandberg, Miller, Harper, Robila, & Davey, 2009).

Though there is little available research on whether a spouse's BMI affects the BMI of their partner, there have been studies done on *other* effects a partner can have on a spouse's health. Monden (2007) suggests that healthy people tend to marry healthy people – though he did not mention matching BMI specifically, nor did he identify results by race or ethnicity. His research revealed that individuals with spouses in poor health were almost three times more likely to report that they too were in poor health than those whose spouses were in good health.

The health benefits of marriage have been variously linked to physical affection (Light, Grewen, & Amico, 2004), cessation of unhealthy behaviors, like smoking and drinking (Leonard & Mudar, 2003; Thompson, Parahoo, McCurry, O'Doherty, & Doherty, 2004), and adoption of healthy habits, like regular eating, sleeping and exercise (Umberson, 1987). Sandberg et al. (2009) examined the effects of happy marriage on health and health care utilization. Controlling for the better health of the target subjects, both men and women in happy marriages reported more frequent use of health care, a positive behavior hypothesized by the authors and explained in part by the social control/support offered by spouses. They were unable, however, to identify significant partner effects in the study. In their discussion of results, they suggested the actor effects were so major they masked the influence of partner effects, and added that further research into the influence of partner effects was needed in the future.

There have been many "couple" variables identified in the link between marriage and BMI, though not all of them have been explained. Eid, Overman, Puga, and Turner

(2008) suggest that there is a significant positive relationship between having a working spouse and BMI for married men. Kemmer et al. (1998) indicates there is less guilt associated with eating too much when both partners are overweight. In a study with a smaller sample, Anderson et al. (2004) did not find that men or women's weight changes related to whether their spouses were obese or of normal weight. They did find, however, that the guilt of consuming too much is reduced when couples eat together.

Even non-dyadic health studies reveal a variety of relational partner effects, as in Janzen and O'Brien-Cousin's (1995) findings that married women's activity levels are strongly influenced by their partners' activities. Leonard and Mudar (2003) identified spousal drinking as a predictor of wife's peer drinking levels, and theorized this effect may be dependent on marital quality. Umberson (1987) suggested the health benefits of shared activities on the regulation of eating, sleeping, and exercise schedules, as well as the potential of a health-conscious spouse as a model for partner's behavior. Thompson et al. (2004) reported that 66.7% of women believed they would find it an important factor in quitting smoking if their partner would stop, as well. These identified partner effects represent a limited body of research, none of which deals with obesity or BMI, and none of which separates results by race/ethnicity.

Some partner effects may be the result of roles adopted within the marriage, as mentioned earlier. Married couples believe eating meals together is important in establishing their identity as a couple (Marshall & Anderson, 2002), and after marriage they endeavor to make these proper meals (Anderson et al., 2004). Consuming reduced-fat foods, fruits, and vegetables in addition to reducing the amount of fast-food eaten are significant improvements to health behaviors among married couples (Burke et al., 1999).

A wife is a nurturer; her role as primary food purchaser and preparer enables her influence her partner's diet as she controls her own (Kemmer et al., 1998).

Hong, Franks, Gonzalez, Keteyian, Franklin, and Artinian (2005) reported that both partners felt spousal support in their exercise attempts as long as they had similar exercise routines/behaviors. When these routines/behaviors differed, feelings of support dissipated and support was often perceived as attempts to control. In addition, the act of exercising itself may be viewed as spousal support as long as the physical activity level of both spouses were similar, but perceptions of what actions are supportive quickly diverge when one spouse is exercising and the other is not. A shared commitment to exercise can prevent misperceptions of support attempts. Women, more than men, cite a lack of companions to exercise with as a barrier to physical activity (Burke et al., 1999). As with the studies of marriage and health cited earlier, none of the above studies identified results based on race or ethnic group.

The current study hopes to open more research into health and marriage among the African American population, as well as adding to the very limited supply of dyadic studies that explore potential partner effects on health.

Process Effects

Without a strong body of research examining partner effects, the literature on marriage and health is heavily weighted toward actor and process effects, that is, the effect of an individual's behavior and how the dynamics of a relationship influences that behavior. Support and social control, two such effects, have been identified in both positive and negative health outcomes (Fekete, Stephens, Druley, & Greene, 2006; Knox & Uvnas-Moberg, 1998; Sandberg et al., 2009; Umberson, 1987; Verheijden, Bakx, van

Weel, Koelen, & van Staveren, 2005). Kiecolt-Glaser and Newton (2001) found the physiological impact of positive marital functioning is largely channeled through health-related behaviors. Verheijden et al. (2005) contends that the addition of social support is beneficial, not directly to health, but to long-term changes in health behaviors. Knox and Uvnas-Moberg (1998) cite the effects of social support on smoking, diet and exercise. Umberson (1987) points out the power of indirect social control, in which a partner maintains adherence to positive health behaviors out of a sense of responsibility to their spouse. Social control can have unintended consequences, however, arousing negative emotional responses even as they promote positive health behaviors (Fekete et al., 2006). The findings of Franks et al. (2004) that men appear to be more sensitive to a wife's control efforts may in part be the effect of different attitudes toward health monitoring, with women taking greater responsibility for looking after the family's health and men harboring the opinion that people ought to be left alone to do as they choose (Umberson, 1992). The negative effects of social control may be exacerbated in troubled marriages, where spouses may perceive even well intentioned monitoring as pushy and critical (Sandberg et al., 2009).

Marital Conflict and Process Effects

The impact of negative interaction provides a compelling link between marriage and health, as so many studies of the physiological effect of marital conflict have shown (Choi & Marks, 2008; Dopp et al., 2000; Kiecolt-Glaser et al., 1993, 2005; 2002; Malarkey et al., 1994; Miller et al., 1999; Robles & Kiecolt-Glaser, 2003). The links between negative marital functioning and physiological outcomes are strongly confirmed by studies that tie negative or hostile behavior, but not positive, avoidant or problem-

solving actions, to measurable physiological changes. Even mildly to moderately stressful conflict discussion may result in increased heart-rate, blood pressure and lymphocyte mobilization (Dopp et al., 2000). To make things worse, the depressive effects of marital conflict can lead to increased conflict, trapping couples in a destructive feed back loop (Choi & Marks, 2008).

The highest physiological risk seems, at first glance, to belong to men with hostile, cynical or angry dispositions, who experience greater negative changes in blood pressure, cortisol levels, heart rate, and cytotoxicity during discussion conflict (Miller et al., 1999). Men high in hostility had greater immunological changes and more negative affect after conflict (Kiecolt-Glaser et al., 2005). Hostile disposition may have an impact on the partner, as well, since couples with more negative or hostile interaction retained greater immunological changes after 24 hours together, and the physiological changes in women are shown to be more persistent over time than in their husbands (Kiecolt-Glaser et al., 1993). Even in healthy and maritally satisfied newlyweds, five of six serum hormonal levels tested showed significant declines during disagreement (Malarkey et al., 1994). Given the lowered cardiovascular, immune, and endocrine functioning during conflict, a marriage high in abrasive or stressful encounters may be a risk for long-term, negative health outcomes (Kiecolt-Glaser et al., 2002; Robles & Kiecolt-Glaser, 2003).

The physical effects of marital conflict have been studied through an array of physiological symptoms. These physiological symptoms have ranged from immune function (Kiecolt-Glaser et al., 2002; Robles & Kiecolt-Glaser, 2003) and blood pressure (Miller et al., 1999) to serum hormonal levels (Malarkey et al., 1994). Researchers have even studied how negative spousal interactions affected the psychological suffering

among cancer patients (Manne & Glassman, 2000). What has not been studied, however, is how marital conflict affects an individual's BMI, nor have there been studies of conflict and physiology distinctly focused on the African American population. An attempt to find literature on the subject reveals this lack. It is a distressing gap, considering the amount of research on the severe health risks of obesity, the overall connections between marriage and BMI, and the health disadvantages experienced by African Americans.

African Americans - Population Most in Need

The African American population experiences both higher rates of obesity (CDC, 2009) and poorer quality marriages (Broman, 2005; Orbuch et al., 2002; Renne, 1971) than the European American population, and thus could benefit significantly from research that explores the associations between marital conflict and obesity. African American marriages are already significantly under-researched (Broman, 2005; Bryant, Taylor, Lincoln, Chatters, & Jackson, 2008; Orbuch et al., 2002). Orbuch et al. concede there is a large body of research regarding African American single-parent families and teen pregnancies, but note that relatively little exists on African American marriages.

Poorer Marriage Quality

This oversight is surprising, since existing evidence indicates the quality of African American marriages is significantly lower than that of European Americans (Broman, 1993, 2005; Bulanda & Brown, 2007; Dixon, 2009; Orbuch et al., 2002; Renne, 1971). African Americans are less satisfied with their marriages (Broman, 2005). They divorce or separate earlier and more frequently than European Americans (Bulanda & Brown, 2007; Dixon, 2009; Orbuch et al., 2002) and are less likely to marry in the first

place (Cherlin, 1992; Raley, 1996; Spanier & Glick, 1980). Surveyed African Americans feel less loved by their spouses, report higher levels of marital disagreements, receive less spousal support, and characterize their spouses more negatively than their European American counterparts (Broman, 2005; Bulanda & Brown, 2007; Johnson & Barer, 1990; Orbuch et al., 2002). African American women feel particularly affected by these marital stressors (Broman, 1993). The studies cited earlier, which did not differentiate results by race or ethnicity, show a variety of harmful physiological effects of negative marital interaction. The current study will focus on African American couples to look at the effects of marital conflict on BMI.

Health

Research into African American health presents a grim picture. African Americans have lower life expectancy rates at most ages, higher infant mortality rates, and higher morbidity rates than European Americans (Cockerham, 1995; Williams, 1998). Ferraro and Farmer (1996) found the disparity between African American and European American health to be significant throughout the life span. According to Williams, in 1998 the urban health picture among African Americans was bleak enough to require "a certain sense of urgency" (p.304). In the ensuing twelve years, African American marriage and health has continued to be underrepresented in the body of research, and to my knowledge no study has examined the link between marital conflict and BMI in African American couples. This study is an attempt to address that lack, and contribute something to the understanding of the African American health disadvantage.

If marital conflict is linked to obesity in African Americans, perhaps the solution to the "grim" health prognosis among that population should include, at least in part, an effort to improve the quality of African American marriages.

This study proposes to take what is already known about marriage and BMI – that getting married leads to weight gain – and look at a specific marital process to see if it can be identified as a significant influence in that BMI change. Marital conflict, because it has already been shown to generate short-term physiological changes in both husbands and wives, will be the process under examination, and African Americans, with higher rates of obesity and lower rates of marital satisfaction than European Americans, will comprise 100% of the sample group. The data is drawn from a large, ongoing longitudinal study sponsored by the National Institute of Child Health and Human Development (NICHD), *A Study of African American Marriage and Health.* The study design allows for a dyadic examination of results, a useful tool that can identify transactional effects as well as the effects of the process (conflict) in question. It is hoped this study will add to the body of research into how marital processes and partners can influence health in general, and BMI in particular.

Current Study

The hypotheses posed by the current study are:

1. Husband's and wife's reported BMI will influence their own and their partner's reported BMI over time.
2. Husband's and wife's report of marital conflict will influence their own reports of BMI and their spouse's reports of BMI over time.

Figure 1. Interindividual and intraindividual effects on BMI.

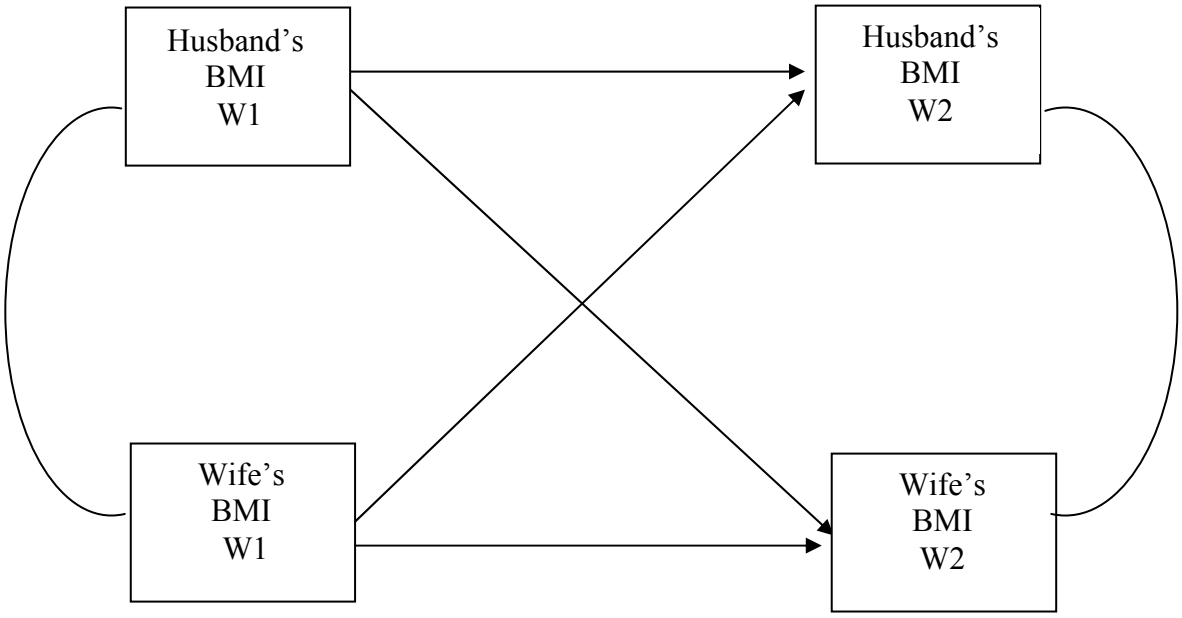
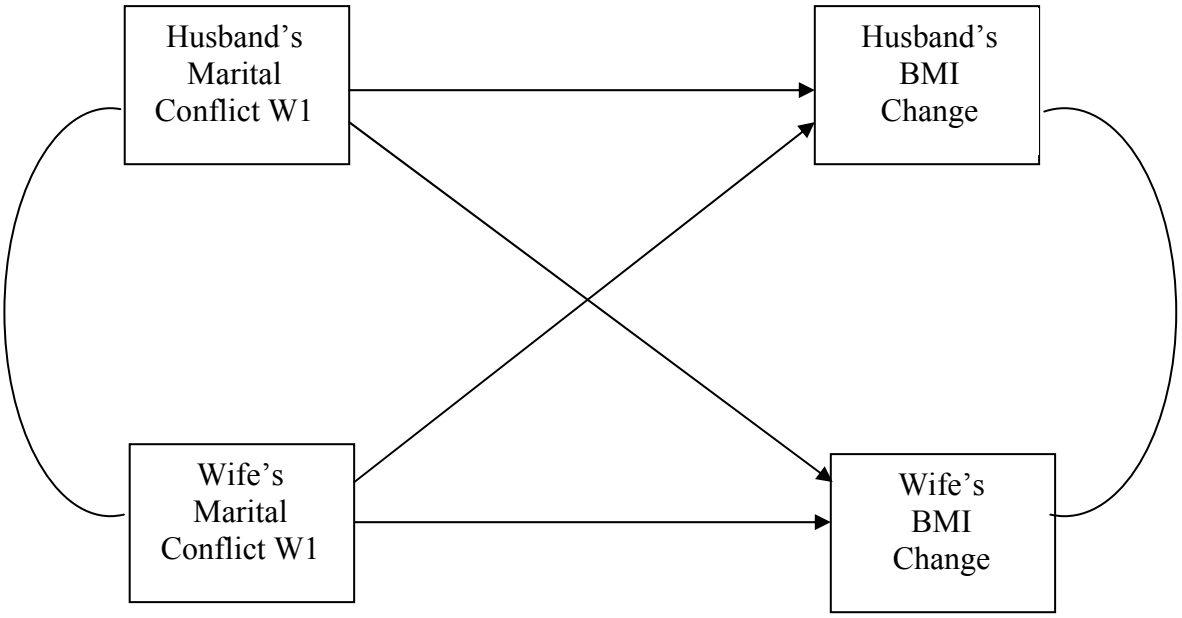


Figure 2. Interindividual and intraindividual effects of marital conflict on change in BMI.



METHOD

Sample

The data for the present study came from a project funded by the National Institute of Child Health and Human Development (NICHD), *A Study of African American Marriage and Health*. It is a three-wave, ongoing longitudinal study of African American couples residing in a Southern state. The present study used wave 1 and wave 2 data collected in 2005 through 2008 (N=590). Second wave data was gathered, on average, 2 years after first wave data, due to data collection procedures. African Americans comprise 46% of the population in the study area (average percentages based on 2000 Census of the United States). Couples divorced by wave 2 of the study were not included in this study.

Procedure

This study targeted recently married couples. An efficient way to identify "newlyweds" was via marriage licenses because it was apparent that those individuals who applied for marriage licenses had intentions to marry. Thus, marriage license information was obtained from the state since that information is public record. Marriage licenses in this state also provided race/ethnicity information. Letters were then sent to those African American couples (to the addresses on the marriage license applications) inviting them to participate in the

study. Some of those targeted people ended up not marrying, but most did, indeed, marry. To be eligible for the study, both partners had to be African American and at least 18 years of age. Both partners in the relationship had to agree to participate. Face-to-face interviews were scheduled in the homes of the participants through follow-up calls. Two interviewers visited the homes of the participants; one person interviewed the husband while the other interviewed the wife in a different room. Interviewers read each question to the participants. The average length of the interview was about two hours. All interviewers were African American. The interviewers asked questions about several topics, including racial discrimination, health, marital interactions, psychosocial resources, social networks, and community characteristics. Of 1,018 couples who were initially contacted, about 4% were unavailable (moved), 27% were refusals, 22% were uncooperative, 47% were interviewed.

Among the African American wives in the study sample, 65.6% had more than a high school education, 85.1% had incomes below $40,000, and 52.7% worked 40 hours or more per week. The mean age, median age, and age-range for wives were 32.5, 29, and 20-70, respectively. About 75% of the wives were under 37 years old in 2005. This was the first marriage for 77.0% of the wives. Among the African American husbands in the sample, 50.7% had more than a high school education, 71.1% had incomes below $40,000, and 79.6% worked 40 hours or more per week. The mean age, median age, and age-range for husbands were 35, 32, and 20-75, respectively. About 75% of the husbands in the present study were under 40 years

old in 2005. About 76 % of husbands had entered into marriage with children. This was the first marriage for 67 % of husbands.

Only 8% of the data were missing in the sample in Wave 1, due to uncooperativeness and refusals from the participant. This study used full information maximum likelihood (FIML) to manage missing data and increase the effective sample size.

Measures

Marital Conflict. The construct of marital conflict was measured by six questions. Answers were coded on a scale of 1 = Always to 4 = Never, with the additional options of 8 = Don't Know and 9 = Not Applicable. Question items were: How often does your spouse - Listen carefully to your point of view?, Boss you around?, Criticize you?, Get angry at you?, Insult you?, and Swear at you? The question "How often does your spouse listen carefully to your point of view?" was reverse coded in order for high scores to reflect high reports of marital conflict. These items were adapted from both the Conflict Tactics Scale (Straus et al., 1996), and the Iowa Youth and Families and Critical Transitions Studies (Conger & Elder, 1994), and were used to construct the variable 'marital conflict' separately for husband's reports and separately for wife's reports. Research has found self-reports of marital conflict to be reliable (Sanford, 2010). Cronbach Alpha for husbands' reports of marital conflict was .71, and was .70 for wife's reports.

Body Mass Index. In order to assess Body Mass Index, respondent answers to questions of weight and height were used to calculate BMI. According to the Centers for Disease Control and Prevention (2009), an individual's BMI is calculated as (weight [kg]

/ height [m^2]). These assessments were also conducted separately for husband's reports and wife's reports. Change in BMI was calculated by subtracting BMI scores for Wave 1 from BMI scores for Wave 2, for both husbands and wives.

Control Variables

Education, income, age at marriage, diabetes and hypertension. Education and income were controlled for since they have been shown to significantly associate with health (Kimbro, Bzostek, Goldman, & Rodriguez, 2008; Ross, Mirowsky, & Goldsteen, 1990). Diabetes and hypertension have also been found to co-occur with BMI (Kotchen, 2008; Scalco, et al., 2005). Thus the present study controlled for diabetes and hypertension. Age at marriage was also controlled for, as research has shown that married individuals of younger age have exhibited higher levels of conflict within the relationship (Kurdek, 1991; Kiecolt-Glaser & Newton, 2001; Renne, 1971).

Education. To determine education levels, participants were asked: What is the highest level of education you have completed?, with response choices: **1** – Grade School, **2** – some High School, **3** – High School, **4** – Technical School or Trade School Degree, **5** – Some College, **6** – Associate Degree, **7** – Bachelor's Degree, **8** – Master's Degree, **9** – Doctorate/Ph.D., or **10** – Medical Doctor/M.D.

Income. To determine income levels, participants were asked: Thinking of **your** income – not your spouse's – please indicate what your personal income was last year. **1** – No income, **2** - $1 - $4,999, **3** - $5,000 - $9,999, **4** - $10,000 - $14,999, **5** - $15,000 - $19,999, **6** - $20,000 - $24,999, **7** - $25,000 - $29,999, **8** - $30,000 - $34,999, **9** - $35,000 - $39,999, **10** - $40,000 - $49,999, **11** - $50,000 - $59,999, **12** - $60,000 - $74,999, **13** - $75,000 - $100,000, or **14** More than $100,000.

Age at Marriage. Age at marriage was determined by calculation of birth date and wedding date of participants.

Hypertension. Hypertension in the subject was determined with the following question: - During your lifetime, have you been diagnosed with Hypertension by a doctor, nurse, or other health professional? A response of 1 indicated that yes, the participant has been diagnosed with hypertension, or 2, no, he/she has not. This variable was recoded so that higher numbers signified a higher prevalence of hypertension.

Diabetes. Presence of diabetes was determined with the follow question: During your lifetime, have you been diagnosed with diabetes by a doctor, nurse, or other health professional? A response of 1 indicated that yes, the participant had been diagnosed with diabetes, or 2, no, he/she has not. The variable of diabetes, like hypertension, was recoded for higher numbers to reflect a higher prevalence of diabetes.

Analyses

First, I examined the descriptive statistics (i.e., mean, minimum, maximum, and standard deviation) of the variables of interest.

In order to address the first hypothesis, a model was fit using path analysis to determine any influence between Husbands' and Wives' BMI and their own over time. In order to address the second hypothesis and understand how reported marital conflict is associated with reported change in BMI between and within spouses, path analysis was again used. Change in BMI was calculated by subtracting Wave 1 BMI scores from Wave 2 BMI scores for husbands and wives.

I used chi-square statistics, CFI, and RMSEA to evaluate the study models. When a chi-square value divided by the degree of freedom is less than 2.0, it is believed to indicate good model-fit (Byren, 1989). Carmines and McIver (1981)

suggest that a chi-square to degrees of freedom ratio less than 3 indicates that the model fits the data reasonably. Bentler and Bonett (1980) suggest that a CFI value of more than .90 indicate that the model fits the data reasonably. When RMSEA is less than .05, it is believed to indicate good model-fit (Browne & Cudeck, 1993; Joreskog & Sorbon, 1984). Browne and Cudeck (1993) suggest that a RMSEA of less than .08 indicate that the model fits the data reasonably.

RESULTS

Univariate Statistics

I examined the descriptive statistics for the variables of interest, Body Mass Index and Marital Conflict and the control variables, education, income, age at marriage, hypertension, and diabetes. With the exception of BMI, which used information gathered from Wave 1 and Wave 2, all variable scores used were taken from Wave 1 of the study.

Table 1.

Descriptive Statistics for Variables of Interest and Control Variables.

Measures	**Wives**			**Husbands**		
	M	***SD***	**Range**	***M***	***SD***	**Range**
Marital Conflict	9.20	2.49	6.0 – 24.0	10.63	3.05	6.0 – 24.0
BMI W1	30.35	7.50	17.43 - 71.22	29.63	5.96	16.69 – 59.54
BMI W2	30.60	7.32	17.85 – 59.36	29.99	5.96	18.23 – 54.87
Change in BMI	0.	2.69	-11.4 – 12.35	0.05	2.26	-12.10 – 9.10
Education	4.89	1.8	1.0 – 10.0	4.15	1.58	1.0 – 8.0
Income	5.63	2.78	1.0-13.0	7.55	2.86	1.0-14.0
Age at Marriage	33.40	9.65	21.0 – 71.0	35.99	10.67	20.0 – 76.0
Hypertension	1.80	0.40	1.0 – 2.0	1.76	0.43	1.0 – 2.0
Diabetes	1.93	0.25	1.0 – 2.0	1.92	0.26	1.0 – 2.0

Variables of Interest

BMI. To initially create the measure of body mass index (BMI) for each respondent, I divided self-reported weight (kg) by height^2 (m). Mean, standard deviation, and range information is found in Table 1. BMI in the sample for Wave 1 ranged from

17.43 to 71.22 with a mean of 30.34, and from 16.69 to 59.63 with a mean of 29.63, for wives and husbands, respectively. The prevalence of obesity was 51% among wives and 45% among husbands (using a BMI cut-off point of equal to or greater than 30 to determine obesity) (CDC, 2008).

BMI in the sample for Wave 2 ranged from 17.99 to 61.44 in wives and 17.23 to 54.46 in husbands. Means were 30.61 and 31.33, for husbands and wives respectively. Change in BMI was calculated by subtracting Wave 1 BMI from Wave 2 BMI.

Marital Conflict. Descriptive statistics (see Table 1) revealed that husbands reported slightly higher levels of marital conflict than did wives and also had a slightly larger spread, as the standard deviation was greater for wives' reports than husbands'.

Control Variables

Education. Mean levels of education were very similar for husbands and wives, with husbands reporting a mean of 4.15, and wives a mean of 4.89, both averaging a technical or trade school degree.

Income. Incomes for wives ranged from 1 – No Income to 14 – More than $100,000, with a mean income score of 5.63, somewhere between $15,000 and $19,999. The mean income score for husbands was 7.55, an income slightly higher than the mean for wives, and falling somewhere between $25,000 and $29,999. Incomes for husbands ranged between 1 – No Income and 13 – $75,000 - $100,000, a range actually smaller than that for wives. Standard deviations were 2.86 and 2.78, for husbands and wives respectively.

Age at Marriage. Mean age at marriage for husbands was 35.99, with a range from 20 to 76. Standard deviation for husbands was 10.67. Mean age for wives was

33.40, slightly younger than husbands, and with a smaller range of 20 to 71. The standard deviation for wives was 9.65

Hypertension. Mean occurrence of hypertension for wives was 1.80, meaning well over half of the female population had previously been diagnosed with hypertension. Similarly the mean occurrence for husbands was .76, also signifying a large incidence. Standard deviations were .43 and .40, for husbands and wives respectively.

Diabetes. Diabetes was found to be even more prevalent than hypertension, with the mean occurrence for husbands being 1.92 and for wives 1.93. Standard deviation was .26 for husbands and .25 for wives.

Bivariarate Statistics

Table 2.
Bivariate Correlations for Variables of Interest and Control Variables for husbands and wives

Variables	1	2	3	4	5	6	7	8	9
1. Marital Conflict	-	.06	.01	.03	-.01	-.02	-.06	-.03	-.02
2. BMI W1	.08*	-	.93†	-.14*	-.17†	-.10*	.10*	.29†	.24†
3. BMI W2	.04	.93†	-	.25†	-16†	-.02	.21†	.33†	.18†
4. Change in BMI	-.10	-.19†	.19†	-	-.04	.06	.01	.04	.02
5. Education	-.02	.10*	.08	.07	-	.51†	-.10*	-.09*	-.10*
6. Income	-.03	.09*	.09	.04	.32†	-	.13†	-.01	-.06
7. Age at Marriage	-.08	.03	.07	-.08	-.11†	.08	-	.36†	.20†
8. Hypertension	-.06	.27†	.20†	-.08	.00	.03	.33†	-	-.29†
9. Diabetes	-.07	.23†	.22†	-.07	.05	-.05	.28†	-.27†	-

Husbands' scores are shown below the diagonal and wives' scores are shown above the diagonal.
*p < .05 †p < .01

I next conducted bivariate correlational analyses for all variables included in the study, and found that several variables were highly correlated with each other (see Table 2). Looking first at marital conflict, husband marital conflict was significantly positively correlated with husband BMI W1 (r = .08, p<.05). This indicated that husbands reporting higher levels of marital conflict were also more likely to report high levels of BMI in Wave 1. Mens' BMI at Wave 1 was also significantly positively correlated with levels of

education (r = .10, p<.05) and income (r = .09, p<.05), meaning higher scores of BMI were associated with higher education and income.

Husbands' scores of BMI W1 and BMI W2 were also significantly correlated with levels of hypertension (r = .27 and r = .20, p<.01) and diabetes (r = .23 and r = .22, p<.01). Results showed that all these scores of BMI were positively correlated with hypertension and diabetes, meaning that the husbands with higher scores of BMI were also more likely to experience hypertension and diabetes. This finding is consistent with previous findings that hypertension and diabetes are often found to co-occur in individuals with higher BMIs (Kotchen, 2008; Scalco, et al., 2005). Husbands' scores of income and education were also significantly positively correlated with each other (r = .32, p<.01); as would be expected, higher levels of education correlate with higher incomes. Another expected correlation was the significant positive correlation between hypertension and diabetes, meaning individuals with one are more likely to have the other.

Several significant negative correlations were also found in the husbands' scores, such as the surprising finding between age at marriage and education (r = -.11, p<.01). The negative correlation indicates men with higher levels of education were more likely to report lower ages at marriage. Hypertension and diabetes were also found to be significantly positive correlated with age at marriage (r = .33 and r = .28, p<.01), meaning that husbands with higher ages at marriage were also more likely to suffer from diabetes and hypertension.

Similar to findings with husbands' BMI correlations were wives' BMI correlations (See Table 2). Wives' BMI W1 scores were significantly positively

correlated with age at marriage, meaning higher ages at marriage were associated with higher BMI scores (r = .10, $p<.05$). Wives' education was significantly positively correlated with income, again, similar to the finding in men (r = .51, $p<.01$). Education was significantly negatively correlated with BMI W1 (r = -.17, $p<.01$) and BMI W2 (r = -.16, $p<.01$), as well as age at marriage (r = -.10, $p<.05$), meaning those with higher levels of education were more likely to report lower BMI W1 and W2 scores and lower ages at marriage. Income was significantly negatively correlated with BMI W1 scores (r = -10, $p<.05$). This indicated that at higher levels of income, lower BMI W1 scores were more likely.

Age at marriage was significantly positively correlated with BMI W1 (r = .10, $p<.05$) and significantly correlated with BMI W2 scores as well (r = .21, $p<.01$), meaning at higher ages at marriage higher scores of BMI W1 and BMI W2 were more likely. Age at marriage was significantly negatively correlated with education (r = -.10, $p<.05$). In congruence with that finding was the significant negative correlation between income and age (r = .13, $p<.01$).

Similar to the finding in husbands' scores, wives' levels of hypertension and diabetes were also positively correlated with BMI scores. Specifically, hypertension was significantly positively associated with BMI W1 (r = .29, $p<.01$) and W2 scores (r = .33, $p<.01$). Diabetes was significantly positively associated with BMI W1 (r = .24, $p<.01$) and W2 scores (r = .18, $p<.01$). These scores all indicate that those reporting higher BMI were more likely to experience hypertension and diabetes. Both hypertension and diabetes were also significantly negatively correlated with education (r = .09 and r = .10 $p<.05$), so those with higher levels of education were less likely to experience

hypertension and diabetes. At higher ages at marriage, hypertension and diabetes were found to be more likely, as both were highly significantly positively correlated (r = .36 and r = .20, $p<.01$). Lastly, as would be expected, hypertension and diabetes were highly significantly positively associated with one another (r = .29, $p<.01$), meaning if an individual suffered from hypertension, she was more likely to also suffer from diabetes.

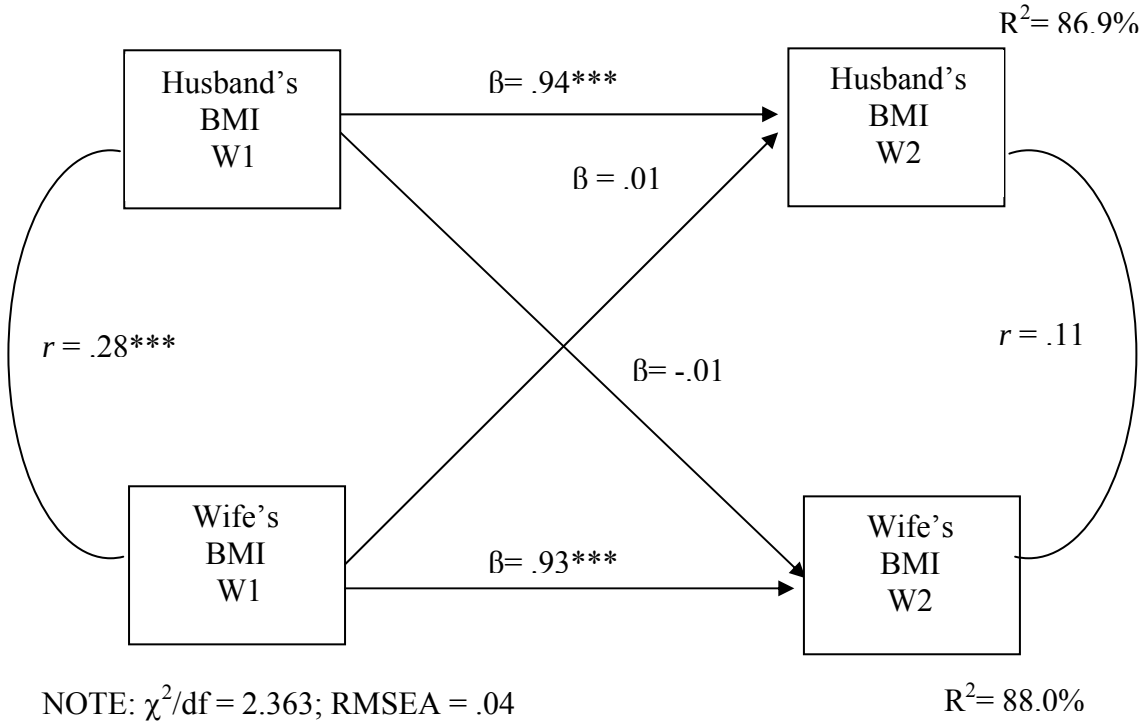
Multivariate Statistics

Hypothesis 1

In order to answer the hypotheses of the study, I fit a series of path models. After controlling for the variables of education, income, age at marriage, hypertension, and diabetes, I fit the model for the first research hypothesis: Husband's and Wife's reported BMI will influence their own and their partner's reported BMI over time. In the first model, Husband's BMI Wave 1 predicted his own BMI at Wave 2, and Wife's BMI Wave 1 predicted her own BMI at Wave 2. Additionally, Husband BMI W1 was significantly associated with Wife BMI W1. This model showed adequate fit, $\chi^2/df =$ 2.363 and RMSEA was .04, indicating good fit between the data and the model. Significant relationships were observed between Husband BMI W2 and Husband BMI W1 ($\beta= .97$, $p<.001$) as well as Wife BMI W1 and W2 ($\beta= .93$, $p<.001$). In other words, BMI at time 1 significantly predicted variance in time 2. However, there appeared to be no transactional effects in the model. It does not appear that Husbands' and Wives' BMI at W1 significantly predicted their partners' BMI at W2 (See Figure 3). Since it appears that Husbands' and Wives' BMI may have an influence on each other given their correlation in Wave 1 ($r = .28$, $p<.001$), it was suspected that it might be possible that Husbands' and Wives' BMI would predict variance across time in their partners' BMI.

The model explained 86.9% of the variance in Husband's BMI at Wave 2, and 88.0% of the variance in Wife's BMI W2. However, the correlation between Husband's BMI W2 and Wife's BMI W2 was insignificant.

Figure 3. The Association Between Husbands' and Wives' BMI W1 with their own and their partners' BMI W2.

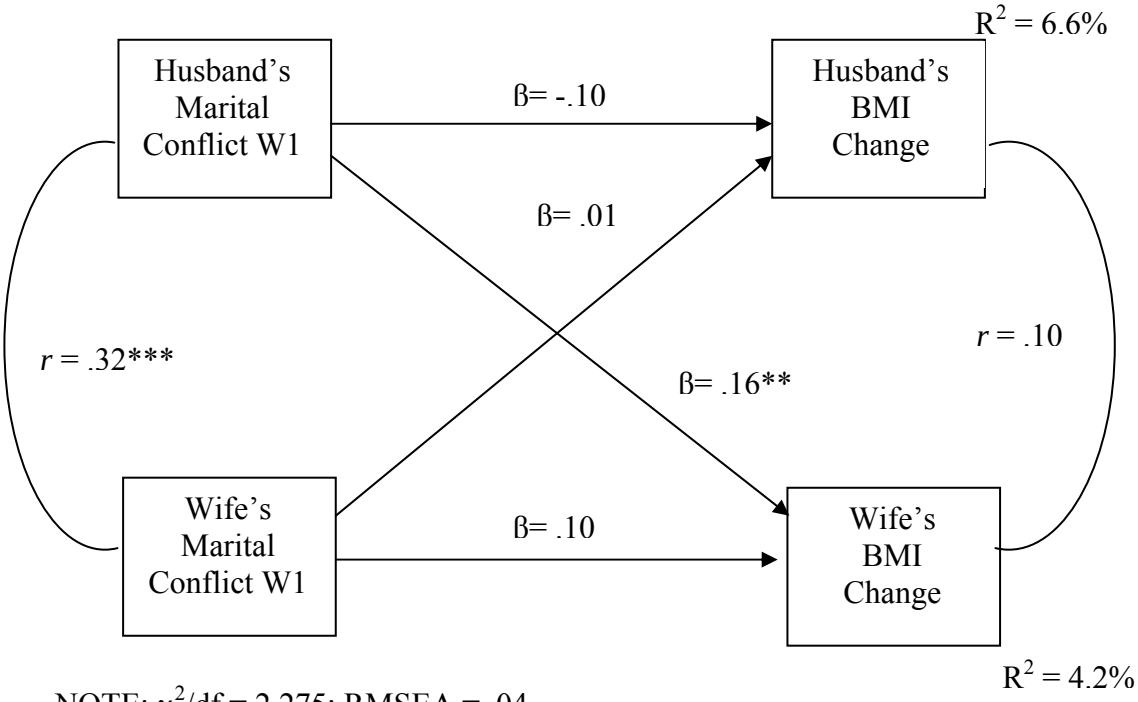


Hypothesis 2

The second research hypothesis was: Husband's and Wife's report of marital conflict will influence their own reports of change in BMI and their spouse's reports of change in BMI over time. In this model, Husband BMI Change and Wife BMI Change were simultaneously regressed on Husband Marital Conflict at W1. In addition, Husband BMI Change and Wife BMI Change were regressed on Wife Marital Conflict. This model showed adequate fit, χ^2/df = 2.275 and RMSEA was .04, indicating good fit

between data and the model. There were no significant relationships observed between Husband Marital Conflict and Husband BMI Change or between Wife Marital Conflict and Wife BMI Change. However, there was a transactional effect in the model between Husbands' Marital Conflict (at Time 1) and the Change in BMI for Wife ($\beta = .16$, $p<.01$). Thus, it appears that husbands' level of reported marital conflict significantly predicted the Change in BMI in wives, meaning higher reports of marital conflict from the husband predicted a positive increase in wives' BMI Change. However, there was no significant transactional effect between Wives' reported levels of marital conflict and Husbands' change in BMI (See Figure 4). The model explained 6.6% of the variance in Husband's BMI Change, and 4.2% of the variance in Wife's BMI Change. The correlation between Husband's Marital Conflict and Wife's Marital Conflict was significant ($r= .32$, $p<.001$), and correlation between Husband's BMI Change and Wife's Change was insignificant.

Figure 4. The influence of marital conflict on BMI with interindividual and intraindividual associations.



NOTE: χ^2/df = 2.275; RMSEA = .04

DISCUSSION

I began the study with the goal of understanding more about the connection between marriage and BMI in African American couples. I expected to see an association between spouses' BMIs, both initially, at Wave 1, and over time, when Wave 2 results were collected. I also anticipated a link between levels of reported marital conflict and changes in BMI from Wave 1 to Wave 2. Because of the dyadic design of the study, I hoped to identify both direct and transactional effects of partner BMI and marital conflict.

Hypothesis 1

The first hypothesis of the study predicted that husbands' and wives' BMI scores at time 1 would predict their own and each other's BMI scores at time 2. As would be expected, husbands' and wives' scores did predict their own scores. In fact, almost 90% of the variance in both husbands' and wives' BMI scores at Wave 2 were predicted by their initial BMI scores. However, contrary to my first hypothesis, there were no transactional effects found between husbands' and wives' BMI scores. To make matters even more interesting, husbands' and wives' first wave BMI scores were significantly related to one another, and although both husbands' and wives' BMI scores increased between Wave 1 and Wave 2, the second wave scores were not significantly correlated between spouses.

These findings may be due to the social selection theory discussed in the literature review. Because BMI scores between spouses were correlated at Wave 1 but not Wave 2, and because of the lack of any transactional effect, the theory that healthy people marry healthy people, and vice versa, unhealthy people marry unhealthy people may apply (Joung, Mheen, Stronks, Poppei, & Mackenbach, 1998). This is especially applicable within this study, as all couples were newlyweds at the beginning of the study (within a year of data collection), making mate selection a timely factor. By the second wave, mate selection was at least three years in the past, and the marital relationship or other stressors may have influenced one spouse's BMI differently than the other, resulting in the non-significant correlation of residual error variance in BMI of husbands and wives.

Hypothesis 2

The second hypothesis predicted that husbands' and wives' reported levels of marital conflict at Wave 1 would associate with their own and their spouses' changes in BMI at Wave 2 (change in BMI calculated by subtracting Wave 1 scores from Wave 2 scores). Surprisingly, no association was found between husbands' and wives' reported levels of marital conflict and their own changes in BMI. Of all the physiological changes examined in the review of literature, weight gain is the one most dependent on personal choices over a period of time. It would be reasonable to assume a person who identified conflict in their marriage might respond to that stressor with behaviors that could affect their BMI. Therefore, a significant association between levels of marital conflict and BMI was anticipated, but not found.

One of the uninvestigated but related concepts in this study is the level of marital conflict reported by both husbands and wives at Wave 2. I identified the level of conflict at Wave 1, and compared those results to changes in BMI at Wave 2, acknowledging the reality that weight gain requires time. I did not, however, look at how the reports of marital conflict had changed over the three-year span. The participants in the study were identified through marriage license applications, making all of them, whatever their ages, newlyweds. I think it is feasible that there was some lag in the recognition of marital conflict among all of the participants, but more particularly among the wives, who may have been more affected by a hopeful, "honeymoon" mentality than their husbands. Women generally feel it is part of their role to be nurturer and caretaker of the relationship, so they may have been reluctant to recognize or report a high degree of conflict early in the marriage. It would be interesting to see if the wives' reports of conflict were markedly different three years later. In fact, preliminary analyses indicate the levels of marital conflict at Wave 2 had almost doubled for husbands and had *more* than doubled for wives. Further study is needed to better understand how marital conflict is related to increase in BMI, as I would be reluctant to conclude, on the basis of a single study, that there is no direct effect between conflict and BMI. Within the parameters of this study, however, though both husbands and wives showed increases in BMI between Wave 1 and Wave 2, there was no direct effect between those increases and their own reports of marital conflict.

I was particularly interested to know, since the husbands were reporting higher levels of conflict at Wave 1, why there was no direct association between husbands' marital conflict and husbands' BMI change. It seems that men have an advantage over

women in regards to weight control, both physiologically and behaviorally. Men have a higher percentage of muscle, which burns calories efficiently, while women are naturally equipped with extra adipose tissue, which stores calories more effectively than it burns them (Willett, Dietz, & Colditz, 1999). This gives men a biological edge in staving off weight gain. But the larger answer may lie in the different ways the genders respond to emotional distress. Choi and Marks (2008) found that marital conflict was a predictor of increased depression. Simons (2002) noted that men externalize emotional problems, while women internalize them, adding that men's overuse of alcohol and women's depressive symptoms are functionally equivalent. Since my topic of study was BMI, I did not look for changes in the rate of alcohol use, but if Simons is right, the husbands may have been turning to a substance other than food to deal with the conflict in their marriages. This would be consistent with Smith's (2006) suggestion that women eat more when they are depressed and men eat less. Men turning to substance other than food, as suggested by Simons (2002), may be a reason for the lack of association between martial conflict and BMI for husbands.

The search for a BMI-conflict connection bore more fruit when I looked at the transactional effects, though once again, the husbands increase in BMI was not associated with either their own or their wives' reported marital conflict. As was predicted, there *was* a transactional effect between husbands' reported marital conflict and wives' change in BMI. Why did the *wives* gain weight when their husbands were the ones reporting the conflict? Once again, research points to gender differences that suggest possible explanations.

The first difference lies in the roles adopted upon entry into marriage. Evidence indicates that interindividual influence between husbands and wives may work to benefit men more than women (Franks et al., 2004; Sandberg et al., 2009). For example, women believe they ought to look after their family's health, while men think everyone should be left to do as they please (Umberson, 1992). This means husbands have someone monitoring and encouraging their good health habits, while wives, for the most part, do not. It can be a thankless task for the wife, as even the husbands who recognize the monitoring behavior as caring consider it unnecessary, and husbands in already conflicted marriages perceive it as nagging and critical (Sandberg et al., 2009). In addition to providing health-related social control, the wife commonly adopts the role of main purchaser and preparer of food (Kemmer et al., 1998). On the surface, one would expect this gives the wife greater control over both spouses' diets, putting them on an even playing field in terms of weight control. Lipowicz et al. (2002) found this not to be the case, noting the traditional female role of food preparation was one mechanism at work in the higher obesity rates of married women than single women. Grocery shopping and cooking are both tasks that put a wife into frequent proximity with food, and not everything that comes home from the store has to end up on the table. If food becomes a source of comfort, the increased time spent planning, buying, and preparing it can work to a wife's disadvantage. It is possible that even though the wives' conflict reports did not directly affect any outcome, they felt the conflict reported by their husbands, and the health disadvantage resulting from their role within the marriage had an impact on their BMI.

There is another way in which a conflicted marriage might work to create an even greater divergence between genders in the effect of conflict on BMI. Kemmer et al. (1998) found that partners had greater difficulty resisting food when they saw it enjoyed by their spouses. The scenario they portray is of a normal couple whose mutual guilt at indulging is assuaged by the partner's obvious delight. In a conflicted marriage, where time together is less companionable, those shared pleasures might not work to entice the husband to overeat. But the wife, still filling her food-related role, is exposed to continual temptations. Though these temptations are not guilt-reduced as in the Kemmer et al. (1998) study, they are nevertheless more frequently present for her than for her husband. It is feasible that she would gain more than the average married woman, while her husband, not enjoying the same enticement at meals as those in less troubled marriages, may gain less than the average married man, thus accentuating the gap in BMI change.

Exercise, commonly recognized as beneficial to weight control, is another area in which married men and women diverge. Most research into the impact of marriage on exercise habits indicates that married women lose more of the time that was available to them before marriage for exercise than their husbands do, and are less active than single women (Janzen & Cousins, 1995; Wood et al., 2007). In a conflict-heavy marriage, this hit could prove to be even more significant. It would be reasonable to assume that couples experiencing high conflict are not spending a lot of time "working out" together, and women, more than men, cite lack of an exercise partner as an impediment to physical activity (Burke et al., 1999).

All of these explanations establish a woman's predisposition to gain weight in a marriage high in conflict, but they still do not explain why the significant association between BMI and conflict was not in the direct effect, but in the transactional effect. What were those husbands who reported conflict in their marriage saying or doing at home that might have influenced their wives more significantly than the wives' own perceptions of the marriage?

The importance of the transactional effect for women (but not for men) may be due to another gender difference – women's greater responsiveness to relational nuances, particularly their reaction to negative marital functioning. It has been suggested that women act as a "barometer" of marital conflict, exhibiting higher levels of physiological change than husbands involved in the same interactions (Kiecolt-Glaser et al, 1993). In my study, it was the husbands who reported the marital conflict, but their wives who gained weight. It is possible the wives reacted to the attitudes and feelings expressed by their husbands, without necessarily agreeing with their husbands' assessments of the marriage. Kiecolt-Glaser, Glaser, Cacioppo, and Malarkey (1998) found the physiological responses to negative interaction were much stronger, and more persistent over time, in women than in men. Miller et al. (1999), coding affect in couples during conflict discussions, found significantly higher levels of anger and sadness in wives than in husbands. In the examples above, the physiological changes under examination were cardiovascular and immunologic responses to conflict; in my research, it was BMI. Somewhere between the heightened heart rate of the single conflict events discussed above and the increased BMI found in my own study, something is happening to the wives that is not happening to the husbands.

The explanation may begin with the wives' increased sensitivity to their husbands' feelings about the marriage, accentuated in all likelihood by the husbands' increased hostility in words and actions, particularly common responses to conflict in African American husbands (Broman, 2005; Bulanda & Brown, 2007; Orbuch et al., 2002). Growing awareness of her husband's dissatisfaction may cause the wife to turn to sources of gratification other than the relationship. My study included only couples who were still married three years after the initial interviews, so those wives (or husbands) who gave up and called it quits are not represented in the data. The data reflects, then, only those husbands and wives who found some way to cope with conflict within the confines of the marriage.

As already discussed, exercise tends to be less available for women, and is particularly less accessible for people in the poorer neighborhoods African Americans are more likely to occupy, since street crime is a concern and the safer exercise environment of a gym is not a ready option (CDC, 2009; Kahn, et al., 1991; Kuczmarski, 1992; Kumanyika, 1987; Lin, Huang, and French, 2004). Sedentary pursuits, on the other hand, don't require a pleasant companion or a safe neighborhood, so time may increasingly be spent on activities that burn few calories. Meanwhile, families still need to be fed, putting the wife in temptation's way over and over as she fills the role she has adopted. Her husband continues to express dissatisfaction, she continues to be sensitive to it, and the cycle continues. As weeks, months, and even years pass, it is clear how a wife's BMI can be vulnerable to a transactional effect in a way uniquely different from other health outcomes. In all cases, the women exhibited the greater, more enduring changes, but in the case of BMI, the change was associated with their husbands' reports of marital

conflict rather than their own, a transactional effect not present in the earlier studies mentioned.

This is only one of what I hope will be many studies investigating links between marital processes and obesity. It leaves many questions yet to be answered. Many of the strengths and limitations of this study are related to its being one of the first to use a dyadic model to explore the links between BMI and marital conflict in a longitudinal study of African Americans.

Strengths

One of the strengths of the study was that it opened a new area, examining marital conflict as a predictor of BMI. Current research into the links between obesity and marriage examine marital transitions, eating patterns, and exercise habits (Lee et al., 2005; Sobal et al., 2003; Stoebele & DeCastro, 2004; Wood et al., 2007), but in my search of the literature, I found nothing that linked marital conflict and BMI changes within person. This may, in part, be a function of the cross-sectional nature of many studies of marriage and health (Kiecolt-Glaser et al., 2002; Miller et al., 1999; Robles & Kiecolt-Glaser, 2003). Changes in blood pressure and heart rate can be measured and observed over the course of a single interview session, but changes in BMI take more time, and require a longitudinal study, such as the present one.

The longitudinal data I used gave me the opportunity to measure change and association over time, another contribution of my study. Many studies have verified the immediate physiological changes that take place during conflict. Only a longitudinal study can examine a long-term physiological change, like an alteration in BMI. By identifying marital conflict at the beginning of the study, and then returning to examine

changes in BMI three years later, I was able to study the association between marital conflict and a health outcome that requires time to manifest itself.

An additional strength of the study is its focus on an understudied population, African American married couples (Broman, 2005; Bryant et al., 2008; Orbuch et al., 2002). As cited earlier, the African American population has higher rates of obesity as well as higher rates of divorce (CDC, 2009; Broman, 1993, 2005; Bulanda & Brown, 2007; Dixon, 2009; Mackey & O'Brien, 1998; Orbuch et al., 2002; Renne, 1971). It is useless to wring our hands and bemoan the disadvantages suffered by African Americans without taking steps to help, and understanding the problem is a necessary early step. I believe a study that addresses both BMI and marital conflict in a 100% African American sample group is a much-needed contribution to our understanding of African American health and marriage.

As well as addressing some gaps in the existing body of knowledge, the study had other strengths specific to its design. One was the choice to take a dyadic approach to the topic of BMI and marital conflict. We marry a person, but we also marry an influence. What we feel, what we eat, how we spend our time, all are influenced by the most important person in our lives, our marital partner. To ignore that influence, and to seek results based on individuals (as if they exist independently of each other), is to leave out some of the most important chapters in the story. Few of the existing studies on marriage and health employ a dyadic design, and those that do, often focus on marriages where there is illness or disability, referring to spouses not as husbands and wives, but as support recipients and caregivers (Franks et al., 2004). We need to expand our vision of what we can find when we look at husbands and wives together. Despite the limited

number of existing design models, there have been successful dyadic studies on marital processes and health. For example, Wickrama and Bryant (2010) found both direct and transactional correlations between BMI and depressive symptoms in husbands and wives, using a dyadic approach. It can be difficult to recognize transactional effects, even in a longitudinal study, but with a dyadic model I was able to capture the influence of each spouse on their own and each other's BMIs, with results that identified the husband as the most influential person in the relationship between marital conflict and the wife's weight gain. This finding would have gone unnoticed in any study that did not employ a dyadic transactional study design, which allowed me to see a significant transactional effect.

Because of the range of data available, I was able to control for many of the factors already linked to BMI, such as income, education, age at marriage, hypertension and diabetes. I was also able to select a number of questions to develop a construct that would reliably identify levels of marital conflict.

Limitations

As stated earlier, the effects of marital conflict on BMI is best examined in a longitudinal study, and my own research was limited to only two waves of an ongoing three-wave study. Clearly, three years was sufficient for measurable changes in BMI, however, additional findings might result from another look when the third wave of the study is completed. Particularly if the reported conflict data is gathered in the second wave and compared to BMI changes both at Wave 2 and Wave 3, it might be possible to find some direct effects of conflict on BMI, as well as verify the transactional effects already identified. Non-linear associations may also be found with additional waves of data.

The study is somewhat limited in its applicability to other populations, as well, with an African American sample drawn entirely from one state, a sample established as being demographically representative nationally. Given the cultural and experiential differences discussed in the literature review, additional studies with European American and other ethnic groups would need to be done to see if results are replicable within those groups.

Certain limitations exist because of the exclusive use of self-reported data. Although previous studies show that self-reported measures marital conflict are reliable (Sanford, 2010), there may have been an undetermined margin of error in subjects' reluctance to report weight accurately in a face-to-face interview. Also, though previous studies support the use of self-reported marital conflict and BMI figures, it should be noted that all of the control variables (income, education, age at marriage, etc.) were also dependent on self-report.

The biggest limitation I felt in this study was using a data set not specifically developed for my investigation. Despite the thoroughness of the interview, there was no question about the birth of children in the time period between Wave 1 and Wave 2 of the study, making it impossible to control for childbirth-linked weight gain among women. Such a question could easily have been included, had the prospect of studying marital conflict and BMI been considered from the outset.

Implications for Future Research

Given the under-researched scope of interest of this study, I believe additional research should be directed toward marital conflict and Body Mass Index. While the findings of this study prove interesting, to my knowledge, this is the first study with these

results. A re-examination of the topic after the third wave of data is collected would help clarify existing results and might bring to light the direct effects that were missing from this study. Additionally, it is yet to be seen if similar results can be found in sample populations of other ethnicities. Studies of this nature should be conducted in a variety of populations. With the alarming statistics showing the prevalence of obesity still on the rise, studies establishing links between other marital processes and obesity should also be conducted.

Future studies on marital conflict, or any other marital process, and its relation to BMI, should be conducted with a dyadic model. Results of this study would have yielded no significant transactional associations if not for the dyadic study design. And while research on the rising obesity epidemic is not in short supply, current studies are not tapping into the dyadic relationships between husband and wife in regard to obesity. An individual's spouse is one of the most influential persons in his/her life. In my study, it was clear that wives' BMIs increased more than husbands' did, but without the dyadic design, there would have been no way of identifying the husbands' reports of marital conflict as significantly associated with that male-female variation in weight gain. More investigation needs to be done to reveal the mechanisms between the husbands' marital conflict reports construct and the wives' BMI change construct. Intermediate causal pathways may include, but are not limited to, links between husbands' conflict reports and wives' depressive symptoms, and links between wives' depression and their subsequent food and exercise behaviors. Marriage researchers have looked at the effects of obesity on marriage. Ignoring the flip side, the effects of marital processes on obesity,

is, in my opinion, a glaring omission, one that can only be addressed and corrected with dyadic studies.

Longitudinal studies of greater length would be an asset to the field of study, as well, and any research involving BMI should control for significant weight-altering medical conditions (illnesses such as diabetes or hypertension, both controlled for in this study, or pregnancy in women).

Conclusion

At the onset of this study, it was expected a number of transactional effects would confirm the influence of the marital relationship on BMI. The findings of this study, while not revealing any direct effects and only presenting one transactional effect between variables, is the beginning of an untold story. Much research remains to be done both to replicate and expand the findings of the current study, but it is significant to note that without a dyadic research design, no transactional effects between marital conflict and BMI would have been uncovered. More studies are needed to understand the root causes of obesity and the role marital conflict plays in an epidemic that threatens the African American population and the nation.

If future studies confirm associations between marital processes and BMI, public health officials should add improving marital relationships to their efforts to reduce the startlingly high cost of obesity. Organizations like the African American Healthy Marriage Initiative (AAHMI) sponsored by the US Department of Health & Human Services, or programs like the Alabama Community Healthy Marriage Initiative (ACHMI) Black Marriage Education are a good start.

For many years, the fight against obesity was waged by nutritionists and physical education teachers. Perhaps it is time to involve Marriage and Family Therapists in the battle. As the epidemic grows, it is clear that more needs to be done to address the serious dangers African Americans face from both obesity and marital conflict.

REFERENCES

Allen, T. D., & Armstrong, J. (2006). Further examination of the link between work-family conflict and physical health: The role of health-related behaviors. *American Behavior Scientist*, *49*, 1204-1221.

Allison, D. B., Fontaine, K. R., Manson, J. E., Stevens, J., & VanItallie, T. B. (1999). Annual deaths attributable to obesity in the United States. *The Journal of the American Medical Association*, *282*, 1530-1538.

Anderson, A. S., Marshall, D. W., & Lea, E. J. (2004). Shared lives–an opportunity for obesity prevention? *Appetite*, *43*, 327-329.

Balag, P., Janszky, I., Leineweber, C., Blom, M., Wamala, S. P., & Orth-Gomer, K. (2003). Depressive symptoms in relation to marital and work stress in women with and without coronary heart disease. The Stockholm female coronary risk study. *Journal of Psychsomatic Research*, *54*, 113-119.

Broman, C. L. (1993). Race differences in marital well-being. *Journal of Marriage and the Family*, *55*, 724-732.

Broman, C. (2005). Marital quality in black and white marriages. *Journal of Family Issues*, *26*, 431-441.

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research, 21,* 230-258.

Bryant, C., M., Taylor, R. J., Lincoln, K. D., Chatters, L. M., & Jackson, J. S. (2008). Marital satisfaction among African Americans and Black Caribbeans: Findings from the National Survey of American Life. *Family Relations*, *57*, 238-253.

Bulanda, J., & Brown, S. (2007). Race-ethnic differences in marital quality and divorce. *Social Science Research*, *36,* 945-967.

Burke, V., Giangiulio, N., Gillam, H. F., Beilin, L. J., Houghton, S., & Milligan, R. A. K. (1999). Health promotion in couples adapting to a shared lifestyle. *Health Education Research: Theory & Practice, 14,* 269-288.

Burman, B., & Margolin, G. (1992). Analysis of the association between marital relationships and health problems: An interactional perspective. *Psychological Bulletin*, *112*, 39-63.

Carmines, E., & McIver, J. (1981). Analyzing models with unobserved variables: Analysis of covariance structures. In G. Bohrnstedt and E. Borgatta (eds.), *Social Measurement: Current Issues*. Sage, Beverly Hills, CA. Pp. 61-73.

Carpenter, W. H., Fonong, T., Toth, M. J., Ades, P. A., Calles-Escandon, J., Walston, J. D., & Poehlman, E. T. (1998). Total daily energy expenditure in free-living older African-Americans and Caucasians. *American Journal of Physiology*, *70,* 96-101.

Carroll, G. (1998). Mundane extreme environmental stress and African American families: A case for recognizing different realities. *Journal of Comparative Family Studies, 29,* 271-284.

Centers for Disease Control and Prevention (2009). Differences in prevalence of obesity among Black, White, and Hispanic Adults – United States, 2006-2008. *Morbidity*

and Mortality Weekly Report, *58*, 740-744. Retrieved July 19, 2009, from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5827a2.htm.

Cherlin, A. J. (1992). *Marriage, divorce, remarriage* (revised and enlarged ed.). Cambridge, MA: Harvard University Press.

Choi, H., & Marks, N. F. (2008). Marital conflict, depressive symptoms, and functional impairment. *Journal of Marriage and Family*, *70*, 377-390.

Cockerham, W. C. (1995). *Medical Sociology*. Englewood Cliffs, NJ: Prentice Hall.

Conger, R. D. & Elder, G. H., Jr. (1994). Families in troubled times. New York: Aldine De Gruyter.

Dixon, P. (2009). Marriage among African Americans: What does the research reveal? *Journal of African American Studies*, *13,* 29-46.

Dopp, J. M., Miller, G. E., Myers, H. F., & Fahey, J. L. (2000). Increased natural killer-cell mobilization and cytotoxicity during marital conflict. *Brain, Behavior, and Immunity*, *14*, 10-26.

Eid, J., Overman, H. G., Puga, D, & Turner, M. A. (2008). Fat city: Questioning the relationship between urban sprawl and obesity. *Journal of Urban Economics*, *63*, 385-404.

Eng, P. M., Kawachi, I., Fitzmaurice, G., & Rimm, E. B. (2005). Effects of marital transitions on changes in dietary and other health behaviors in US male health professionals. *Journal of Epidemiology & Community Health*, *59*, 55-62.

Fekete, E. M., Stephens, M. A. P., Druley, J. A., & Greene, K. A. (2006). Effects of spousal control and support on older adults' recovery from knee surgery. *Journal of Family Psychology*, *20,* 302-310.

Ferraro, K. F., & Farmer, M. M. (1996). Double jeopardy to health hypothesis for African Americans: Analysis and critique. *Journal of Health and Social Behavior*, *37*, 27-43.

Flegal, K. M., Graubard, B. I., Williamson, D. F., & Gail, M. H. (2007). Cause-specific excess deaths associated with underweight, overweight, and obesity. *Journal of the American Medical Association*, *298*, 2028-2036.

Franks, M. M., Wendorf, C. A., Gonzalez, R., & Ketterer, M. (2004). Aid and influence: Health-promoting exchanges of older married partners. *Journal of Social and Personal Relationships*, *21*, 431-445.

French, S. A., Story, M., & Jeffery, R. W. (2001). Environmental influences on eating and physical activity. *Annual Review of Public Health*, *22*, 309-335.

Goldman, N. (1993). Marriage selection and mortality patterns: Inferences and fallacies. *Demography*, *30*, 189-208.

Hong, T. B., Franks, M. M., Gonzalez, R., Keteyian, S. J., Franklin, B. A., & Artinian, N. T. (2005). A dyadic investigation of exercise support between cardiac patients and their spouses. *Health Psychology*, *24*, 430-434.

Jacobson, P., Torgerson, J. S., Sjostrom, L., & Bouchard, C. (2006). Spouse resemblance in body mass index: Effects on adult obesity prevalence in the offspring generation. *American Journal of Epidemiology, 165,* 101-108.

Janzen, W. & O'Brien-Cousins, S. (1995). "I do" or don't: Marriage, women, and physical activity throughout the lifespan. *Journal of Women & Aging*, *7*, 55-70.

Jeffery, R. W., & Rick, A. M. (2002). Cross-sectional and longitudinal association between body mass index and marriage-related factors. *Obesity Research*, *10*, 809-815.

Jeffery, R. W., & Utter, J. (2003). The changing environment and population obesity in the United States. *Obesity Research*, *11*, 12S-22S.

Johnson, C. L., & Barer, B. M. (1990). Families and networks among older inner-city blacks. *The Gerontologist*, *30,* 726-733.

Joreskog, K. G., & Sorbom, D. (1984). Recent developments in structural equation modeling. *Journal of Marketing Research, 19,* 404-416.

Joung, I. M. A., Van de Mheen, H. D., Stronks, K., Van Poppel, F. W. A., & Mackenbach, J. P. (1998). A longitudinal study of health selection in marital transitions. *Social Science & Medicine*, *46*, 425-535.

Kahn, H. S., & Williamson, D. F. (1991). Is race associated with weight change in US adults after adjustment for income, education, and marital factors? *American Journal of Clinical Nutrition*, *53,* 1566S-70S.

Kahn, H. S., Williamson, D. F., & Stevens, J. A. (1991). Race and weight change in US women: The roles of socioeconomic and marital status. *American Journal of Public Health, 81,* 319-323.

Kemmer, D., Anderson, A. S., & Marshall, D. W. (1998). Living together and eating together: changes in food choice and eating habits during the transition from single to married/cohabiting. *Sociological Review, 46,* 48-72.

Kiecolt-Glser, J. K., Glaser, R., Cacioppo, J. T., & Malarkey, W. B. (1998). Marital stress: Immunologic, neuroendocrine, and autonomic correlates. *Annals of the New York Academy of Science, 840,* 656-663.

Kiecolt-Glaser, J., K., Loving, T. J., Stowell, J. R., Malarkey, W. B., Lemeshow, S., Dickinson, S. L., & Glaser, R. (2005). Hostile marital interactions, proinflammatory cytokine production, and wound healing. *Archives of General Psychiatry*, *62*, 1377-1383.

Kiecolt-Glaser, J. K., Malarkey, W. B., Chee, M. A., Newton, T., Cacioppo, J. T., Mao, H. Y., & Glaser, R. (1993). Negative behavior during marital conflict is associated with immunological down-regulation. *Psychosomatic Medicine*, *55*, 395-409.

Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Emotions, morbidity, and mortality: New perspectives from psychoneuroimmunology. *Annual Review of Psychology*, *53*, 83-107.

Kiecolt-Glaser, J. K., & Newton, T. L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127*, 472-503.

Kimbro, R. T., Bzostek, S., Goldman, N., & Rodriguez, G. (2008). Race, ethnicity, and the education gradient in health. *Health Affairs, 27,* 361-372.

Knox, S. S., & Uvnas-Moberg, K. (1998). Social isolation and cardiovascular disease: An arthrosclerotic pathway? *Psychoneuroendocrinology*, *23*, 877-890.

Kotchen, T. A. (2008). Obesity-related hypertension? *Hypertension, 52:*801.

Kuczmarski, R. J. (1992). Prevalence of overweight and weight gain in the United States. *American Journal of Clinical Nutrition*, *55*, 495S-502S.

Kumanyika, S. K. (1987). Obesity in black women. *Epidemiologic Reviews*, *9*, 31-50.

Kumanyika, S. K. (1993).Special issues regarding obesity in minority populations. *Annals of Internal Medicine*, 19*,* 650-654.

Kurdek, L. A. (1991). Marital stability and changes in marital quality in newlywed couples: A test of the contextual model. *Journal of Social and Personal Relationships, 8,* 27-48.

Lee, S., Cho, E., Grodstein, F., Kawachi, I., Hu, F. B., & Colditz, G. A. (2005). Effects of marital transitions on changes in dietary and other health behaviors in US women. *International Journal of Epidemiology*, *34*, 69-78.

Leonard, K. E. & Mudar, P. (2003). Peer and partner drinking and the transition to marriage: A longitudinal examination of selection and influence processes. *Psychology of Addictive Behaviors*, *17,* 115-125.

Light, K. C., Grewen, K. M., & Amico, J. A. (2004). More frequent partner hugs and higher oxytocin levels are linked to lower blood pressure and heart rate in premenopausal women. *Biological Psychology*, *69,* 5-21.

Lillard, L. A., & Waite, L. J. (1995). 'Til death do us part: Marital disruption and mortality. *American Journal of Sociology*, *100*, 1131-1156.

Lin, B. A., Huang, C. L., & French, S. A. (2004). Factors associated with women's and children's body mass indices by income status. *International Journal of Obesity*, *28, 536-542.*

Lipowicz, A., Gronkiewicz, S., & Malina, R. M. (2002). Body mass index, overweight and obesity in married and never married men and women in Poland. *American Journal of Human Biology*, *14*, 468-475.

Mackey, R. A., & O'Brien, B. A. (1998). Marital conflict management: Gender and ethnic differences. *Social Work, 43,* 128-141.

Malarkey, W. B., Kiecolt-Glaser, J. K., Pearl, D., & Glaser, R. (1994). Hostile behavior during marital conflict alters pituitary and adrenal hormones. *Psychosomatic Medicine*, *56*, 41-51.

Manne, S., & Glassman, M. (2000). Perceived control, coping efficacy, and avoidance coping as mediators between spouses' unsupportive behaviors and cancer patients' psychological distress. *Healthy Psychology*, *19*, 155-164.

Marshall, D. W., & Anderson, A. S. (2002). Proper meals in transition: Young married couples on the nature of eating together. *Appetite, 39,* 193-206.

Merkus, M. P., Mathus-Vliegen, L. M. H., Broekhoff, C., & Heijnen, A. M. P. (1995). Extreme obesity: Sociodemographic, familial and behavioural correlates in The Netherlands. *Journal of Epidemiology and Community Health*, *49*, 22-27.

Miller, G. E., Dopp, J. M., Myers, H. F., Stevens, S. Y., & Fahey, J. L. (1999). Psychosocial predictors of natural killer cell mobilization during marital conflict. *Health Psychology*, *18*, 262-271.

Monden, C. (2007). Partners in health? Exploring resemblances in health between partners in married and cohabiting couples. *Sociology of Health & Illness*, *29*, 391-411.

Orbuch, T. L., Veroff, J., Hassan, H., & Horrocks, J. (2002). Who will divorce: A 14-year longitudinal study of black couples and white couples. *Journal of Social and Personal Relationships*, *19,* 179-202.

Pereira, M. A., Folsom, A. R., McGovern, P. G., Carpenter, M., Arnett, D. K., Liao, D. . . . Hutchinson, R. G. (1999). Physical activity and incident hypertension in black and white adults: The atherosclerosis risk in communities study. *Preventive Medicine, 28,* 304-312.

Raley, R. K. (1996). A shortage of marriageable men? A note on the role of cohabitation in Black-White differences in marriage rates. *American Sociological Review*, *61*, 973-983.

Rand, C. S. W., & Macgregor, A. M. C. (1991). Successful weight loss following obesity surgery and the perceived liability of morbid obesity. *International Journal of Obesity, 15*, 577-9.

Ren, X. S., Amick, B., & Williams, D. R. (1999). Racial/ethnic disparities in health: The interplay between discrimination and socioeconomic status. *Ethnicity and Health, 9,* 151-165.

Renne, Karen S. (1971). Health and marital experience in an urban population. *Journal of Marriage and Family*, *33*, 338-350.

Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: Pathways to health. *Physiology & Behavior*, *79*, 409-416.

Ross, E. C., Mirowsky, J., & Goldsteen, K. (1990). The impact of the family on health: The decade in review. *Journal of Marriage and the Family, 52,* 1059-1078.

Sandberg, J. G., Miller, R. B., Harper, J. M., Robila, M., & Davey, A. (2009). The impact of marital conflict on health and health care utilization in older couples. *Journal of Health Psychology*, *14*, 9-17.

Sanford, K. (2010). Assessing conflict communication in couples: Comparing the validity of self-report, partner-report, and observer ratings. *Journal of Family Psychology, 24,* 165-174.

Sarlio-Lahteenkorva S., & Lahelma, E. (1999). The association of body mass index with social and economic disadvantage in women and men. *International Journal of Epidemiology*, *28*, 445-449.

Scalco, A. Z., Scalco, M. Z., Azul, J. B. S., & Neto, F. L. (2005). Hypertension and depression. *Clinics, 60,* 241-150.

Simon, R. W. (2002). Revisiting the relationships among gender, marital status, and mental health. *American Journal of Sociology, 4*, 1065-1096.

Slentz, C. A., Duscha, B. D., Johnson, J. L., Ketchum, K., Aiken, L. B., Samsa, G. P., Kraus, W. E. (2004). Effects of the amount of exercise on body weight, body composition, and measures of central obesity. *Arch Intern Med, 164,* 31-39.

Smith, R. (2006). *In sickness and in health: An examination of marital status and obesity in the United States.* Unpublished senior honor thesis, Ohio State University, Columbus.

Sobal, J. (2001). Social and cultural influences on obesity. In P. Bjorntorp (Ed.), *International Textbook of Obesity* (pp.305-322). New York: John Wiley & Sons Ltd.

Sobal, J., & Rauschenbach, B. S. (2003). Gender, marital status, and body weight in older U.S. adults. *Gender Issues*, *21*, 75-94.

Sobal, J., Rauschenbach, B. S., & Frongillo, E. A. (1992). Marital status, fatness and obesity. *Social Science & Medicine*, *35*, 915-923.

Sobal, J., Rauschenbach, B. S., & Frongillo, E. A. (2003). Marital status changes and body weight changes: A US longitudinal analysis. *Science & Medicine*, *56*, 1543-1555.

Spanier, G. B., & Glick, P. C. (1980). Mate selection differentials between whites and blacks in the United States. *Social Forces*, *58*, 707-725.

Stoebele, N. & DeCastro, J. M. (2004). Effect of ambience on food intake and food choice. *Nutrition*, *20*, 821-838.

Straus, M. A., et al. (1996). The revised conflict tactics scales (CTS2): Developmental and preliminary psychometric data. *Journal of Family Issues, 17,* 283-316.

Thompson, K. A., Parahoo, K. P., McCurry, N., O'Doherty, E., & Doherty, A. M. (2004). Women's perceptions of support from partners, family members and close friends for smoking cessation during pregnancy – combining quantitative and qualitative findings. *Health Education Research: Theory & Practice*, *19,* 29-39.

Trovato, F., & Lauris, G. (1989). Marital status and mortality in Canada. *Journal of Marriage and Family*, *51*, 907-922.

Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior*, *28,* 306-319.

Umberson, D. (1992). Gender, marital status and the social control of health behavior. *Social Science & Medicine*, *34*, 907-917.

Umberson, D., Liu, H., & Powers, D. (2009). Marital status, marital transitions, and body weight. *Journal of Health and Social Behavior*, *50,* 327-343.

U.S. Census Bureau. (1998). Household income at record high; Poverty declines in 1998. *Ecnomics and Statistics Bureau,* September 1999.

Verheijden, M. W., Bakx, J. C., van Weel, C., Koelen, M. A., & van Staveren, W. A. (2005). Role of social support in lifestyle-focused weight management interventions. *European Journal of Clinical Nutrition, 59,* S179-S186.

Waldron, I., Hughes, M. E., & Brooks, T. L. (1996). Marriage protection and marriage selection – prospective evidence for reciprocal effects of marital status and health. *Social Science & Medicine*, *43*, 113-123.

Waldron, I., Weiss, C. C., & Hughes, M. E. (1997). Marital status effects on health: Are there differences between never married women and divorced and separated women? *Social Science & Medicine*, *45,* 1387-1397.

Wickrama, T. & Bryant, C. (2010). Association between BMI and depressive symptoms of African American married couples: Mediating and moderating couples' behavioral closeness. *Journal of Family Issues,* under review.

Willett, W. C., Dietz, W. H., & Colditz, G. A. (1999). Guidelines for healthy weight. *New England Journal of Medicine, 341,* 427-434.

Williams, D. R. (1998). African-American health: The role of the social environment. *Journal of Urban Health: Bulletin of the New York Academy of Medicine, 75,* 300-321.

Williams, D. R., Neighbors, H. W., & Jackson, J. S. (2003). Racial/ethnic discrimination and health: Findings from community studies. *American Journal of Public Health, 93,* 200-208.

Williams, D. R., & Williams-Morris, R. (2000). Racism and mental health: The African American experience. *Ethnicity and Health, 5,* 243-268.

Wood, R. G., Goesling, B., & Avellar, S. (2007, June 19). *The effect of marriage on health: A synthesis of recent research evidence.* Retrieved July 22, 2009, from http://secure.psychoanalyticce-credit.com/articles/101236/marriagehealth.pdf.