Body Weight Perceptions and Weight Control Behavior Among Adult Bermudians

Kyla J. Raynor

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BODY WEIGHT PERCEPTIONS AND WEIGHT CONTROL BEHAVIOR
AMONG ADULT BERMUDIANS

By
Kyla J. Raynor

A Dissertation in Partial Fulfillment of the Requirements for the
Degree of Doctor of Public Health in Health Education

June 2009
Each person whose signature appears below certifies that this dissertation, in his/her opinion, is adequate in the scope and quality as a dissertation for the degree of Doctor of Public Health.

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ABSTRACT OF THE DISSERTATION

Body Weight Perceptions and Weight Control Behavior among Adult Bermudians

by

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Doctor of Public Health Candidate in Health Education

Loma Linda University, 2009

Naomi Modeste, DrPH, CHES, Chair

Background. Overweight and obesity is a serious public health concern that has major consequences on health and quality of life. As of 2006, 64% of adults in Bermuda were overweight or obese. There remains a gap in the literature related to how adult Bermudians perceive their body weight and body image, and if perceptions of being overweight or obese are associated with weight control behaviors.

Purpose. This study was undertaken to develop a better understanding of the perceptions of ideal body weight, level of overweight, body image and weight control behavior in adult Bermudians.

Methodology. This was a cross-sectional observational study of perceptions of ideal body weight, overweight, body image and weight control behavior obtained by a self-administered questionnaire of 462 (207 males, 255 females) adult Bermudians. Items on perceptions of ideal weight and overweight were taken from the United Kingdom Office of National Statistics Omnibus Survey, and perceptions of body image were assessed using the Contour Drawing Rating Scale. Weight control behaviors were assessed using the Weight Control Behavior Scale.
Results. Among participants, 25.5% of men and 24.9% of women had a BMI in the normal range. More men (41.7%) were overweight compared to women (31.2%); while more women (43.9%) were obese, compared to 32.8% of men (p<.05). Normal weight men were more likely (90.4%) to accurately categorize themselves as normal weight when compared to women (84.5%), however, women were more likely to accurately perceive themselves as overweight (92.2%), compared to men (90.2%) (p<.001).

Based on reports of ideal weight, the ideal BMI selected by women (mean BMI=24.5) was significantly lower than the ideal BMI indicated by men (mean BMI =25.9) (p<.001). The mean perceived ideal body image for men (mean=5.46) corresponded to a normal body size, while the average ideal body image for women (mean= 4.17) corresponded to an underweight body size, both of which were significant (p<.001).

Significantly more women (79.8%) tried to lose weight in the past year compared to 54.6% of men [$\chi^2 (1, N=443) = 32.14, p<.001$]. Among normal weight participants’ who were accurate in categorization of their body weight as normal, significantly more women (58.7%) tried to lose weight in the past year compared to men (14.3%) [$\chi^2 (1, N=119)= 18.47, p<.001$].

Independent predictors such as age, gender, education, perceived susceptibility, perceived severity, perceived benefits, and perceived self-efficacy were significantly associated with ideal-current body weight discrepancy, and weight control behaviors.

Implications for Health Education. The results of this study are important given the current obesity epidemic in Bermuda and worldwide. These findings may provide new information about how adult Bermudians perceive their body weight, overweight,
body image and behaviors used to control weight. This study will add to the existing literature regarding weight perceptions and obesity and will provide data that may have important implications in the development of obesity related interventions.
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DEDICATION

This doctorate dissertation is dedicated to my grandparents, Howard & Virginia Raynor and Alfred & Cecily Seaman.
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CHAPTER 1
INTRODUCTION

A. Statement of the Problem

Worldwide, approximately 1 billion adults or 16.6% of the 6 billion population are overweight, of which at least 300 million (5%) of those are obese (World Health Organization, 2003). The obesity rate has significantly increased in North America, the United Kingdom, Eastern Europe, the Middle East, Pacific Islands, China and the Caribbean. A steady growth in obesity is occurring among adults in Bermuda as well. According to the Bermuda Department of Health as of 2006, 64% of adults were overweight or obese, an increase of 7% since 1999 (Government of Bermuda, 2007). Being overweight or obese is of particular concern because of the increased risk of premature death due to chronic health conditions associated with being overweight and obese such as cardiovascular disease, type 2 diabetes, hypertension, stroke and some forms of cancer (Thompson, Edelsberg, Colditz, Bird, & Oster, 1999).

Body mass index (BMI) is a common indicator of total body fat and is related to the risk of disease and death. BMI is based on a person’s weight relative to their height and is calculated as weight in kg/height(m2). For adults in the United States, the desirable BMI range is from 18.5-24.5. A BMI of 25 to 29.9 is defined as overweight and a BMI greater than 30 is defined as obese (National Institutes of Health, 1998). While BMI is commonly used to assess total body fat, there are limitations with its use: 1) it may overestimate body fat in athletes and others who have a muscular build and; 2) it may underestimate body fat in older persons and
others who have lost muscle mass (National Institutes of Health, 1998). Waist-to-hip ratio (WTHR) may be a more accurate method than waist circumference and BMI in evaluating risk for diabetes and heart disease (Ryan, Fenster-Farin, Abbasi, & Reaven, 2008; Hu, Tuomilehto, Silventoinen, Sarti, Mannisto, & Jousilahti, 2007). This is because health status is affected by not just how much fat a person has, but also by how the fat is distributed. People with more weight around their waist are at greater risk of lifestyle related diseases such as heart disease and diabetes than people with weight around their hips (National Institutes of Health, 2008). Research indicates that excessive visceral fat may be associated with increased metabolic activity, insulin resistance and other metabolic risk factors for coronary heart disease (Klein, 2004).

The healthy body fat range is about 13-21% for men and 23-31% for women (National Institutes of Health, 1998). Percent body fat as determined by the percentage of total body weight that is fat, is the best indicator of overweight and obesity (Gallagher, Heymsfield, Heo, Jebb, Murgatroyd, & Sakamoto, 2000). Until recently, with the use of bioelectrical impedance instruments, this was difficult to assess in non-clinical samples (Jebb, Cole, Doman, Murgatroyd, & Prentice, 2000). Additionally, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) (2004) report that women with waist-to-hip ratios of more than 0.8 and men with waist-to-hip ratios of more than 1.0 are at increased health risk because of their fat distribution.

Both BMI and WTHR provide an idea of whether an individual’s BMI combined with waist and hip circumference increases his or her risk for developing obesity related diseases or conditions. In Bermuda, the National Institutes of Health
(1998) reference categories for BMI, percent body fat and WTHR are likely to be used.

Body weight perception is defined as how an individual perceives his or her weight appropriateness. Actual body weight relative to height, as reflected by BMI, is one of many factors that shape how individuals perceive their weight. If someone does not have an accurate perception of body weight or does not realize that being overweight or obese presents a health problem, he or she is less likely to maintain or lose weight (Steenhuis, Bost, & Mayer, 2006). Beliefs concerning an ideal body weight and what constitutes overweight are often significantly different from standards of U.S. health authorities. Paeratakul, White, Williamson, Ryan, and Bray (2002) found that among normal weight individuals, 18% reported that they were overweight, while 60% of overweight and 87% of obese individuals reported that they were overweight. Results from another study found that women report a lower BMI as the ideal and are more likely than men to perceive themselves as overweight, even if they are of normal weight, whereas men are more likely to perceive themselves as normal weight when they are actually overweight (Crawford & Campbell, 1999).

Discrepancies in body weight perceptions among adults may be responsible for behaviors leading to chronic health conditions seen in some populations. For example, normal weight individuals who perceive themselves as being overweight may be prone to unhealthful behaviors such as unnecessary dieting and binge eating. On the other hand, overweight people may believe they are normal weight and may not think they need to control their weight and/or that they are at risk for obesity.
An awareness of these discrepancies is important in evaluating the impact of current public health messages regarding healthy weight, and to better target weight-related initiatives.

The prevalence of obesity-related misperceptions may vary across socioeconomic class, gender, and race. Obesity is associated with low socioeconomic status such that people of low socioeconomic status may be more susceptible to becoming overweight or obese when compared to those of higher socioeconomic status. Studies show that women of a higher socioeconomic status (SES) tend to have a lower risk of obesity than lower SES women (Wardle & Johnson, 2002). Schieman et al. (2007) reported that Black women of low SES were heavier than high SES Black women and White women of all SES levels, and that low SES women perceive heavier body types as more attractive. Weight misperception is most common among Blacks and women. Authors of one study reported that overweight Black men and women were twice as likely as Whites to underestimate current body weight, and obese Black adults were even more likely to underestimate weight status. The prevalence of underestimation of body weight was highest among overweight Black women (40.9%) compared to overweight White women (20.6%), and Black men (66.4%) compared to (43.2%) overweight White men (Bennett & Wolin, 2006).

Overall, these findings suggest that Blacks may underestimate their weight more often, compared with Whites.

The literature suggests that body image may be more of a concern for Blacks than Whites. In one study (Smith, Thompson, Raczynski, & Hilner, 1999), Blacks were more devoted to their appearance than Whites and women were more concerned
about their appearance than men. Women were more dissatisfied with size and overall appearance than men. Sociocultural norms of thinness may be responsible for determining body image within cultures (Padgett & Biro, 2003). The differences in how Blacks and Whites see their bodies and how they feel about their bodies may affect how they respond to weight changes and weight control. Unlike White females, who more often prefer thin bodies as their cultural ideal, Black women report that those ideals of thinness do not relate to them (Fitzgibbon, Blackman, & Avellone, 2000). Black adolescent girls and adult women indicate less social pressure to be slim, less dissatisfaction with body size and weight, a greater acceptance of overweight, and a preference for a larger body shape than do Whites (Boyington, Carter-Edwards, Piehl, Hutson, Langdon, & McManus, 2008; Mitola, Papas, Le, Fusillo & Black, 2007).

Overweight and obesity continues to grow at a steady rate among Bermudians. Studies of the adult Bermuda population have focused on quantifying the amount of overweight and obesity. Currently there is little available information concerning adult Bermudians body weight perceptions and weight control behavior, and how these perceptions compare to the health standards. The knowledge on body weight perceptions and weight control behavior obtained from this study will have important implications in the development of obesity related interventions in this population.

B. Purpose of the Study

The purpose of this study was to determine perceptions of ideal body weight, level of overweight, body image and weight control behavior among adult Bermudians, and to provide a clearer comprehension of the significance of
perceptions in determining weight status and performance of weight control behaviors. Discrepancies between ideal body weight perceptions and current body weight were identified.

C. Research Questions

1. What do adults living in Bermuda perceive as their ideal body weight, level of overweight and ideal body image and do differences exist for these variables between men and women?

2. Is there a discrepancy between adult Bermudians perceptions of their ideal body weight, their current body weight and what medical guidelines indicate their weight should be, and are there differences between men and women?

3. If weight discrepancies exist or if adult Bermudians perceive they have a weight problem, what measures, if any, are they taking to control their weight?

4. Do the health belief model variables of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and perceived self-efficacy explain the relationship between ideal and current body weight discrepancy and weight control behavior?

Note: When body weight or overweight is discussed it refers to ideal body weight-for-height.

D. Theoretical Framework

The health belief model (HBM) is a psychosocial model that explains and predicts preventive health behaviors. This is done by focusing on the effects of beliefs on health and the decision process in making behavioral choices. Based on the model,
people will take action to prevent, screen for, or control ill-health conditions if they feel they are susceptible to the condition (perceived susceptibility), if they believe it would have potentially serious consequences (perceived seriousness), if they believe that a course of action available to them would be beneficial in reducing their susceptibility or severity of the condition (perceived benefits), if they believe that the anticipated barriers to taking action are outweighed by its benefits (perceived barriers), and if they have the conviction to successfully execute the behavior required to produce the outcome (self efficacy) (Janz, Champion & Strecher, 2002). The model also includes the variables of cues to action, and mediating factors such as age and gender.

Behavior change models are important in identifying factors related to performing weight control behaviors and ultimately preventing overweight and obesity. The health belief model has been applied to varying populations, health conditions and interventions. However there is limited research on applying the health belief model to weight perceptions and weight management. Lambert et al. (2005) used a group of overweight and obese postpartum participants in the Women, Infants, and Children (WIC) program to determine weight loss practices. Concepts from the health belief model served as the basis for questions related to experiences and attitudes of participants. Key findings of the study suggest that individuals may not perceive their own susceptibility to or severity of risk from being overweight or obese to the extent that it would motivate that person to take action. Because individuals make changes if they believe that their health is at risk and their current behavior could have serious consequences, Lambert et al recommend emphasizing
the risk and severity of the medical conditions and health complications that can occur from being overweight or obese.

The problems involved in modifying lifelong weight control behaviors are more difficult than those for accepting a one-time immunization or a screening test. In weight control initiatives, emphasizing the risks of obesity-related health problems may not directly affect behavior, as weight control behavior may be motivated more by social consequences and a concern for appearance, rather than health concerns. Modifying weight control behaviors requires confidence that a person can alter lifestyle behaviors before change is possible. For example, in order for a successful change to occur a person must feel threatened by his/her current behavior (perceived susceptibility and severity), and believe that a specific change will benefit him/her and be confident that he/she is able to implement that change (self-efficacy).

Another author used the health belief model in a weight management study (Kelly, 2005). The model was applied to health related changes occurring when a person has interest in and concern about his or her personal health, perceiving both a personal vulnerability to a particular health threat and potential negative consequences if change did not occur. The main finding related to the health belief model indicates that if a person’s health beliefs do not support the management of overweight and obesity, he or she is less likely to achieve and maintain weight loss. They also found that motivation to participate in the weight-loss program was positively related to staying in the program and losing weight, as opposed to maintaining weight loss.
An author of another study on the health belief model and weight loss proposed that people will be motivated to lose weight if they believe that it will decrease their likelihood of contracting a life-threatening disease, that specific behaviors will yield significant weight loss, and that people must feel confident they are able to perform the behaviors (Nejad, Wertheim, & Greenwood, 2005). The researchers reported that participants’ intention to diet was moderately to highly associated with all health belief model variables except perceived susceptibility. However, the variables of perceived benefits and susceptibility were important and explained 29.1% of the variance in follow-up dieting and 19% in the variance in fasting behaviors (Nejad, Wertheim, & Greenwood, 2005).

Constructs of the HBM model was applied in this study to assess perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy and sociodemographic factors (modifying factors) in determining the likelihood of action (i.e., weight control behavior)(see Figure 1). The construct ‘cues to action’ was not evaluated. The concept of cues which trigger action may prove to be important in designing interventions; however, they have not been systematically studied in the context of weight control.

According to the HBM, the theoretical framework in Figure 1 (p. 10) shows that one’s subjective perception of the risk of becoming overweight or obese (susceptibility) determines whether or not that person feels they need to engage in weight control behavior, such as dieting or exercise. Feelings concerning the severity (seriousness) of becoming overweight/obese or of not getting treatment include evaluations of medical consequences (e.g., disability, death, pain) and social
consequences (e.g., effects of obesity on work, family life, and social relations). A combination of perceived susceptibility and severity are known as perceived threat: the greater the perceived threat, the greater the likelihood of taking action such as performing weight loss behaviors. In addition, weight control practices will be implemented depending on the individual’s beliefs regarding the benefits of those behaviors (perceived benefits). The potential negative aspects of participating in weight control behaviors, perceived barriers, may act as impediments to practicing weight control. Lastly, a person’s decision on whether or not to implement weight control is determined by the level of confidence they have in their ability to carry out weight control practices successfully.

According to Strecher and Rosenstock (1997), when susceptibility and severity are combined, they provide the force to act, and the perception of benefits (and fewer barriers) provides a path of action. Other variables such as demographic, sociopsychological, and structural variables may affect perceptions and indirectly influence weight control behaviors. Sociodemographic factors such as income, age, gender, race and educational attainment are believed to have an indirect effect on weight control behavior by influencing the perception of susceptibility, severity, benefits, and barriers (Figure 1). The primary motivation to change may be body image appearance or the level of perceived threat or risk of a specific condition (obesity), and the primary resource for change is self-efficacy or confidence to make the change to lose or maintain a healthy weight. Self-efficacy beliefs influence how people feel and think about weight control, and it is these beliefs that motivate an individual to initiate and maintain weight control practices (Bandura, 1994). In order
to initiate or maintain weight control behavior such as dieting and exercise, an individual must feel they are competent to implement the change.

Figure 1. Application of the Health Belief Model to Body Weight Perceptions and Weight Control Behavior

The HBM has been used to explain beliefs and perceptions in various health conditions and within different populations. Research provides support for applying HBM to understand factors related to smoking cessation, safe sex practices and in exercise and nutrition behaviors. Little is known about how the adult Bermuda
population perceives their body image, susceptibility and severity to becoming overweight or obese; how they view the benefits and barriers of weight control behaviors; and if they have the confidence (self-efficacy) to implement weight control behaviors. Use of the HBM in this study enabled us to better comprehend perceptions, beliefs and behavior involved in weight control in the Bermuda population.

**E. Significance to Health Education**

Overweight and obesity are key risks to health. The increasing rates of overweight and obese adults in Bermuda have led to calls for more effective health education on the risks of overweight and obesity. Failure to recognize overweight or obesity may perpetuate a false sense of security around health and contribute to the persistence of unhealthy lifestyles. If people do not recognize that they are overweight or obese, or do not recognize that being overweight or obese is a health threat, strategies that promote lifestyle changes are not likely to be successful.

This study offers the potential for health educators to become more aware of body weight perceptions and weight control behavior, of which there is limited data especially among this population. The results of this research are expected to assist health educators in creating culturally appropriate programs that aim at correcting perceptions of weight and body image and promoting healthy weight control behaviors. It is our hope that the incidence of chronic diseases associated with being overweight and obese will decrease in this population as more education and proficiency in weight loss and weight maintenance become available.
F. Operational Definitions

The following operational definitions of the variables were applied:

**Body fat percentage:** the percentage of total body weight that is fat assessed using a Tanita scale and reported by percent. For women, the acceptable percent body fat range is 23-31%, a body fat percent between 31.1-36.9 is overweight, a percent body fat greater than 37 is considered obese (National Institutes for Health, 1998). For men, the acceptable percent body fat range is 13-21%, a body fat percent between 21.1-24.9 is overweight, a percent body fat greater than 25 is considered obese.

**Body Mass Index (BMI):** a calculation of weight based on measured height and weight. BMI is defined as weight in kg / height in m2. For adults in the United States, the desirable BMI range is from 18.5 and 24.5 (National Institutes of Health, 1998). A BMI between 25 and 29.9 is defined as overweight and a BMI equal to or greater than 30 is defined as obese. In 2003, United Kingdom BMI categories were changed to reflect the guidelines used in the United States (British Department of Health, 2003).

**Body weight:** measurement of body weight using a Tanita scale and reported in pounds.

**Current body weight:** current body weight reported in pounds using a Tanita scale.

**Hip circumference:** measurement of participants’ hips (cm) using a tape measure secured at the widest part of the hip area, over the buttocks.
**Perceived ideal body image**: participants’ selection of body silhouettes from thin to obese, using the Contour Drawings Rating Scale (Thompson & Gray, 1995).

**Perceived ideal weight**: the body weight the respondent would like to weigh; recorded as a number in pounds and obtained by a self-administered questionnaire.

**Perception of overweight**: the amount of body weight considered to be overweight; recorded as a number in pounds and obtained by a self-administered questionnaire.

**Standing height**: vertical height measured using a stadiometer; reported in feet/inches.

**Waist circumference**: measurement of participants’ waist (cm) using a tape measure around the narrowest part of the trunk, between the umbilicus and the xyphoid process.

**Waist-to-hip ratio (WTHR)**: a calculation of obesity related disease risk based on measured waist and hip circumference. For women, a normal WTHR is <0.80, a WTHR between 0.81-0.85 indicates moderate risk for obesity related disease and >0.85 indicates a high risk for obesity related disease. For men, a normal WTHR is <0.95, a WTHR between 0.96-1.0 indicates moderate risk for obesity related disease and >1.0 indicates a high risk for obesity related disease.

**Weight control behavior**: behaviors performed to manage weight, assessed using a self-administered questionnaire, containing the Weight Control
Behaviors Scale (French, Perry, Leon, & Fulkerson, 1995) which asks participants to identify which weight practice statement(s) describes them at the moment.
CHAPTER 2  
LITERATURE REVIEW

A. Introduction

In the United States 29% of adults are overweight, 32.4% obese, and 4.8% extremely obese (Wang & Beydoun, 2007). More men than women are overweight or obese (68.8% and 61.8%), with more Blacks (34.8%) being obese compared to Whites (21.8%). Similar results are found in other westernized countries such as Bermuda. As of 2006, 40% of adults living in Bermuda were overweight and 24% were obese (Government of Bermuda, 2007). In Bermuda, men and women were more likely to be overweight (47.5% and 33%) than obese (20.1% and 27.6%). Overall, 73.2% of Blacks were overweight or obese compared to 54.4% of Whites.

First, literature on body weight perceptions among adults, its disparity with medical standards for overweight and obesity, and various perceptions across sub‑groups related to an individual’s gender, race and socioeconomic status is presented. Also included are information on body image and satisfaction with body shape. Finally, research on weight control behavior and the association of body weight perceptions are discussed.

B. Medical Standards and Body Weight Perceptions

1. Medical Standards

An examination of the literature suggests a paradox exists in which people who are normal weight or underweight appear to be more likely to try to lose weight than those who are overweight. This may be because a large number of people
misclassify their weight according to medical guidelines of appropriate weight for height (McTigue, Hess, Bryce, Fitzgerald, Olshansky, Sacco et al., 2006). Research evaluating misperceptions of body weight have done so using BMI categories as opposed to using other classifications of weight such as body fat percent or WTHR. Discrepancies between self-perception of body weight and medical classifications of overweight and obesity are significant. A cross-sectional study by Chang and Christakis (2001) was conducted among the adult U.S. population using the National Health Interview Survey (NHIS) to assess the extent and type of discordance between respondents' self-classifications of their body weight status and their actual weight status. Respondents’ self-evaluations of weight status were compared to BMI classifications by medical standards (Table 1). The authors report that among all respondents 29% incorrectly classified their weight status, with 16.6% under-assessing and 12.4% over-assessing their weight status. Men (40.3%) were more likely than women (14.6%) to under-assess their weight status. While women tended to over-assess their weight; 29% of normal weight women thought they were overweight, compared to 8% of men. Overall, women had 0.23 times lower odds of under-assessing their weight class and 4.97 times greater odds of over-assessing their weight compared to men. Respondents classified as obese tended not to misclassify their weight. However, research conducted by Charles, Britt and Knox (2006) showed a significant increase across BMI groups in the proportion of respondents who considered themselves overweight. In the underweight group, 3.6% of the respondents considered themselves overweight, while in the normal weight group, 15.5% considered themselves overweight. In the overweight group, 59.6% of patients
saw themselves as overweight and in the obese group, 87.5% saw themselves as overweight.

Studies of the Bermuda adult population have reported the percentage of adults self-identifying as underweight (3.9%), normal weight (50.5%), and overweight (45.5%), however, there has been no direct comparison of self-reported weight with medical recommendations and thus the extent of misclassification in this population is unknown (Government of Bermuda, 2008).

Table 1. Medical Standards for Body Mass Index (BMI), Body Fat Content, and Waist-to-Hip Ratio (WTHR)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Obesity Class</th>
<th>BMI (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td></td>
<td>&lt; 18.5</td>
</tr>
<tr>
<td>Normal Range</td>
<td></td>
<td>18.5-24.99</td>
</tr>
<tr>
<td>Overweight</td>
<td>I</td>
<td>25-29.9</td>
</tr>
<tr>
<td>Obese</td>
<td>II</td>
<td>30-34.9</td>
</tr>
<tr>
<td>Extreme Obesity</td>
<td>III</td>
<td>≥ 35-39.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classification</th>
<th>Body Fat Content (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Normal</td>
<td>23-31</td>
<td>13-21</td>
</tr>
<tr>
<td>Overweight</td>
<td>31.1-36.9</td>
<td>21.1-24.9</td>
</tr>
<tr>
<td>Obese Level 1 (high risk)</td>
<td>37-41.9</td>
<td>25-30.9</td>
</tr>
<tr>
<td>Obese Level 2 (very high risk)</td>
<td>42+</td>
<td>31+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classification</th>
<th>Waist to Hip Ratio (WTHR)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt;0.80</td>
<td>&lt;0.95</td>
</tr>
<tr>
<td>Moderate Risk</td>
<td>0.81-0.85</td>
<td>0.96-1.0</td>
</tr>
<tr>
<td>High Risk</td>
<td>&gt;0.85</td>
<td>&gt;1.0</td>
</tr>
</tbody>
</table>

2. **Body Weight Perceptions and Gender**

   a. *Perceived Overweight*  Perceptions of body weight vary from person to person. There are people who feel their weight is appropriate, while others feel they should lose or gain weight. A strong predictor of the perception of being overweight is gender. Women in Bermuda were more likely to describe themselves as overweight (53.1%) than men (37.1%), even though their rates of overweight were lower for women than men (33% vs. 47.5%) (Government of Bermuda, 2007). A British study found that 27% of men and 10% of women who were overweight described their weight as about right, while 12% of men and 37% of women whose weight was normal considered themselves to be too heavy (Ziebland, Thorogood, Fuller & Muir, 1996). Similar results were found in an Australian study where 17% of men and 6% of women who were overweight or obese classified themselves as a good weight while 24% of men and 47% of women who had an acceptable body weight considered themselves to be slightly overweight (Crawford & Owen, 1994). In a Canadian study, investigators examined the prevalence and the sociodemographic characteristics of adults who have a perception of being overweight when their body mass index indicates that they are normal weight or underweight based on self-reported heights and weights (Gucciardi, Wang, Badiani, & Steward, 2007). The odds of identifying oneself as being overweight were 3.7 times higher in women (79.8%) than in men (20.2%). They found that compared to men, women were almost five times more likely to over-assess their body size. The findings suggest that 38.3% of normal weight women considered themselves overweight, while 32.8% of overweight men considered themselves about the right weight or underweight. Crawford and
Campbell (1999) found that 26% of men and 21% of women under-reported their current weight by more than two kilograms (4.2 lbs.), and that 15% of men and 7% of women over-reported their weight by more than two kilograms (4.2 lbs). Thus, gender clearly plays a role in perceptions of weight, with women more likely than men to.

b. Perceived Ideal Weight Crawford and Campbell (1999) found that the BMI at which women considered themselves at their ideal weight was significantly lower than that for men (22 versus 24.9). Based on self-reported weight estimates, the BMI at which women considered themselves to be overweight was lower than that for men (23.7 versus 26.1). Women had 0.23 odds of under-assessing their weight and 4.97 odds of over-assessing their weight compared to men. A study of 473 undergraduate students from the University of Pennsylvania was conducted to assess body image dissatisfaction (Rozin, Trachtenberg, & Cohen, 2001). Ratings of current and ideal body weight were obtained using silhouettes along with self-reported height and weight. Participants indicated their current and ideal ratings of body image and researchers then calculated the current minus ideal difference. A positive current-ideal difference would indicate that the participant is heavier than he or she would like to be, while a negative current-ideal difference would indicate that the participant weighs less than he or she would like to be. They found that males had a very small discrepancy between current and ideal (mean= -0.3) indicating that they tended to weigh less than their ideal, while females showed a large, positive difference between current and ideal figures (mean= 7.0), indicating that females were heavier than their ideal, at least among the undergraduate population.
It is important to note that women are significantly more likely to over-assess their current body weight, compared to men who tend to under-assess their body weight. Equally important is the concept of ideal BMI, where women consider a lower BMI to be ideal (22) compared to men (24.9).

3. Body Weight Perceptions and Race/Ethnicity

a. Perceived Weight Race may represent a core dimension that influences body weight perceptions. For example, Chang and Christakis (2001) reported that Blacks had greater odds of under-assessing their weight status compared to Whites (1.76 vs. 0.43). Whites showed 1.0 times the odds (or equal odds) of over-assessing their weight compared to medical standards. Those who are Black, of lower income, of lower educational level, or in occupations other than management or professional specialty are more likely to under-assess their own weight status. Blacks showed 0.43 times the odds of over-assessing their weight compared to health standards. Thus, Blacks are less likely to over-assess their weight compared to Whites (Chang & Christakis 2001).

b. Perceived Ideal Weight. Limited research has been conducted on ethnic differences in the ideal body weight of men (Cachelin, Rebeck, Chung, & Pelayo, 2002). However, women from various racial/ethnic backgrounds differ in their beliefs regarding weight appropriateness. White women experience body dissatisfaction at a lower BMI level (BMI= 24.6) that is below the criterion for overweight (BMI= 25) (Fitzgibbon, Blackman, & Avellone, 2000). However, Black and Hispanic women did not report body dissatisfaction until they were well in the overweight range (BMIs of 29.2 and 28.5, respectively. In their evaluation of body
image and eating behaviors among 104 African-American and White female college students, Rucker and Cash (1992) found that Black women, compared to White women, had body-size ideals that were less thin and more congruent with their current perceived size. On the other hand, ideals of body weight among White women were significantly thinner than their self-perceived size.

Overall, Blacks are more likely to under-assess their weight compared to Whites. Black and White women appear to have different views regarding appropriate weight for height that may be responsible for their perceptions of body weight. This indicates that there may be an association of body weight perceptions and culture or ethnicity, and that discrepancies and associations between perceptions of weight and body image among White women may not generalize to Black women.

4. Body Weight Perceptions and Socioeconomic Status (SES)

In the United States, obesity has reached epidemic proportions especially among minority women across all income levels (Chang & Lauderdale, 2005). The question arises as to whether or not attitudes toward one’s body weight are associated with socioeconomic status (SES). The Government of Bermuda (2007) reports that among adults with a secondary education or less, those from a low income household reported the highest incidence of obesity (28.8%), while those in household with incomes over $100,000 had among the lowest incidence of obesity (17%). Additionally, adults from poorer households were slightly, but non-significantly, less likely to describe themselves as overweight (43.4%) than adults from middle income (47.6%) or high income (46.0%) households.
Research suggests that differences in diet and exercise habits between Whites and minorities could contribute to disparities in the onset of obesity and depending on social class there are either opportunities or barriers to performing weight control activities (Malinauskas, Raedeke, Aeby, Smith, & Dallas, 2006). Individuals at a higher income and educational level appear to be at lower risk of obesity; however, they report a higher likelihood of feeling overweight, especially for women (Chang & Christakis, 2003). Among women, having a family income ≥ $20,000 increased the odds of placing oneself in a higher weight-perception category by 55%, while similar results were found in men: income increased the odds of placing oneself in a higher weight-perception category by 10%. In general, White adults, women, and high-SES individuals are more likely than Black adults, men, and low-SES individuals to describe themselves as overweight or obese and in fact are less likely to actually be overweight (Schieman, Pudrovski, & Eccles, 2007).

Misperceptions in body weight status may cause individuals to neglect potential health problems and hinder motivation to engage in weight control behaviors. Gender, race and socioeconomic status may be significant predictors of body weight perceptions. The research presented demonstrates that certain individuals’ tend to under-assess their weight while others over-assess their weight status. Literature shows that men are more likely than women to under-report their current body weight, while women are more likely to over-report it. Overall, Whites of higher income/educational level are more likely to over-assess their weight status, while Blacks of lower income/educational level are more likely to under-assess their weight status. In the current study we anticipate similar gender differences among the adult
Bermuda population. These findings may also be similar to that seen with Black Americans.

C. Body Image Perceptions and Satisfaction

1. Body Image and Race/Ethnicity

Thin figures are typically regarded as ideal in mainstream, Euro-American culture (Markey, Tinsley, Ericksen, Ozer, & Markey, 2002). Research findings reveal differing perceptions of attractive and healthy body sizes among Black and Mexican Americans compared to Whites. This has led to the suggestion that cultural and value systems contribute to the development of standards that influence individuals' perceptions of body sizes (Markey, Tinsley, Ericksen, Ozer, & Markey, 2002). Previous research indicates that compared to Whites females, Black females held more favorable body image attitudes and held body-size ideals that were less thin and more congruent with their current perceived size (Rucker & Cash, 1991). For example, in the Caribbean there has been a tradition that obesity is healthy and that fat women are preferred by men, compared to normal weight or thin women (no comparisons were made on women's preference for male body types). Recent studies of obesity and attitudes toward body shape preferences in Barbados show continuing change in male preference, towards a more slender female body type; however, there is a continuing increase in the prevalence and acceptance among females of overweight or obese female figures (Fraser, 2003).

In the U.S., Black women may face less social pressure to be thin than White women. Patel and Gray (2001) reported in their study that for Black women, their mean current figure was significantly larger than their mean ideal figure. Their mean
current figure was also significantly larger than the figure that Black women thought would be most attractive to Black men. Overall Black women's mean ideal figure was significantly larger than the mean figure they thought would be attractive to Black men. The discrepancy between ideal and current body shape perceptions was not as large for Black women as with White women, which suggests Black women may be dissatisfied with their current body shape but not to the extent of White women.

Body shape and size perceptions have yet to be studied in the adult Bermuda population. It is possible that perceptions of body image and shape observed in the Caribbean as a whole are shared among adult Bermudians. This study provided data to assist in this determination.

2. Body Image and Gender

Previous studies report differences in preferences of body shape/size and body image according to gender. McCready and Sadava (2001) explored the relationships among gender, relative weight, perceived weight, attractiveness, life satisfaction, and health. The authors obtained a data set of 338 women and 236 men (total= 544) 19-39 from the Niagara Young Adult Health Study. The Niagara Young Adult Health Study was a community-based study of 574 men and women 19-39 years of age, who completed a questionnaire evaluating relative weight, perceived weight, attractiveness, life satisfaction, and health. They found significant differences in body image by gender. Among overweight participants, men rated themselves as more attractive and healthier compared to women, while woman were less satisfied with their appearance and shape. Additionally, underweight women rated themselves as more attractive and healthier compared to underweight men.
A British study was conducted with 2176 bank employees and 1641 university employees to determine the extent of difference between lay definitions of weight and medical definitions (Emslie, Hunt & Macintyre, 2001). Respondents were asked to report their height and weight so that body mass index could be calculated. Participants were also asked to indicate whether they thought they were “about the right weight,” “too heavy” or “too light” for their height. There was a significant interaction between gender and BMI for both university and bank employees, with a greater effect in the bank employee sample. In the university sample, women were more than three times as likely as men to think they were too heavy, while in the bank sample, women were 10 times more likely than men to perceive this. Men and women were similarly unlikely to think they were “too heavy” if their BMI was very low (BMI <25), and similarly likely if it was high (BMI>25).

Cognitive and affective dimensions of body image in college men were examined on the basis of body mass index (BMI) (Watkins, Christie, & Chally, 2008). A cross-sectional survey was carried out using 188 randomly selected male college students 18-57 years of age. Overweight and obese participants reported significantly higher levels of negative body image than did normal and underweight participants. Overweight participants indicated higher weight and shape concerns than did underweight, normal-weight, and obese participants. Underweight, overweight, and obese participants reported significantly higher levels of body dissatisfaction than that reported by normal-weight participants. In another study, researchers assessed male and female body weight and shape dissatisfaction (Neibors & Sobal, 2007). A brief survey was administered to 325 students at a large university in the Eastern United
States. Respondents were on average 20 years of age with the following ethnic
distribution: 72% Caucasian, 15% Asian, 5% African American, 6% Hispanic, and 2%
other. Overall, females had greater body dissatisfaction than males. Normal weight
females desired a slightly thinner, lighter body, while underweight females and
normal weight males expressed little body weight dissatisfaction and body shape
dissatisfaction, and were more interested in maintaining their BMI classification.
Overweight individuals showed the greatest body weight and body shape
dissatisfaction. No ethnic differences were reported.

Overall, regardless of current body weight, men rate themselves as more
attractive and healthier, compared to women. Women may be less satisfied with their
body shape and size, rating themselves as heavy when they are of normal body
weight.

D. Body Weight Perceptions and Weight Control Behavior

1. Weight Status and Weight Control

Some obesity related diseases could be prevented with a moderate
body weight loss of 10% (National Institutes of Health, 1998). Studies suggest that
overweight or obese individuals may not lose weight despite the negative health
outcomes that result from being overweight. This may be due to a lack of motivation
to engage in physical activity. Timperio and colleagues (2000) compared the
frequency and duration of varying intensities of physical activity performed by adults
trying to lose weight; they focused on those who were actively controlling their
weight and those not actively trying to control their weight, to determine if
differences exist across groups regarding the physical activity they should perform. A
random sample of 2,500 adults over the age of 18 years was selected from the Australian electoral roll for the State of Victoria. Among all participants, 30.7% were classified as overweight and 13% as obese. Almost all respondents (97.6%) reported engaging in some kind of physical activity during the week prior to the survey. Among overweight respondents, 50.9% were trying to lose weight or avoid gaining weight and half (49.1%) were not involved in any weight control behaviors. This indicates that although overweight or obese individuals may be aware of their weight status, a significant number may not be motivated to initiate weight control practices. Elmoore (2007) examined public opinions about exercise, perception of weight, as well as perceived adequacy of exercise among adults in Michigan. Blacks aged 65 years and over, people earning higher incomes, and people who had been previously married believed that they exercised as much as they needed to. Interestingly they found that individuals who perceived they were overweight had 0.23 odds of believing they exercised enough compared with those who considered themselves to be underweight or normal weight.

Research conducted in Bermuda shows that 17.6% of adult respondents were considered sedentary, that is they did not engage in moderate physical activity for at least 10 minutes at a time during the week (Government of Bermuda, 2008). Men (19.5%) compared to women (15.8%) were more likely to be sedentary; Blacks (21.7%) and Asian and other races (27.3%) were more likely to be sedentary compared to Whites (11.4%); adults with secondary education or less (23.6%) were more likely to be sedentary compared to respondents with a higher level of education (13.4%); and adults in low income households were more likely to report less than
moderate activity in a week (23.8%) than adults in middle income (13.6%) or high income (14.1%) households. A lack of physical activity among adult Bermudians is important to note given that most weight control initiatives recommend both dietary and physical activity modifications.

Concerns about health and appearance may be motivation for performing weight control behaviors. Cheskin and Donze (2001) reported that women who desire to lose weight are more likely to do so in the hopes of improving their appearance, whereas men who wish to lose weight are more likely to be concerned about their future health and fitness. Of those trying to lose weight, the average respondent had a current weight-loss attempt lasting from 5 to 6 months, had tried a similar plan before, and had averaged one attempt a year for the past 2 years (Cheskin & Donze, 2001). One study of 1,894 British men and women examined body dissatisfaction and weight control in order to address the extent to which weight perceptions and participation in weight control are associated with body weight (Wardle & Johnson, 2002). Data were collected as part of the monthly Omnibus Survey of the Office of National Statistics. Of obese adults’ who correctly perceived themselves as overweight, 25.6% were not bothered by their weight, and only a small number (1.1%) had participated in a weight control program. Obese and overweight adults were aware of their weight problem, but 39.3% felt their weight was about right and did not engage in diet or exercise modification (Wardle & Johnson, 2002).

Lastly, a study by Annunziato and Lowe (2006) evaluated 120 women 22-65 years old who were overweight or obese and not seeking ongoing external assistance for weight loss. A majority of the participants were Black (58.3%) and single (52.5),
with a mean age of 39.5. They examined help-seeking, BMI, co-morbid conditions, socioeconomic status, psychological stress, disordered eating behavior, body image, and obesity related knowledge. Help seeking was defined as ongoing external assistance for weight loss. Help seeking was measured as both a continuous and categorical variable. For the continuous help-seeking variable, there was no correlation between help-seeking and BMI or comorbid medical risk. Higher levels of psychological distress, self-reported responsiveness to the food environment and concern about body shape and weight were associated with greater help-seeking. Lower scores on the sexuality aspect of weight-related quality of life were significantly associated with increased help-seeking. The greater psychological distress of those who seek formal assistance for weight loss may contribute to poorer long-term outcomes. The authors also suggested that the greater psychological distress of treatment-seekers is also reflected in disinhibited eating which undermines long-term success at weight loss (Annunziato & Lowe, 2006). They indicate that modest weight losses are unacceptable to persons with more negative perceptions of their bodies and quality of life. Additionally, they surmise that help-seeking for weight control in overweight and obese individuals may be motivated by psychological aspects of obesity rather than physical or medical burden of obesity (Annunziato & Lowe, 2006). This indicates that people seek out assistance for overweight or obesity if they have more knowledge of obesity or disease related conditions, if they are experiencing psychological distress, and if they are concerned about their body shape and weight.
2. Weight Control and Gender

Gender may be associated with the type of method chosen for weight control. Women are more likely to want to lose a greater percentage of their body weight than men and attempt to lose weight more often than men (Gucciardi, Wang, Badiani, & Steward, 2007). One study found that 71% of women and 62% of men reported that they were both changing their diet and exercising more as part of a current weight-loss attempt (Levy & Heaton, 1993). A majority of both men (79%) and women (95%) report having participated in at least one healthy dieting behavior, whereas only a majority of women (57% vs. 36% of men) had utilized at least one unhealthy dieting behavior, such as purging or skipping meals (Markey & Markey, 2005). Additionally, participants who were overweight were less satisfied with their bodies and more likely to diet than participants who were not overweight. Body size dissatisfaction was positively associated with trying to lose weight among both women and men (Millstein, Carlson, Fulton, Galuska, Zhang, Blanck et al., 2008). In their evaluation of body weight from emic perspectives (evaluating body weight from the perspective of someone from the culture being studied) of limited income overweight and obese White women, Parker and Keim (2004) indicated that White woman wanted to lose weight because of social pressure (such as pushy people, magazines, and the media) and the ability to attract a man, not for reasons of improved health. Additionally, of participants who tried to lose weight in the past, recidivism in weight loss was common, and most White women reported being on several diets throughout their lives (Parker & Keim, 2004).
A quasi-experimental study of American female college students examined if there are differences in dieting among those who are of normal weight, overweight or obese, and whether these dieting practices could be adapted to promote a healthy body weight (Malinauskas, Raedeke, Aeby, Smith, & Dallas, 2006). The majority of participants (83%) used dieting for weight loss and believed they would be 2% to 6% heavier than their current weight if they did not diet. Normal weight, overweight, and obese groups perceived an attractive weight to be 94%, 85%, and 74%, respectively, of current weight. Most participants (80%) reported using physical activity to control weight, although only 19% exercised at a level that would promote weight loss. Of the dieting behaviors assessed, two differed in terms of prevalence of use: consciously eating less than you want and using artificial sweeteners. Among those who consciously ate less, 44% of normal weight individuals ate less, 57% of overweight participants ate less, and 81% of obese individuals ate less. Among those using artificial sweeteners, 31% of normal weight individuals used artificial sweetener, 31% of overweight respondents used artificial sweetener and 5% of obese respondents used artificial sweetener. The most unhealthful behaviors for weight loss included smoking cigarettes (9% of participants) and skipping breakfast (32%).

In light of the ineffectiveness of dieting and the negative health consequences from unhealthy dieting, understanding weight control behaviors is important in developing lifestyle approaches that encourage maintaining a healthy weight throughout the lifespan.
E. Conclusions

The literature provides evidence of an association between perceptions of ideal body weight and current levels of overweight and obesity. This is based on findings that perceptions about ideal weight are due to individual preferences rather than on any particular set of standards (Gore, 1999; Ziebland, Thorogood, Fuller, & Muir, 1996). A review of the literature supports a relationship of perceptions of body weight and sociodemographic factors such as age, gender and race/ethnicity. There appears to be distinct differences in perceptions of body weight by population subgroups that differ by gender and level of income. For example, the odds of perceived overweight were significantly higher in women, Whites, and individuals with higher income and higher education (Paeratakul, White, Williamson, Ryan & Bray, 2003). Variations in perceptions of body weight have been well documented among Black and White women but less is known about the difference in perceptions among men and individuals of different socioeconomic groups and education levels. Additionally, most research has been done in the U.S. or Great Britain, and not in other countries and cultures such as Bermuda.

Body image and level of body weight satisfaction may be associated with weight loss practices. Gender has been shown to be a mediating factor in how body image perceptions are shaped and if weight control practices are implemented, with females more likely to participate in both healthy (95%) and unhealthy dieting behaviors (57%) compared to men (79% and 36%, respectively)(Markey & Markey, 2005).
Lastly, few studies have explored adult Bermudians perceptions of body weight, overweight, body image and weight control behavior. Not knowing how this population perceives body weight may reduce the effectiveness of weight control initiatives. Additionally, misperceptions of body weight may result in a failure of an individual to recognize his or her risk status and one’s ability to take action to prevent a host of chronic health conditions. A better understanding of these relationships will enable public health educators to improve on knowledge concerning perceptions of body weight and weight control behavior among the adult Bermuda population.
CHAPTER 3
METHODS

A. Study Design

This study was a cross-sectional observational study of perceptions of ideal body weight, overweight, body image and weight control behavior. A convenience sample of 462 (207 males, 255 females) adult participants was recruited from grocery stores, private sector organizations, as well as health and social service facilities. Participants were included if they were: (a) residents of Bermuda for at least 1 year (citizens and permanent residents) (b) 18-65 years of age, (c) not pregnant or breastfeeding, (d) spoke English and, (e) signed a consent form. Participants were excluded if they had a chronic health condition such as cardiovascular disease or cancer.

B. Subject Setting, Recruitment and Selection

Study participants included adults 18-65 years old who were residents of Bermuda for at least 1 year (citizens and permanent residents). Bermuda is 21 square miles in area and has a population of approximately 60,000 people (Forbes, 2008). The local population is 63% Black, 33% White and 4% classified as Asian and other. The official language spoken in Bermuda is English; however, Bermuda has a diverse population of race/ethnic groups such as Portuguese, Filipino and Indian, who speak various dialects. While it was our intent to capture demographic information, funding limitations prevented us from recruiting subjects who did not speak English.
Bermuda is made up of 9 parishes with the western parishes being more populated (approx. 17,816 people) than the eastern parishes (approx. 11,187 people), while the central parishes are most populated (approx. 21,783 people). Potential participants were recruited throughout various parishes around the island and from diverse socioeconomic and race/ethnic groups. Every effort was made to ensure equivalent recruitment of men and women into the study. For each person who was approached and declined participation, we asked for their reason for declining and clarified any questions they had about participation. Of people approached to participate in the study, 56 people declined citing personal reasons; 35 were men and 21 were women. The following sites were used to recruit participants: The Marketplace Stores- Heron Bay, Lindo’s Family Foods, FIL Limited, King Edward VII Memorial Hospital, Teen Services, and the Southampton Seventh-Day Adventist Church.

Two grocery stores were used to recruit participants: the Marketplace Stores-Heron Bay location and the Lindo’s Family Foods grocery store. The protocol for data collection was reviewed with a representative of each facility. The general public was informed about participating in the study through flyers placed at the stores. As customers entered the store they were asked by the student investigator if they would like to participate in the research study (Appendix E for recruitment script). If they were interested, informed consent was obtained and data collection commenced immediately.

Participant recruitment also took place at the King Edward VII Memorial Hospital (KEMH). The protocol for data collection was reviewed with a representative of the facility. Staff members at KEMH were recruited to participate in
the study by the staff wellness coordinator. A flyer was emailed to all staff advertising the study and providing the location within the hospital where data collection was to take place, the wellness coordinator’s office. Staff could drop by the wellness office between 9:00am to 4:00 pm Thursday and Friday of each week, beginning November 20, 2008 to participate. Support for staff recruitment was obtained from the Employee Relations department of the King Edward VII Memorial Hospital.

A private sector organization, FIL Limited, was another site for participant recruitment. The protocol for data collection was reviewed with a representative of this facility and staff was recruited to participate in the study by FIL Limited personnel. A flyer was emailed to all staff advertising the study and providing the time and location where data collection was to take place. Support for the use of FIL Limited facilities and a letter of agreement are on file.

Lastly, participants were recruited through The Bermuda Diabetes Association (BDA). BDA is a nonprofit organization that conducts community assessments related to body weight and health throughout the island. BDA has a database of over 500 clients and supporters. They agreed to email their clients a flyer advertising the research study. Participants were given a date, time and location to complete the survey and have body measurements taken. Teen Services Inc. and the Southampton Seventh-day Adventists church locations were used as sites for data collection with BDA clients. The Southampton SDA church is located at the western end of the island, was easily accessible to participants and had sufficient space needed for data collection. Teen Services Inc. is centrally located in the capital city of Hamilton, was
easily accessible to participants and also had the space to accommodate data collection.

Recruitment began after Institutional Review Board (IRB) approval and the approval of the Bermuda Hospitals Board Ethics Committee. A letter of agreement for data collection from each recruitment location was obtained and kept on file.

C. Procedures for Data Collection

Data collection proceeded using a self-administered survey and collection of anthropometric measurements. The survey was piloted with 10 adults living in Bermuda. There were no changes to the study survey or method of anthropometric collection as a result of this pilot-test.

Various sites around Bermuda were used for data collection on different days of the week. Having data collection sites at the western and central parishes allowed for a more diverse group of participants being enrolled into the study. The dates and times for data collection were negotiated with each facility, prior to data collection. For example, data collection using the Southampton Seventh-Day Adventist church facilities and Teen Services Inc. facilities took place 1 day of the week; data collection at the grocery stores took place 2-3 days of the week; data collection at the King Edward VII Memorial Hospital took place 2 days of the week; data collection within the private sector took place 2 mornings throughout the week, during the fall of 2008.

Data collection was organized and carried out by the student investigator. On the day of data collection, consent forms were signed as part of the informed consent process and a copy was given to the participant. The survey (with body measurement...
Questionnaire completion and body measurement took 15-20 minutes. At the close of each day, consent forms were checked and stored separately from the surveys and body measurement records; surveys were sorted and prepared for data entry. Data collection lasted 6 weeks during the fall of 2008.

When people arrived at the data collection site, they were asked if they had already participated in the study. If they had not previously participated, they were asked to read and sign the consent document (CD). All subjects were given the opportunity to ask questions of the student investigator before signing the CD. After consent was obtained, an identification code was applied to each survey. This provided a way to identify each survey while maintaining the anonymity of participants. Only the student investigator had access to the codes which were stored within a locked file cabinet. Data collected on participants were entered into SPSS at the completion of each data collection session.

The anonymous self-report questionnaire was administered to assess demographic information, perceptions of body weight, and weight control behavior. Demographic data collected included: age, gender, race/ethnicity, education level, income, employment status, marital status, type of physical activity as part of employment and religious background. Subjects were also asked if they had ever been diagnosed with type 1 or 2 diabetes by a physician.

Figure 2 shows the sequential steps in the recruitment and data collection process. After informed consent was obtained, participants began by filling out the questionnaire. Depending on the site, a separate room or partitioned area was used to
collect anthropometric measurements. Participants then proceeded to the body measurement station to have their weight, standing height, waist and hip measurements taken and recorded. Participants were then given an information sheet with reference values on BMI, body fat, and waist-to-hip ratio (WTHR), and a beverage and small gift and thanked for their time. Contact information for the student investigator was provided to all participants.

**Figure 2.** Sequential Steps of Data Collection Protocol

**D. Study Variables**

1. **Dependent Variables**

   The dependent variables were perceptions of ideal body weight, overweight, body image, weight control behaviors, measurements of weight (lbs), standing height (in), waist (cm) and hips (cm), body fat percentage, BMI and WTHR.
2. Independent Variables

The independent variables included the core constructs of the health belief model, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy about weight control. Sociodemographic factors such as gender, race/ethnicity, age, education level, income, marital status and religious background were examined as independent variables or covariates.

E. Instrumentation and Measurement

The instrument used for data collection was a self-report questionnaire of perceptions, weight control behaviors and sociodemographic information. Anthropometric measures were also collected.

1. Anthropometric Measures

Anthropometric measures included weight, standing height, waist and hip circumference. All anthropometric measures were collected by the student investigator. Weight was measured using a Tanita scale and standing height was measured using a stadiometer. Height and weight were used to calculate current BMI. BMI was computed as weight in kilograms divided by the square of height in meters. Body fat percentage was computed by the Tanita scale and recorded to the nearest percent. Waist and hip measurements (cm) were collected with a tape measure and used to calculate waist to hip ratio (WTHR). To measure the waist, the tape measure was placed around the narrowest part of the trunk, between the umbilicus and the xyphoid process. To measure hips, the tape measure was secured at the widest part of the hip area, over the buttocks. WTHR was calculated by dividing the waist
circumference by the hip circumference. References for all anthropometric measures can be found in Table 2. Measurements were taken immediately following the completion of the questionnaire.

2. **Body Weight Perceptions**

   Questionnaire items on perceptions of ideal weight and overweight were drawn from the United Kingdom Office of National Statistics Omnibus Survey 1999 (Wardle & Johnson, 2002). This is a household survey which is administered to persons over the age of 16 years. To assess self-perceived (estimated) weight, participants were asked to provide an estimate of their current body weight. Lastly, to assess perceived overweight participants were asked, “In your opinion, what is the most you could weigh and still not consider yourself overweight?” Additionally, respondents were asked to provide an estimate of their current height. All responses to weight related questions were reported in pounds and height was reported in feet and inches. To evaluate current weight, each participant’s height and weight was measured by the student investigator. Respondents height was also measured by the student investigator. Each definition of self-perceived (estimated) weight, ideal weight, and level of overweight was translated into self-perceived BMI, ideal BMI, and overweight BMI using self-reported height. Each participants measured current weight and height was translated into current BMI.

3. **Body Image Perceptions**

   The male and female versions of the Contour Drawing Rating Scale (Thompson & Gray, 1995) were used to assess participants’ perceptions of body image. To evaluate body image, participants were provided silhouettes of men and
woman and asked to select a picture they thought currently looked like them and which picture they wanted to look like. Each picture was assigned a number from 1-9. These numbers corresponded to a range of body weight sizes from 1= very thin to 9= very overweight. Scores were calculated to indicate the discrepancy between participants' current and desired body images, with a possible range of -8 to 8. Actual scores in this study ranged from -8 to 3.

In evaluating the Contour Drawing Rating Scale (CDRS), Thompson and Gray (1995) used 51 full-time, female undergraduate students from an urban, East Coast university. Participants were 18-23 years old, 86% White, 2% Black, 2% Asian, 6% Hispanic, and 4% unspecified. Test-retest reliability was conducted with a subsample of 32 subjects with an intervening period of 1 week. A Pearson product-moment correlation between image chosen and current body size revealed a reliability coefficient that was highly significant $r = .78$ ($p < .0005$). A test-retest assessment of the rank-ordering procedure was conducted to determine the agreement between the drawings at two points in time. The correctly positioned drawings increased from 95.2% to 97.6% for the female drawings, and 96.1% to 97.8% for the male drawings.

Concurrent validity assessment was conducted for the drawings by assessing perceived body size. This was examined by the degree of correspondence between an individual's reported weight and current self-ratings of body size. Contour drawing selections were strongly correlated with reported weight, $r = .71$ ($p < .0005$).

Concurrent validity was also conducted between self-ratings and body mass index (BMI) and a strong correlation between the self-ratings and BMI, $r = .59$ ($p < .0005$).
were reported. Based on this data, the researchers concluded that the CDRS has a strong reliability and validity.

4. **Performance of Weight Control Behaviors**

Participation in healthy and unhealthy weight control behaviors was assessed using the Weight Control Behavior Scale (WCBS) (French, Perry, Leon, & Fulkerson, 1995). The WCBS is a measure of the performance of various weight loss behaviors. It contains subscales for healthy weight control behaviors (15 items) and an unhealthy weight control behaviors (9 items).

Participants are first asked to indicate if they have tried to lose weight in the past year (yes/no). Participants who respond “yes” are then asked how often they used each strategy in the past year to try to lose weight. Participants who answer “no” proceed to the sociodemographic information section. Each dieting strategy is rated on a Likert-type scale using response categories of never, sometimes and always.

Using the Weight Control Behavior Scale, Markey and Markey (2005) assessed 208 men and women on their performance of 15 healthy and 9 unhealthy dieting behaviors (104 men, mean age = 25.88 years; 104 women, mean age = 23.87 years). Participants’ responses were aggregated across items. The healthy dieting behavior subscale assessed behaviors including eat more fruit and vegetables and eliminate snacking. Cronbach’s alphas for this scale were .87 for women and .88 for men, indicating strong internal reliability of the instrument. Items on the unhealthy dieting behavior subscale include diet pills and vomiting. Cronbach’s alphas for the unhealthy dieting scale were .70 for women and .67 for men indicating good
reliability of the scale. Overall, they supported the use of this scale for assessing weight control behaviors, based on these findings.

5. **Health Belief Model Variables**

   The health belief model variables of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and perceived self-efficacy was assessed by asking respondents a series of statements regarding their beliefs about overweight/obesity and weight control. Respondents indicated if they agreed with each statement by selecting from five responses, strongly disagree, disagree, undecided, agree, and strongly agree (Appendix F). These items were developed based on scales used in previous research (Koopman, Rotheram-Bonus, Henderson, Bradley, & Hunter, 1990 and Lux & Petosa, 1994). There were two items on the questionnaire that assessed perceived susceptibility; two items evaluating perceived severity; perceived benefits was assessed with two items; perceived barriers was evaluated with two items and; perceived self-efficacy which was assessed with three items.

6. **Sociodemographics**

   The sociodemographic section assessed each participant's age, gender, employment status, income, marital status, education level, race, type of physical activity with job and religious background (Appendix F).

**F. Data Analysis**

Statistical analysis was performed using SPSSv.16 software. The data were cleaned and checked for consistency. Data entry occurred at the end of each collection session by the student investigator. Descriptive statistics were performed
for the following variables: current BMI, self-perceived BMI, ideal BMI, overweight BMI, body image, percent body fat, WTHR and weight control behavior. These analyses include percentages, averages and other measures of central tendency.

For the first research question, What do adults living in Bermuda perceive as their ideal body weight, level of overweight and ideal body image?, the discrepancy between average ideal BMI and overweight BMI was calculated, as well as the discrepancy between average ideal BMI and current BMI. Frequencies and percentages were performed to evaluate the perceived weight status (self-perceived weight) of participants by each category of weight (underweight, normal weight and overweight). Chi-square analysis determined if there were differences in categories of weight (normal weight, overweight, obese) between males and females, based on current BMI and self-perceived (estimated) BMI.

To evaluate body image, percentages of current self rating (Contour Drawing 1-9) were calculated. A body satisfaction score was calculated using computed scores of the discrepancy between the figure they would like to look like (ideal) and the figure they feel most looks like them (current). Positive scores indicated that participants are dissatisfied and want to be heavier, zero indicated dissatisfaction, and negative scores indicated that participants were dissatisfied and wanted to be thinner. Lastly, a correlation analysis and scatterplots were conducted for current BMI, self-perceived BMI, ideal BMI, overweight BMI and body satisfaction score to determine the linear association among these variables.

For the second research question, Is there a discrepancy between adult Bermudians perceptions of their ideal body weight, their current body weight and
what medical guidelines indicate their weight should be?, an independent t-test was used to determine if there was a significant difference between mean ideal BMI and mean current BMI. Mean ideal BMI was compared across current BMI categories, based on the National Institutes of Health (NIH) BMI classifications of underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9) and obese (30+), using Analysis of Variance (ANOVA).

For the third research question, Do overweight or obese adult Bermudians perceive they have a weight problem and what measures, if any, are they taking to control their weight?, the percentage of participants who tried to lose weight over the past year and those who used each of the healthy and unhealthy weight control behaviors was determined. To assess if there was an association of gender and whether or not respondents tried to lose weight in the past year, a simple cross tabulations (Chi-Square) was performed. For the healthy and unhealthy weight control behavior scales, participants’ responses were summed for a total score, creating a continuous variable for use in regression analysis. An independent samples t-test compared males and females on healthy and unhealthy weight control behavior scores.

For the forth research question, Do the health belief model variables of perceived susceptibility, perceived severity, perceived benefits, perceived barriers and perceived self-efficacy explain the relationship between ideal and current body weight discrepancy and weight control behavior?, ideal-current BMI discrepancy and weight control behaviors were regressed onto the independent variables of age, gender, education, income, perceived susceptibility, perceived severity, perceived
benefits, perceived barriers, and perceived self-efficacy. The regression equations for these analyses are as follows:

\[
\text{Ideal-current Body Weight Discrepancy} = \beta_0 + \beta_1(\text{age}) + \beta_2(\text{gender}) + \beta_3(\text{education}) + \beta_4(\text{income}) + \beta_5(\text{susceptibility}) + \beta_6(\text{severity}) + \beta_7(\text{self-efficacy}) + \beta_8(\text{benefits})
\]

\[
\text{Total Weight Control Behavior} = \beta_0 + \beta_1(\text{age}) + \beta_2(\text{gender}) + \beta_3(\text{education}) + \beta_4(\text{income}) + \beta_5(\text{susceptibility}) + \beta_6(\text{severity}) + \beta_7(\text{self-efficacy}) + \beta_8(\text{benefits})
\]

\[
\text{Healthy Weight Control Behavior} = \beta_0 + \beta_1(\text{age}) + \beta_2(\text{gender}) + \beta_3(\text{education}) + \beta_4(\text{income}) + \beta_5(\text{susceptibility}) + \beta_6(\text{severity}) + \beta_7(\text{self-efficacy}) + \beta_8(\text{benefits})
\]

\[
\text{Unhealthy Weight Control Behavior} = \beta_0 + \beta_1(\text{age}) + \beta_2(\text{gender}) + \beta_3(\text{education}) + \beta_4(\text{income}) + \beta_5(\text{susceptibility}) + \beta_6(\text{severity}) + \beta_7(\text{self-efficacy}) + \beta_8(\text{benefits})
\]

For the HBM variables, participants’ responses were averaged for a total score for each variable, creating a continuous variable for use in regression analysis. For the perceived barriers construct, there were too few items for the scale to be reliable. We combined the two items for perceived barriers with the two items for perceived self-efficacy. Having low self-efficacy is a barrier to losing/controlling weight. Therefore, together these items represent confidence in an individual performing weight control under certain circumstances (barriers to action).

G. Power Analysis

Because multiple statistical comparisons was conducted during data analysis, the alpha value was adjusted to be more conservative (p<.01). The expected sample size needed to answer the question on the association of ideal weight, level of overweight, and body image was determined by performing a power analysis. Based on previous research (Wertheim, Paxon, & Tilgner, 2004), a medium effect size of \( r=0.30 \) and alpha set at 0.01 was used. This analysis required a sample of 125 participants per category (gender group) to achieve adequate power (0.80), for a total
of 250 participants. To assess weight category by gender using an estimate of the population effect size of $p=0.40$, power=80%, and $\alpha=.01$, 130 subjects were needed per gender group, for a total of 260 participants.

For the second question assessing the discrepancy between perceived ideal-overweight BMI and ideal-current BMI, using an estimate of the population mean difference of 0.4, power=80%, and $\alpha=.01$, 95 participants per group, a total of 190 participants were needed for the paired t-tests. To evaluate ideal BMI and current BMI with medical classifications (4) of BMI, an effect size using ANOVA ($f$) was estimated to be 0.25 based on Cohen’s (1992) standards. Based on Power and Precision (1997) analysis, an estimated $f$ value of 0.25, power=80%, and $\alpha=.01$, 63 participants per BMI category were needed for a total of 252 participants.

For question three evaluating a relationship between gender with weight control behavior, power analysis was conducted using Power and Precision (1997). With an estimate of the effect size of $p=0.40$, power=80%, and $\alpha=.01$, 130 subjects were needed per group, for a total of 260 participants.

For question four evaluating a relationship among age, gender, education, income, perceived susceptibility, and perceived severity with ideal-current body weight discrepancy and weight control behavior, power analysis was conducted using Power and Precision (1997). With an estimate of the effect size of $f^2=0.40$, power=80%, and $\alpha=.01$, 108 subjects were needed per group.

Based on the power calculations across analyses determined above, the minimum number of subjects needed ($N=260$ or 130 males and 130 females) were
used for the proposed study. A total of 312 participants (156 males and 156 females) were recruited to ensure that sufficient usable data were collected.

H. Strengths and Limitations

1. Strengths

While this study could not determine if there is a cause-and-effect relationship, an association between perceptions of weight and weight control behavior was established. The present study provided important information on current perceptions, knowledge and beliefs, concerning body weight and weight control, which had never been collected before in Bermuda. Additionally, this study used three objective measures to assess body weight: BMI, WTHR and body fat percent. Previous studies among this population have relied primarily on subjective measures to assess body weight, which are often inconsistent (Government of Bermuda, 2007). Objective measurement of body weight allowed for more reliable data collection. Lastly, this initiative will provided an opportunity for future weight related programs within this community.

2. Limitations

By using a cross-sectional design, we were unable to determine cause and affect relationships about body weight perceptions and utilization of weight control behaviors. Convenience sampling was chosen as the easiest and most accessible means of reaching individuals. Convenience sampling however, is not representative of the entire population and may bias the results. To reduce bias and make the participant pool more representative of the population, we recruited participants from various locations throughout the island such as grocery stores,
private sector organizations, and health facilities and social service facilities, and at different times of the day and/or week. By having a diverse group of recruitment sites we increased the likelihood of reaching people from varying economic, social and racial backgrounds.

I. Research Ethics

1. Informed Consent to Participate

The consent form and the study overview sheet clarified for participants that they could consent or refuse to take part in the study and withdraw from the study without repercussions. All subjects consented to be a part of the study and were given a script that explained the study and whom to contact for additional questions or concerns (Appendix C). They were asked if they understood what they were consenting to and if they had any questions. Informed consent was obtained prior to study enrollment. All informed consent sheets were collected from each participant and secured in a locked file cabinet where only researcher had access. The consent forms provided another way to control for duplication of study participants. Study data was reported in large numbers and did not report participants individually. Surveys were anonymous and contained a unique identification number, making it impossible to connect any individual with a particular survey.

2. Privacy and Confidentiality

Bermuda is a small island in which people may have concerns about confidentiality in services such as health care. It is possible that people may not have been honest with their responses if they knew someone was going to examine them. Subjects may have been concerned regarding the confidentiality of their information
as well. Confidentially was achieved by: making the survey anonymous; providing subjects with information on the chain of security of data collected; explaining the future use of the data and by whom and; subjects were told that no names will be used in the analysis, just aggregated data. Confidentiality was maintained throughout the process by keeping signed informed consent forms and surveys which have no names, separate. When participants completed the survey and body measurements were taken, their survey was deposited into a box with other questionnaires. Lastly, to maintain privacy, body measurements were collected in a separate room that had a locked door. When mobile data collection was conducted, such as at the grocery stores, a partition was erected that had full enclosure.

3. Information for Participants

As this was a non-experimental study, no treatment was provided to participants. However, being overweight or obese presents serious health consequences and we could not ignore the opportunity to educate participants on these issues. In addition to informed consent information and investigator contact information, participants were provided with a reference sheet containing information on BMI, body fat percent and WTHR (Appendix G). This information assisted participants in determining their status in relation to normal values and included tips on maintaining/losing weight.

4. Dissemination

A short report of the main findings will be sent to sites that participated in recruitment such as the Bermuda Hospitals Board, the Health Promotion Disease Prevention Office of the Bermuda Health Department, the
Bermuda Diabetes Association and media outlets. Two articles will be submitted to a peer-reviewed journal for publication, and presentations of findings will be conducted for various groups in Bermuda from which participants were recruited.
CHAPTER 4

FIRST PUBLISHABLE PAPER

Gender Differences in Perceptions of Weight and Body Image and
Comparison to Recommended Weight among Adult Bermudians

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Abstract

Objective: To determine adult Bermudians perceptions of ideal weight, overweight and body image and to decide if a discrepancy exists between their perceptions and World Health Organization standards.


Subjects: 462 men (n=207) and women (n=255), 18-65 years of age and various body weights.

Measures: Current weight was converted into current BMI using objectively measured height; self-perceived weight, ideal weight, and level of overweight was converted into self-perceived BMI, ideal BMI, and overweight BMI using self-reported height. Self-perceived current and ideal body image was measured using the Contour Drawing Rating Scale.

Results: There was a significant difference in mean current BMI between men (M=28.6, SD=5.82), and women (M=30.1, SD=6.80) (p<.05). Nearly equal proportions of men (25.5%) and women (24.9%) had a current BMI in the normal range (BMI<24.9). There was also a significant gender difference in mean self-perceived BMI as men indicated a mean BMI of 28.0 (SD=5.82), compared to women who indicated a mean BMI of 29.9 (p<.01). Participants were more likely to correctly categorize their weight status. Overweight men were more likely (81.2%) to accurately categorize themselves as overweight when compared to overweight women (76.4%) (p<.001). Based on self-reports of ideal weight, the ideal BMI selected by women (mean BMI= 24.5) was significantly lower than the ideal BMI...
indicated by men (mean BMI =25.9) (p<.001). The mean perceived ideal body image for men (mean= 5.46) corresponded to a normal body size, while the mean ideal body image for women (mean= 4.17) corresponded to an underweight body size (p<.001).

**Conclusion:** The data presented have important implications for weight management among this population and in communities with similar cultural backgrounds. Public health programs must stress to adults the correct definition of overweight and obese acceptable by medical standards.
Introduction

Obesity rates have significantly increased in North America, the United Kingdom, Eastern Europe, the Middle East, Pacific Islands, China and the Caribbean. In the United States, 66.2% of adults are overweight with men (68.8%) being more likely to be overweight than women (61.8%). Similar results are found in other westernized countries such as Bermuda. As of 2006, 64% of adults living in Bermuda were overweight. In Bermuda, the prevalence of overweight is similar to that observed in the United States, in that men (67.6%) were more likely to be overweight compared to women (60.6%). Being overweight or obese is of particular concern because of the increased risk of premature death due to chronic health conditions associated with being overweight and obese such as cardiovascular disease, type 2 diabetes, hypertension, stroke and some forms of cancer.

Body weight perception is defined as how a person perceives his or her weight appropriateness. Actual body weight relative to height, as reflected by BMI, is one of many factors that shape how individuals perceive their weight. If someone does not have an accurate perception of body weight or does not realize that being overweight or obese presents a health problem, he or she is less likely to maintain or lose weight. Beliefs about what is an ideal body weight and what constitutes overweight is often significantly different from the standards of the World Health Organization (WHO). Research indicates that misperceptions concerning body weight status may be responsible for the current increases in chronic health conditions seen in some populations. For example normal weight individuals who perceive themselves as being overweight may be prone to unhealthful behaviors such as unnecessary dieting.
and binge eating, which may predispose them to eating disorders. On the other hand, persons who are overweight may believe they are normal weight and may not think they need to control their weight or that they are at risk for diabetes or cardiovascular disease. An awareness of these discrepancies is important in evaluating the impact of current public health messages regarding healthy weight, and to better target weight-related initiatives.

Research suggests that cultural and value systems contribute to the development of standards that influence individuals’ perceptions of body sizes. In one study, Black women held more favorable body image attitudes and held body-size ideals that were less thin and more congruent with their current perceived size, when compared to White women. In the Caribbean there has been a tradition that obesity is healthy and that fat women are preferred by men, compared to normal weight or thin women. Although in countries such as Barbados there has been a change in male preference towards a more slender female body type, however there is a continuing increase in the prevalence and acceptance among females of overweight or obese female figures.

Another study reported that Blacks were more devoted to their appearance than Whites and women were more concerned about their appearance than men. Women were more dissatisfied with their size and overall appearance than were men. Sociocultural norms of thinness may be responsible for determining body image within cultures. The differences in how Blacks and Whites see their bodies and how they feel about their bodies may affect how they respond to weight change and weight control. Unlike White females, who more often prefer thin bodies as their cultural
ideal, Black women report that those ideals of thinness do not relate to them.\textsuperscript{12} Black adolescent girls and adult women indicate less social pressure to be slim, less dissatisfaction with body size and weight, a greater acceptance of overweight, and a preference for a larger body shape than do Whites.\textsuperscript{13,14,15}

Few studies have explored body weight perceptions and weight control behaviors among adults living in diverse countries such as Bermuda. Knowledge of how adult Bermudians perceive their body weight may improve the effectiveness of weight control initiatives among this population. Misperceptions of body weight may result in the failure of people to recognize their risk status and their ability to take action to prevent a host of chronic health conditions. A better understanding of these relationships will enable public health educators to improve their knowledge concerning perceptions of body weight and weight control behavior among the adult Bermuda population. Findings from this study may also help health professionals to design culturally competent weight-related programs. Body size and shape perceptions have yet to be studied in the adult Bermuda population. It is possible that perceptions of weight and body image observed in the Caribbean as a whole are shared among adult Bermudians.

**Methods**

**Study Design**

The present study was a cross-sectional observational study of perceptions of weight, actual height, and body image. Participants were included based on the following criteria: (a) resident of Bermuda for at least 1 year (citizens/permanent residents), (b) 18-65 years of age, (c) not pregnant or
breastfeeding, (d) speak English and, (e) signed an informed consent form. Participants were excluded if they had a chronic health condition such as cardiovascular disease or cancer.

Subjects

A convenience sample was used to recruit 462 adults (207 men and 255 women) to participate in the study. Participants were recruited from grocery stores, hospitals, social services agencies, and private sector organizations on the Island of Bermuda.

Assessment Measures

Perceptions of Body Weight

Participants’ body weight was both subjectively (self-reported) and objectively measured using a self-administered questionnaire followed by anthropometric measurement of weight and height. Perceptions of body weight were assessed by asking participants a variety of weight related questions. Self-perceived (estimated) weight was evaluated by asking participants “How much do you currently weigh?”. Ideal weight was assessed by asking participants “Thinking about your current weight, what would you ideally like to weigh?” Perceived overweight was evaluated by asking, “In your opinion, what is the most you could weigh and still not consider yourself overweight?” Responses to weight related questions were reported in pounds. Additionally, height was subjectively and objectively measured. Participants were asked “What is your current height.” Height was recorded in feet and inches. Current weight was measured by the researcher using a Tanita scale and
recoded in pounds. Additionally, height was measured by the researcher using a stadiometer and recorded in feet and inches.

Objectively measured current weight was converted into current BMI using objectively measured height. Each definition of self-reported (estimated) weight, ideal weight and overweight were transformed into self-perceived BMI, ideal BMI and overweight BMI using self-reported height. BMI was calculated using the formula weight (kg)/height (m2). Initially four categories based on BMI were used: underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9), obese (30+). The underweight category had too few cases (n=3) and was therefore combined with those in the normal weight category. Use of BMI in this study allowed for adjustment in weight and height differences between men and women.

Perceptions of Body Image

The male and female versions of the Contour Drawing Rating Scale were used to assess participants’ perceptions of body image. To evaluate body image, participants were provided with nine silhouettes of men and women and asked to select a picture they thought currently looked like them (current body image) and which picture they would prefer to look like (ideal body image). Each picture was assigned a number from 1-9. These numbers corresponded to a range of body weight sizes from 1= very thin to 9=very overweight. Scores were calculated to indicate the discrepancy between participants’ current and desired body images, with a possible range of -8 to 8. Actual scores in this study ranged from -8 to 3.

A body satisfaction score was calculated to show the difference between participants’ current and ideal body image. Body satisfaction scores were calculated
based on the figure the participant thought was ideal minus the figure that most looked like them (current), as used in previous research.\textsuperscript{19,20} Positive scores indicate that participants are dissatisfied with their body shape and want to be heavier, zero indicates participants' satisfaction with their shape and negative scores indicate that participants are dissatisfied and want to be thinner. Similar methods have been used in other studies.\textsuperscript{20}

**Procedure**

First, participants consented to be a part of the study by signing the informed consent document. Then participants completed a self-administered survey which took approximately 10-15 minutes. Next, measurements of weight, height, waist and hip circumference were taken. A small gift was provided for participation in the study. This study was approved by the Loma Linda University Institutional Review Board and the Bermuda Hospitals Board Ethics Committee.

**Data Analysis**

Prior to analysis, the data were cleaned and checked for consistency. Data entry occurred at the end of each collection session and was entered by the study coordinator. Upon completion of data collection and entry, the data were re-checked for accuracy. Multiple comparisons were conducted in the analysis of the data, therefore a more stringent criteria (p<.01) was used.

Descriptive statistics were carried out for self-perceived BMI, current BMI, ideal BMI, overweight BMI, body weight discrepancy and body satisfaction scores, and included percentages, means and other measures of central tendency. Correlation analysis was conducted on self-perceived BMI, current BMI, ideal BMI, overweight
BMI and body image satisfaction to determine the linear association among these variables. Crosstabulations and Chi-square analysis examined associations of current (actual) and perceived categories of weight by gender. Body weight discrepancy was calculated as the absolute difference between ideal and current (actual) BMI, as well as ideal and overweight BMI. Mean levels of ideal BMI were compared across current medical classifications of BMI, using ANOVA. All analyses were performed using SPSSv.16 software.²

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research. Approval was given by the Loma Linda University Institutional Review Board and the Bermuda Hospitals Board Ethics Committee for this study.

Results

Sample Characteristics

Selected characteristics of the survey participants by gender are presented in Table 1. The majority of participants were middle age (mean age men M= 40.45, SD=11.73 and mean age women M= 42.91, SD=11.77). Most women (86.8%) and men (82.9%) were Black, although this was a non-significant finding (p>.05). The “other” race category had too few cases (n=19) and was therefore combined with those in the Black category, as these “other” participants indicated their race to be a combination of Black and another racial group. Among participants, 76.6% of men 68.6% of women had a combined yearly income of at least $50,001. Although not a significant finding, most participants were employed (men=87%; women=90.2%) and had at least a secondary/high school education (94.5% of men,
91.1% of women). Significantly more men (50.5%) were married compared to 39.3% of women (p<.05). Participants indicated a religious preference for a Christian faith (men= 70.7%, women= 77.5%).

(Insert Table 1)

**Perceived Body Weight**

The prevalence of overweight and obesity in this sample is similar to that reported for the Bermuda population. There was a significant difference in mean current BMI between men (M=28.6, SD=5.82), and women (M=30.1, SD=6.80) (p<.05). Significant differences were observed among all participants according to BMI group. Nearly equal proportions of men (25.5%) and women (24.9%) had a current BMI in the normal range (BMI<24.9). Significantly more men (41.7%) were overweight (BMI=25-29.9), compared to 31.2% of women (p<.05); whereas more women (43.9%) were obese (BMI>30), compared to 32.8% of men. There was a significant gender difference in mean self-perceived BMI as men indicated a mean BMI of 28.0 (SD=5.82), compared to women who indicated a mean BMI of 29.9 (p<.01). Normal weight men were significantly more likely (90.4%) to accurately categorize themselves as normal weight when compared to women (84.5%) (p<.001), as seen in Table 2. Among overweight participants, men were also more likely than women to accurately categorize themselves as overweight (81.2% versus 76.4%) (p<.001). Lastly, in the obese category, women were significantly more likely to accurately categorize themselves as overweight (92.2%), compared to men (90.2%) (p<.001).

(Insert Table 2)
Ideal Weight

Reports on ideal weight show that the BMI at which women (mean BMI=24.5) considered themselves to be at their ideal weight was significantly lower than that for men (mean BMI=25.9) (p<.001), as seen in Table 3. There were significant differences in perceived ideal weight based on BMI group. Significantly more men (59.4%) specified an ideal BMI in the overweight classification (mean BMI=25-29.9), compared to women (38.7%) (p<.001). Women preferred an ideal BMI in the upper normal range (mean BMI=24.5), which is acceptable by WHO standards; while men preferred an ideal BMI of 25.8, which is not an acceptable normal BMI by WHO standards. The mean difference between subject’s ideal weight and current weight was -16.9 pounds for men and -33.68 pounds for women, with significantly more women (94.1%) indicating they wanted to weigh less compared to men (75.6%) (p<.001).

Level of Overweight

The BMI at which women (mean BMI=26.3) considered themselves to be overweight was significantly lower than that for men (mean BMI=27.6) (p<.01). Both BMI’s were considered to be in the recognized range for overweight (BMI>25) according to World Health Organization standards, as reported in Table 3. The mean difference between subject’s ideal weight and perceived level of overweight was -12.8 pounds for men and -10.7 pounds for women, which was not statistically significant (p>.05).
**Perceived Height**

Significant gender differences were observed for self-perceived (estimated) and current measured height. Based on self-reports, men estimated a mean height of 70.6 inches compared to women who indicated a mean height of 64.4 inches (p<.001). Additionally, there were significant gender differences in current measured height between men and women. The average measured height for men (69.5 inches) was significantly lower than the height indicated for women (64.2 inches) (p<.001). A non-significant discrepancy in self-perceived and measured height was observed. The mean difference in men's current height perception was 1.1 inches, compared to women who had a mean current height difference of 0.15 inches (p>.05).

**Perceived Body Image**

Men selected a perceived current body image of 6.44 compared to women who indicated a current body image of 6.57, both of which corresponded to a normal body shape (on a scale of 1 to 9). Significant differences were found in current body image among participants in various BMI groups. Based on reports of current (actual) BMI, normal weight men (BMI=18.5-24.9) indicated a mean perceived current body image of 5.25, which corresponded to a normal body shape; overweight men (BMI >25) selected a mean perceived current body image of 6.20, which corresponded to a normal body shape; while obese men (BMI >30) had a mean perceived current body image score of 7.69, an overweight body shape [F (2, 197)= 69.95, p<.001]. Multiple comparisons of current body image with current BMI categories showed significant differences for men among the following BMI groups:
normal weight and overweight (MD=-.947 p<.001); normal weight and obese (MD=-2.44 p<.001); overweight and obese (MD=-1.49 p<.001).

Among women, normal weight women (BMI=18.5-24.9) indicated a mean perceived current body image of 4.62, which corresponded to an underweight body shape; overweight women (BMI >25) selected mean perceived current body image of 6.36, an overweight body shape; while obese women (BMI >30) had a mean perceived current body image score of 7.85, which corresponded to an overweight body shape [F (2, 240)= 101.76, p<.001]. Multiple comparisons of current body image with current BMI categories showed significant differences for women among the following BMI groups: normal weight and overweight (MD=-1.73 p<.001); normal weight and obese (MD=-3.23 p<.001); overweight and obese (MD=-1.49 p<.001).

There were significant gender differences in perceived ideal body image. Men preferred a mean ideal body image of 5.46, a normal body shape, while women selected a mean ideal body image of 4.17, an underweight body shape (p<.001). On average, normal weight men preferred an ideal body image of 5.39, which corresponded to a normal body shape; overweight men preferred an ideal body image of 5.27, which corresponded to a normal body shape; while obese men preferred an ideal body image of 5.74, which also corresponded to a normal body shape [F (2, 189)= 4.76, p<.01]. Multiple comparisons of ideal body image with current BMI categories showed the overweight category was significantly different from the obese category (MD= -.467 p<.01).
Normal weight women preferred an ideal body image of 3.51, an underweight body shape; overweight women preferred an ideal body image of 4.01, an underweight body shape; while obese women preferred an ideal body image of 4.68, an underweight body shape [F (2, 232)= 19.56 p<.001]. Multiple comparisons of ideal body image with current BMI categories showed significant differences for women among the following BMI categories: normal weight and overweight (MD=-.505, p<.05); normal weight and obese (MD=-1.17 p<.001); overweight and obese (MD=-.666 p<.01).

Findings on body shape (image) satisfaction can be found in Table 3. We found significant gender and BMI group differences when assessing body shape satisfaction. Although men were more likely than women to be overweight (41.7% versus 31.2% respectively), 21.5% of men and 9.4% of women were more satisfied with their current body shape; more women (89.3%) than men (66.2%) wanted a thinner body shape; while more men (12.3%) compared to women 1.3%) wanted to be heavier (p<.001).

(Insert Table 3)

**Correlations among Body Weight Perceptions and Body Satisfaction**

Self-perceived BMI, current BMI, ideal BMI and overweight BMI were significantly inversely related to body satisfaction, as seen in Table 4. This suggests that as BMI increased, body satisfaction decreased indicating that participants with heavier body types were more likely to be dissatisfied with their body weight and desired to be thinner. Current BMI and self-perceived BMI showed
the strongest correlation (r= .940 p<.05), indicating that as current (actual) BMI increased so did self-perceived (estimated) BMI.

A stronger inverse association was observed between self-perceived BMI and body satisfaction score at -.516 such that as BMI increased body satisfaction decreased. A high degree of accuracy was observed between current BMI and self-perceived BMI at .940, signifying that as participants current (actual) BMI increased, so did their perceived BMI. Lastly, the lowest inverse association was observed between ideal BMI and body satisfaction score (-.135), indicating that as ideal BMI increased participants body satisfaction decreased.

(Insert Table 4)

Discussion

Results of this study confirm that perceptions of weight and body image differ by gender and current weight status, for this sample of adult Bermudians. Most participants were likely to correctly categories their weight status. As seen in Table 2, 76.4% of overweight women correctly categorized themselves as overweight and 81.2% of overweight men correctly categorized themselves as such. There were some women however, that did not have an accurate perception of their current weight, as they were more likely to perceive themselves as overweight (15.5%) when they were actually normal weight, compared to men (9.6%). These findings suggest that healthy body weight may still be an issue for women in Bermuda, despite public health messages advocating an appropriate weight based on height. Similar to other research, this study confirms earlier results that women’s ideal body image BMI is lower than men’s.19,22 Women indicated an ideal body image BMI at the upper range of normal
(BMI = 24.5), while men indicated an ideal body image BMI in the overweight category (BMI = 25.9). Men and women had similar perceptions with regards to the BMI at which they considered themselves to be overweight. Women and men considered themselves to be overweight at a BMI = 26.3 and BMI = 27.6, both of which are in the category recognized by WHO as overweight.

Concerning body image, we found that Bermudian men and women appeared to feel similarly about their current body weight. As seen in other studies, current body image among men and women was significantly larger than their mean ideal figure, indicating that both men and women recognize that they currently are not the shape and size at which they prefer to see themselves. However, there is a greater discrepancy between ideal and current BMI and level of body image satisfaction among women. Women demonstrated a higher ideal-current BMI discrepancy (M = -5.86, SD = 5.56), compared to men (M = -2.80, SD = 4.94) (p < .001). Alternately, men (M = -1.03, SD = 1.46) (p < .001) indicated more body image satisfaction than women (M = -2.49, SD = 1.68) (p < .001). Not surprisingly, both men and women indicated current perceived body shape images that corresponded with their current weight category, except for normal weight women, who were more likely to select an underweight body image. For example, normal weight men selected a mean current body image that corresponded with a normal shape body image (mean = 5.25), while overweight men selected a mean current body image that was overweight (mean = 6.20). Alternatively, overweight and obese men desired an ideal body image that corresponded to a normal body shape, while overweight and obese women preferred an ideal body image that corresponded to an underweight body shape.
This study was undertaken to develop a better understanding of how adult Bermudians perceive their weight and body image. It is important to note that most of the men in this study defined ideal BMI as a BMI in the overweight category, whereas women viewed their ideal BMI in the upper normal range for normal BMI suggested by international health authorities. It is possible that changing views of body weight by men may be indicative of a greater acceptance of overweight among men in this sample. These findings may have important implications in preventing further weight gain among men and in developing an appropriate definition of weight for women.

The results of this study are not surprising given that 74.8% of participants in this sample were overweight and obese. The discrepancy in body weight status and body image is apparent in both genders as there remain normal weight people who see themselves as overweight and overweight people who perceive themselves as normal weight. Further research is needed to determine what characteristics distinguish between adults with accurate body weight perceptions and those who underestimate or overestimate their body weight.

**Strengths and Limitations**

Unlike many of the previous studies among this population, we utilized both subjective and objective body weight measurements to determine the discrepancy between one’s self-perceived (estimated) weight and actual current body weight (Government of Bermuda, 2007). Objective measurement of body weight allowed for more reliable data collection, while self-reported body weight permitted us to make comparisons in the accuracy of such perceptions. Few studies have been conducted
among the adult Bermuda population. This study provided important information on current perceptions, knowledge and beliefs, concerning body weight, which had never been collected before among a moderate sample of adult Bermudians.

There are a few limitations that must be mentioned. These data have the disadvantage of being derived from a non-representative population sample. To minimize these limitations we recruited participants from various locations around the island, on different days and times of the week. Additionally, we tended to oversample those in the overweight/obese categories and therefore the prevalence of overweight may be inflated. The study used a cross-sectional design and convenience sampling technique and therefore the results should be interpreted with caution as we could not determine a cause and effect relationship between body weight status and use of healthy weight control behaviors. Future research is suggested to determine if these findings are generalizable to the larger adult population living in Bermuda.

Conclusion

The role gender plays in perception of weight status and body shape is yet to be fully understood. The present study demonstrates that both men and women may have incorrect perceptions about their current weight status. Additionally, we observed that Bermudian women may desire an ideal body shape (image) that is underweight, suggesting that women in this sample hold views about their body image that may be a result of societal pressures to be thin, similar to those views held by women in the U.S.

It is possible that misperceptions of weight status may result in a failure of an individual to recognize his or her risk status and one’s ability to take action to prevent
a host of chronic health conditions. Public health programs must stress to women and men the correct definition of overweight and obesity acceptable by medical standards. Normal weight men and women need to be encouraged to accept their body size and to make healthy lifestyle choices to prevent weight gain. Further research is recommended to determine if the greater Bermuda population has similar perceptions of weight and body image observed in this study.
Acknowledgments

This study was supported by the Hulda Crooks Research Grant and the Center for Health Research, School of Public Health, Loma Linda University. We would also like to thank the Bermuda Hospitals Board for their participation.
Table 1. Selected Characteristics of Study Participants by Gender

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*p<.05
Table 2. Comparison of Current Weight and Self-perceived Weight by Gender

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<tbody>
<tr>
<td></td>
<td>%</td>
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<td>%</td>
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<tr>
<td>Self-perceived weight</td>
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<tr>
<td>Women* (n=233)</td>
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<tr>
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<tr>
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<td>0</td>
<td>13.9</td>
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</table>

*Body Mass Index categories include underweight/normal (BMI= <18.5-24.9), overweight (BMI= 25-29.9), obese (BMI= 30+). The underweight and normal weight categories were collapsed as the underweight category had only a few cases.

Highlighted numbers indicate the proportion of respondents that accurately estimated their current body weight.

*p<.001
Table 3. Measures of Current Weight, Self-perceived Weight, Ideal Weight, Level of Overweight, Perceived Current Weight and Ideal Body Image, Body Weight Discrepancy, and Body Image Satisfaction by Gender

<table>
<thead>
<tr>
<th></th>
<th>Men n = 207</th>
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<th></th>
<th>Women n = 255</th>
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<tr>
<td></td>
<td>M</td>
<td>SD</td>
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<td>n</td>
<td>M</td>
<td>SD</td>
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<td>23.13</td>
<td>201</td>
<td>20.37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean BMI † † †</td>
<td>25.9</td>
<td>3.28</td>
<td>197</td>
<td>3.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI Group**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>33.5</td>
<td></td>
<td></td>
<td>58.3</td>
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<tr>
<td>Overweight</td>
<td>59.4</td>
<td></td>
<td></td>
<td>38.7</td>
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<tr>
<td>Obese</td>
<td>7.1</td>
<td></td>
<td></td>
<td>3.0</td>
<td></td>
<td></td>
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<tr>
<td>Perceived overweight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean weight in lbs</td>
<td>192.0</td>
<td>27.66</td>
<td>204</td>
<td>24.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean BMI † † †</td>
<td>27.6</td>
<td>3.96</td>
<td>202</td>
<td>3.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI Group***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>20.0</td>
<td></td>
<td></td>
<td>36.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>57.5</td>
<td></td>
<td></td>
<td>49.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>22.5</td>
<td></td>
<td></td>
<td>13.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a Body Mass Index: Underweight/Normal (BMI= <18.5-24.9), overweight (BMI= 25-29.9), obese (BMI= 30+). The underweight and normal weight categories were collapsed as the Underweight category had only a few cases.  
*p<.05  **p<.01  ***p<.001
Table 3 (Continued). Measures of Current Weight, Self-perceived Weight, Ideal Weight, Level of Overweight, Perceived Current Weight and Ideal Body Image, Body Weight Discrepancy, and Body Image Satisfaction by Gender

<table>
<thead>
<tr>
<th>Measure of Discrepancy</th>
<th>Men (n=207)</th>
<th>Women (n=255)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ideal-current weight discrepancy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ideal-current weight discrepancy (lbs)</td>
<td>-16.9</td>
<td>-33.68</td>
</tr>
<tr>
<td>Mean ideal-current weight BMI discrepancy</td>
<td>29.56</td>
<td>32.36</td>
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<tr>
<td>Weight discrepancy group ***</td>
<td>199</td>
<td>238</td>
</tr>
<tr>
<td>No weight discrepancy</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Want to weigh less</td>
<td>75.6</td>
<td>94.1</td>
</tr>
<tr>
<td>Want to weigh more</td>
<td>24.4</td>
<td>5.9</td>
</tr>
<tr>
<td><strong>Ideal-overweight discrepancy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ideal-overweight weight discrepancy (lbs)</td>
<td>-12.8</td>
<td>-10.8</td>
</tr>
<tr>
<td>Mean ideal-overweight BMI discrepancy</td>
<td>14.69</td>
<td>13.83</td>
</tr>
<tr>
<td>Weight discrepancy group</td>
<td>199</td>
<td>223</td>
</tr>
<tr>
<td>No weight discrepancy</td>
<td>17.6</td>
<td>13.5</td>
</tr>
<tr>
<td>Want to weigh less</td>
<td>79.4</td>
<td>80.3</td>
</tr>
<tr>
<td>Want to weigh more</td>
<td>3.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Mean perceived current body image BMI Group ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>6.44</td>
<td>203</td>
</tr>
<tr>
<td>Overweight</td>
<td>6.20</td>
<td>200</td>
</tr>
<tr>
<td>Obese</td>
<td>7.69</td>
<td>6.57</td>
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<tr>
<td>Mean perceived ideal body image BMI Group ***</td>
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<td></td>
</tr>
<tr>
<td>Normal</td>
<td>5.46</td>
<td>195</td>
</tr>
<tr>
<td>Overweight</td>
<td>5.39</td>
<td>192</td>
</tr>
<tr>
<td>Obese</td>
<td>5.20</td>
<td>4.17</td>
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<tr>
<td>Body image satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean satisfaction score</td>
<td>-1.03</td>
<td>-2.49</td>
</tr>
<tr>
<td>Body satisfaction group ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied with body shape</td>
<td>21.5</td>
<td>9.4</td>
</tr>
<tr>
<td>Want thinner body shape</td>
<td>66.2</td>
<td>89.3</td>
</tr>
<tr>
<td>Want heavier body shape</td>
<td>12.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

*Weight discrepancy is calculated as the absolute difference between ideal weight and current weight. Body image satisfaction is calculated as the difference between ideal and current body image.

†Significance by gender: †p<.05 ††p<.01 †††p<.001

*Significance by group: *p<.05 **p<.01 ***p<.001
Table 4. Correlation of Participants Current BMI, Self-perceived BMI, Overweight BMI and Body Image Satisfaction

<table>
<thead>
<tr>
<th></th>
<th>Current BMI</th>
<th>Self-perceived BMI</th>
<th>Ideal BMI</th>
<th>Overweight BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-perceived BMI</td>
<td>.940*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ideal BMI</td>
<td>.508*</td>
<td>.624*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overweight BMI</td>
<td>.509*</td>
<td>.591*</td>
<td>.837*</td>
<td>-</td>
</tr>
<tr>
<td>Body Image Satisfaction</td>
<td>-.486*</td>
<td>-.516*</td>
<td>-.135*</td>
<td>-.142*</td>
</tr>
</tbody>
</table>

*p< 0.05

*Body image satisfaction is calculated as the absolute difference between ideal and current body image.
References


21 SPSS Inc. SPSS Base 16.0 for Mac Users Guide. SPSS Inc.: Chicago, USA 2008.

CHAPTER 5
SECOND PUBLISHABLE PAPER

Body Weight Perceptions and Weight Control Behaviors among Adult Bermudians

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Key words: body weight, weight control, health behaviors, health belief model, overweight, obesity

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Abstract

Objective: To determine if adult Bermudians are aware of their weight status and whether they are engaged in weight control behaviors. To evaluate if health belief model (HBM) variables are associated with ideal-current body weight discrepancy and weight control behaviors.


Subjects: 462 Bermudian men (n=207) and women (n=255), 18-65 years of age and various body weights.

Measures: Objectively measured current weight was converted into current body mass index (BMI) using objectively measured height. Self-perceived weight and ideal weight were converted into self-perceived BMI and ideal BMI using self-reported height. In addition, self-reported weight loss attempts, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and perceived self-efficacy of losing/maintaining weight were assessed. The discrepancy between ideal and current body weight was calculated and the total number of weight control behaviors were summed across 24 items: 15 healthy and 9 unhealthy behaviors.

Results: Normal weight men were significantly more likely (90.4%) to accurately perceive themselves as normal weight when compared to women (84.5%) (p<.001). Among overweight participants, men were more likely than women to accurately perceive themselves as overweight (81.2% versus 76.4%)(p<.001). In the obese category, women were more likely to accurately perceive themselves as overweight (92.2%),
compared to men (90.2%) (p<.001). There was a significant difference in the ideal weight (BMI) selected by men and women. Men (59.4%) specified a mean ideal BMI of 25.9 (p<.001), which would fall into the overweight category according to medical standards, which was significantly higher than women who preferred a mean ideal BMI=24.5.

Based on self-reports of weight loss attempts within the past year, significantly more women (79.8%) tried to lose weight in the past year compared to 54.6% of men [$\chi^2 (1, N=443) = 32.14$, p<.001]. Among normal weight participants’ who were accurate in categorization of their body weight as normal, significantly more women (58.7%) tried to lose weight in the past year compared to men (14.3%) [$\chi^2 (1, N=119)= 4.39$, p<.001].

Independent variables age, gender, perceived susceptibility, perceived severity, perceived self-efficacy, and perceived benefits were associated with ideal-current body weight discrepancy, healthy and unhealthy weight control behaviors.

Conclusion: Bermudian men and women may have incorrect perceptions and beliefs about their weight status which may in turn affect their performance of weight control behaviors. Women especially need to be educated regarding appropriate weight and healthy weight control behavior, especially among weight challenged individuals in whom body weight presents a health threat.
Introduction

Approximately 1 billion adults or 16.6% of the 6 billion global population are overweight, of which at least 300 million (5%) of those are obese (1). Among adults in the United States 66.2% are overweight (2). Men are more likely than women to be overweight (68.8% and 61.8%); while Blacks (34.8%) are more likely to be overweight compared to Whites (21.8%). The growing rate of obesity has not escaped small countries such as Bermuda. As of 2006, 64% of adult residents living in Bermuda were overweight (3). Bermudian men were more likely to be overweight (47.5%) compared to Bermudian women (33%), who were more likely to be obese (men=20.1%, women=27.6%). Overall, 73.2% of Blacks were overweight compared to 54.4% of Whites. The growing rate of overweight is troublesome given the current prevalence of cardiovascular disease, type 2 diabetes, hypertension, and stroke, all of which are associated with being overweight (4).

Beliefs about what is an accurate body weight are often significantly different from the standards of U.S. health authorities (5, 6). Actual body weight relative to height, as reflected by Body Mass Index (BMI), is one of many factors that shape how individuals perceive their weight. Research indicates that misperceptions concerning body weight status may be responsible for the current increases in chronic health conditions seen in some populations (7). If one does not have an accurate perception of body weight or does not realize that being overweight or obese presents a health problem, one is less likely to maintain or lose weight (8, 9, 10).

Many diseases related to obesity could be prevented with a moderate body weight loss of 5-10% (11). Studies suggest that overweight or obese individuals often do not
attempt to lose weight despite the negative health outcomes that result from being overweight (12, 13). Research conducted in Bermuda shows that 17.6% of adult respondents were considered sedentary, that is they did not engage in moderate physical activity for at least 10 minutes at a time during the week (Government of Bermuda, 2008). Men (19.5%) compared to women (15.8%) were more likely to be sedentary; Blacks (21.7%) and Asian and other races (27.3%) were more likely to be sedentary compared to Whites (11.4%); adults with secondary education or less (23.6%) were more likely to be sedentary compared to respondents with a higher level of education (13.4%); and adults in low income households were more likely to report less than moderate activity in a week (23.8%) than adults in middle income (13.6%) or high income (14.1%) households. A lack of physical activity among the adult Bermuda population is important to note given that most weight control initiatives recommend both dietary and physical activity modifications.

The chosen method of weight control may be different depending on gender. One study found that 71% of women and 62% of men reported that they were changing both their diet and exercise behavior as part of a current weight-loss attempt (14). A majority of both men (79%) and women (95%) report having participated in at least one healthy dieting behavior, whereas a majority of women (57%) compared to about 36% of men, had utilized at least one unhealthy dieting behavior, such as purging or skipping meals, in the past year (15). Women are more likely to want to lose a greater percentage of their body weight than men and attempt to lose weight more often (16). Cheskin and Donze reported that women who wanted to lose weight were more likely to do so in the hopes of improving their appearance, whereas men who wish to lose weight were more likely to be
concerned about their future health and fitness (17, 18). Additionally, participants who were overweight were less satisfied with their bodies and more likely to diet than participants who were not overweight. Body size dissatisfaction was positively associated with trying to lose weight among both women and men (19).

The Health Belief Model (HBM) has been applied to explain or predict preventive behavior related to health. In the current study, the HBM was applied to determine if perceived susceptibility, perceived severity (seriousness), perceived benefits, perceived barriers, and perceived self-efficacy to becoming overweight or obese, along with a host of sociodemographic variables, was associated with ideal and current body weight discrepancy and weight control behavior. According to the HBM, one’s subjective perception of the risk of becoming overweight or obese (susceptibility) determines whether or not that person feels he or she needs to engage in weight control behavior, such as dieting or exercise. The combination of perceived susceptibility and severity are known as perceived threat of disease, which provide the force to act to prevent becoming overweight (20). In addition, behaviors to reduce this threat, such as diet modification and exercise, are implemented depending on the individual’s beliefs regarding the benefits (perceived benefits) and barriers (perceived barriers) of those behaviors, of which low self-efficacy is the main barrier.

The potential negative aspects of engaging in weight control behaviors, perceived barriers, act as impediments to weight control. For example the cost of buying more nutritious food and the time spent exercising, may prevent an individual from attempting these weight control behaviors. In addition, a person’s decision as to whether or not to implement weight control is determined by the level of confidence they have in their
ability to carry out weight control practices successfully (perceived self-efficacy). These are referred to as self-efficacy beliefs which influence how an individual feels and thinks about weight control, and it is these beliefs that partly motivate the individual to initiate and maintain weight control practices (21). The primary motivation to change may be disappointment with body image appearance or the level of perceived risk of becoming overweight or obese, and the primary resource for change is self-efficacy or confidence to make the change to lose or maintain a healthy weight, especially in overcoming barriers to weight control.

Few studies have explored weight control behaviors among adults living in Bermuda. Misperceptions of body weight may also result in the failure of individuals to recognize their risk status and there ability to take action to prevent a host of chronic health conditions. A better understanding of the relationship between weight perceptions and weight control behavior will enable public health educators to design culturally competent weight-related initiatives for this population.

Methods

Study Design

The present study was a cross-sectional observational study of perceptions of weight, actual height, and body image. Participants were included based on the following criteria: (a) resident of Bermuda for at least 1 year (citizens/permanent residents), (b) 18-65 years of age, (c) not pregnant or breastfeeding, (d) speak English and, (e) signed an informed consent form. Participants were excluded if they had a chronic health condition such as cardiovascular disease or cancer.
Subjects

A convenience sample technique was used to recruit 462 adult (255 women and 206 men) Bermudians to participate in the study. Recruitment for this study took place at grocery stores, hospitals, social services agencies, and private sector organizations on the Island of Bermuda. Subjects were from various socioeconomic backgrounds and racial groups. Every effort was made to ensure equivalent recruitment of men and women into the study.

Assessment Measures

Body Weight Perceptions

Participants' body weight was both subjectively and objectively measured to determine current and self-perceived (estimated) weight. Questionnaire items on perceptions of ideal weight were drawn from the United Kingdom Office of National Statistics Omnibus Survey 1999 (22). This is a household survey which is administered to persons over the age of 16 years. Self-perceived (estimated) weight was assessed by asking "How much do you currently weigh?" Respondents provided their weight in pounds. To assess ideal weight, participants were asked "Thinking about your current weight, what would you ideally like to weigh?" Respondents provided their ideal weight in pounds. Participant's height was also subjectively and objectively measured. Respondents were asked "What is your current height?" Height was reported in feet and inches. Each participant's definition of self-perceived weight and ideal weight were converted into self-perceived BMI, and ideal BMI, using self-reported height. Additionally current body weight was measured by the researcher using a Tanita scale. Current body weight was reported in pounds and converted into current BMI using
measured height (20). The discrepancy between ideal weight and current weight was calculated as the absolute difference between ideal BMI and current BMI.

*Weight Control Behaviors*

Engaging in weight control behaviors was assessed using the Weight Control Behavior Scale (WCBS) (23). The WCBS contains a healthy dieting behavior (15-item) subscale and an unhealthy dieting behavior (9-item) subscale. The healthy dieting behavior scale included behaviors such as increase exercise, eat less fat and reduce the amount of calories eaten, in order to lose weight. The unhealthy dieting behavior scale included activities such as use of diet pills, increase the amount of cigarettes smoked, and use of diuretics to lose weight. Test–retest reliability for both the healthy dieting behavior scale and the unhealthy dieting behavior scale has been reported in previous research (15). Cronbach’s alphas for the healthy behavior scale were .87 for women and .88 for men, indicating strong reliability of the subscale. The Cronbach’s alphas for the unhealthy dieting scale were .70 for women and .67 for men, indicating good reliability for that subscale.

Participants were first asked to indicate if they had tried to lose weight in the past year (yes/no). Participants responding “yes” were then asked how often they used each strategy in the past year to try to lose (control) weight. Participants answering “no” were asked to skip to the sociodemographic information section. Each dieting strategy was rated on an ordinal scale in which responses were as follows; “0” indicated respondents “never used” the strategy, “1” indicated that respondents had “sometimes used” the strategy, and “2” indicated that respondents “always used” the strategy. Responses “sometimes used” (1) and “always used” (2) were combined for analysis, to indicate that
a participant ever used the behavior to control weight in the past year. For the healthy and unhealthy weight control behavior scales, participants’ responses were summed for a total score, creating a continuous variable for use in regression analysis.

**Health Belief Model Variables**

The health belief model variables of perceived susceptibility, perceived severity (seriousness), perceived benefits, perceived barriers, and perceived self-efficacy were assessed by asking respondents a series of brief statements regarding overweight/obesity and weight control. There were two items on the questionnaire that assessed perceived susceptibility; two items assessed perceived severity; perceived benefits was evaluated with two items; perceived barriers was evaluated with two items and; perceived self-efficacy was assessed with three items. These statements were based on items from exiting scales (24, 25). Respondents indicated the extent to which they agreed with each statement by selecting from five Likert scale categories: strongly disagree, disagree, undecided, agree, and strongly agree. For perceived susceptibility, perceived severity, perceived barriers, perceived benefits and perceived self-efficacy participants responses were summed for a total score, creating a continuous variable for use in regression analysis. Negatively worded items were recoded prior to data analysis.

**Procedure**

First, participants consented to be a part of the study by signing the informed consent document. Then participants completed a self-administered survey which took approximately 10-15 minutes. Next, measurements of weight, height, waist and hip circumference were taken by the study coordinator. A small gift was provided for
participation in the study. This study was approved by the Loma Linda University Institutional Review Board and the Bermuda Hospitals Board Ethics Committee.

Data Analysis

Prior to analysis, the data were cleaned and checked for consistency. Data entry occurred at the end of each collection session and was entered by the study coordinator. Upon completion of data collection and entry, the data were re-checked for accuracy. Descriptive statistics such as percentages, means and other measures of central tendency, were calculated for current BMI, ideal BMI, weight loss attempt over the past year, and frequency of use of healthy and unhealthy behaviors to control their weight. Chi-square analysis examined differences in categories of weight between males and females. Simple cross tabulations were performed with gender and whether or not respondents tried to lose weight in the past year.

Lastly, multiple regression analysis was conducted to determine which variable independently predicted ideal-current weight discrepancy, and weight control behavior subscales (health and unhealthy subscales). Variables which were included are age, gender, education, income, perceived susceptibility, perceived severity, perceived self-efficacy, and perceived benefits. We combined the two items for perceived barriers with the two items for perceived self-efficacy. Having low self-efficacy is a barrier to losing/controlling weight. Therefore, together these items represent confidence in an individual performing weight control. All analyses were performed using SPSSv.16 software.
Results

Sample Characteristics

Selected characteristics of the survey participants by gender are presented in Table 1. Although non-significant, most women (86.8%) and men (82.9%) selected Black as their race (p>.05). The "other" race category had too few cases (n=19) and was therefore combined with those in the Black category, as these "other" participants indicated their race to be a combination of Black and another racial group. The majority of participants were middle age (mean age men M= 40.45, SD=11.73 and mean age women M= 42.91, SD=11.77), with the largest percentage of women having an age between 45-54 years (34.5%); while men show equal proportions of age between 35-45 (27.3%) years and 45-54 years (27.3%). Participants represented a socioeconomically diverse background. For example, 24.7% reported a combined household income of $50,001 to $75,000, while 8.1% of men and 3.3% of women indicated a combined household income of between $150,001 and 175,000. Most participants were employed (men=87%; women=90.2%) and had at least a secondary/high school education (94.5% of men, 91.1% of women). Approximately half of all men (50.5%) indicated being married compared to 39.3% of women. Most participants reported a religious preference for a Christian faith (men= 70.7%, women= 77.5%).

(Insert Table 1)

Body Weight Perceptions

The prevalence of overweight and obesity in this sample is similar to that reported for the Bermuda population. There was significant gender difference in mean current BMI. Men had a mean BMI of 28.6 compared to women who had a mean BMI of
30.1 (p<.05). Significant differences were observed among all participants according to BMI group. Approximately one quarter of men (25.5%) and women (24.9%) had a normal BMI (BMI <24.9). Significantly more men (41.7%) were overweight (BMI=25-29.9), compared to 31.2% of women (p<.05); whereas more women (43.9%) were obese (BMI>30), compared to 32.8% of men. Significant gender difference was observed for mean self-perceived BMI; men indicated a mean BMI of 28.0 (SD=5.82), compared to women who indicated a mean BMI of 29.9 (p<.01). Additionally, normal weight men were more likely (90.4%) to accurately perceive themselves as normal weight when compared to women (84.5%) (p<.001). Among overweight participants, men were also more likely than women to accurately perceive themselves as overweight (81.2% versus 76.4%)(p<.001). In the obese category, women were more likely to accurately perceive themselves as overweight (92.2%), compared to men (90.2%) (p<.001).

There was a significant difference in the ideal weight (BMI) selected by men and women. Men (59.4%) specified a mean ideal BMI of 25.9 (p<.001), which would fall into the overweight category according to medical standards, which was significantly higher than women who preferred a mean ideal BMI=24.5, corresponding to a normal BMI acceptable by medical standards. The mean difference between subject’s ideal weight and current weight was -16.9 pounds for men and -33.68 pounds for women, with more women (94.1%) indicating they wanted to weigh less compared to men (75.6%) (p<.001). Multiple comparisons were conducted in the analysis of the data, therefore a more stringent criteria (p<.01) was used.
**Weight Control Behavior**

Based on self-reports of weight loss attempts within the past year, significantly more women (79.8%) tried to lose weight in the past year compared to 54.6% of men [$\chi^2 (1, N=443) = 32.14, p<.001$]. Among normal weight participants’ who were accurate in categorization of their body weight as normal, significantly more women (58.7%) tried to lose weight in the past year compared to men (14.3%) [$\chi^2 (1, N=119)= 18.47, p<.001$]; while of normal weight participants who overestimated their body weight as overweight, women were more likely (100%) to try to lose weight in the past year compared to men (40.0%) [$\chi^2 (1, N=119)= 6.87, p<.001$], as seen in Table 2.

In the overweight category, among participants who were accurate in their categorization of their body weight as overweight, women (81.1%) were more likely to try to lose weight in the past year compared to men (54.8%) [$\chi^2 (1, N=147)= 8.92, p<.01$]. Non-significant findings were observed among overweight participants who underestimated their body weight, as 40% of men and 85.7% [$\chi^2 (1, N=147)=3.55, p>.05$] of women tried to lose weight in the past year. Among overweight participants who overestimated their weight, more women (90.0%) tried to lose weight in the past year compared to men (80.0%), although non-significant [$\chi^2 (1, N=147)=.29, p>.05$].

Lastly, among obese participants who accurately categorized their weight as obese, there were no significant differences between men and women as women (89.1%) and men (85.7%) show similar weight loss attempts this was not significant [$\chi^2 (1, N=162)=.38, p>.05$]. Similarly, among obese participants that underestimated their body weight, women were more likely to try to lose weight in the past year (87.5%) compared to men (66.7%) [$\chi^2 (1, N=162)=.88, p>.05$] although these results are non-significant.
Many healthy weight control behaviors were used by participants in the past year to lose weight, as seen in Table 3. Overall, four of the 15 healthy behaviors were significant between men and women: eat less fat (84.5% of men and 92.1% of women) \[ \chi^2(1, N=382)=5.37, p<.05 \], reduce amount of food (74.4% of men and 86.7% of women) \[ \chi^2(1, N=382)=9.43, p<.01 \], diet centers with food (4.6% of men and 10.3% of women) \[ \chi^2(1, N=376)=3.95, p<.05 \], and weight loss group (6.8% of men and 15.0% of women) \[ \chi^2(1, N=375)=7.83, p<.01 \]. There were significant differences found between men and women in the use of two unhealthy weight control behaviors: appetite suppressants (6.5% of men and 20.4% of women) \[ \chi^2(1, N=378)=13.96, p<.001 \], and diet pills (8.4% of men and 20.1% of women) \[ \chi^2(1, N=378)=9.53, p<.01 \].

To explain variation in ideal-current body weight discrepancy, the data were analyzed using multiple regression. Ideal-current body weight discrepancy was regressed onto the variables of age, gender, education, income, perceived susceptibility, perceived severity (seriousness), perceived self-efficacy, and perceived benefits, as seen in Table 4. This model accounted for 24.9% of the variability in ideal-current body weight discrepancy and there were significant independent associations of three of the variables with ideal-current body weight discrepancy (F8, 400 = 16.56, p<0.001). Females showed more body weight discrepancy (less body weight satisfaction) as ideal-current body weight discrepancy decreased (\( \beta=-1.609, p=.002 \)), than did men. Perceived susceptibility was also independently associated with ideal-current body weight discrepancy, such that as perceived susceptibility increased ideal-current body weight discrepancy decreased.
(less body weight satisfaction) \((\beta = -1.885, p<.001)\). Finally, self-efficacy was independently associated with ideal-current body weight discrepancy, such that as self-efficacy increased, ideal-current body weight discrepancy increased (more body weight satisfaction) \((\beta = 1.486, p<.001)\).

To explain variation in the total weight control behavior scale score, the data were also analyzed by multiple regression. The 24 healthy and unhealthy behaviors were summed and regressed onto the predictor variables of age, gender, education, income, perceived susceptibility, perceived severity (seriousness), perceived self-efficacy and perceived benefits, as seen in Table 4. This model accounted for 14.8% of the variability in weight control behavior (total) and there were significant independent associations of four of the variables with weight control behavior \((F_{8, 351} = 7.63, p<0.001)\). Age was independently associated with weight control behavior (total) such that for every increase in age, weight control behavior increased \((\beta=0.055, p<.01)\). Perceived susceptibility was independently associated with weight control behavior such that as perceived susceptibility increased, weight control behavior increased \((\beta=0.899, p<.001)\). Perceived severity (seriousness) was independently associated with weight control behavior such that as perception of severity increased, weight control behavior also increased \((\beta=0.562, p<.05)\). Finally, perceived benefits was independently associated with weight control behavior such that as perceived benefits increased, weight control behavior increased \((\beta=0.956, p<.001)\).

In the model for the healthy weight control behavior subscale score, 15 healthy behaviors were summed and regressed onto the variables of age, gender, education, income, perceived susceptibility, perceived severity (seriousness), perceived self-efficacy
and perceived benefits, as seen in Table 4. This model accounted for 14.3% of the 
variability in weight control behavior and there were significant independent associations 
of four of the variables with healthy weight control behavior (F8, 351 = 7.33, p<0.001). 
Age was independently associated with healthy weight control behavior such that for 
every increase in age, healthy weight control behavior increased (β=0.043, p<.01). 
Perceived susceptibility was independently associated with healthy weight control 
behavior such that as perceived susceptibility increased, healthy weight control behavior 
increased (β=0.872, p<.001). Perceived self-efficacy was independently associated with 
healthy weight control behavior such that as perceived self-efficacy increased, healthy 
weight control behavior also increased (β=0.474, p<.05). Finally, perceived benefits was 
independently associated with healthy weight control behavior such that as perceived 
benefits increased, healthy weight control behavior increased (β=0.614, p<.01).

The nine unhealthy weight control behavior subscale score was regressed onto the 
variables age, gender, education, income, perceived susceptibility, perceived severity, 
perceived self-efficacy and perceived benefits. This model accounted for 8.1% of the 
variability in unhealthy weight control behaviors and there were significant independent 
associations of three of the variables with unhealthy weight control behaviors (F8, 348= 
3.86, p<.001). As education increased, unhealthy weight control behavior increased (β=-
0.146, p<.05). As perceived severity (seriousness) increased, unhealthy weight control 
behavior increased (β=0.234, p<.01). Lastly, as perceived benefits increased, unhealthy 
weight control behavior increased (β=0.344, p<.01).

(Insert Table 4)
Discussion

In the present study we examined if adult Bermudians were aware of their weight status and the extent to which they were performing certain weight control behaviors. We also evaluated whether perceptions of susceptibility, severity, self-efficacy and benefits to becoming overweight or obese, were associated with ideal-current weight discrepancy and use of healthy and unhealthy weight control behaviors. Most participants were likely to correctly categories their weight status, although there were some women however, that may not have an accurate perception of their current weight, as they were more likely to perceive themselves as overweight (15.5%) when they were actually normal weight, compared to men (9.6%) (p<.001).

These findings also show that men and women differ in their weight loss attempts and use of healthy and unhealthy weight control behaviors, as seen in other research (16). Overall most participants (68.6%) (p<.001) reported that they had attempted to lose weight over the past year. Among normal weight participants’ who accurately categorized their weight as normal, as well as normal weight participants who overestimated their weight, there were significant gender differences with regards to weight loss attempts over the past year. Normal weight women that correctly perceived themselves as normal weight were more likely (58.7%) to try to lose weight in the past year compared to men (14.3%) (p<.001). Among normal weight participants who overestimated their body weight as overweight, women were also more likely (100.0%) to try to lose weight in the past year compared to men (40.0%), [χ² (1, N=119)= 6.87, p<.001)]. Women and men were significantly more likely to use healthy (67.7% versus 64.9%, respectively) (p<.05) behaviors to control their weight whereas there were no
significant gendered differences in utilization of unhealthy weight control strategies for 19.3% of women and 15.8% of men.

Regression analysis was conducted to determine if the HBM model variables of perceived susceptibility, perceived severity, perceived self-efficacy and perceived benefits were associated with ideal-current body weight discrepancy. Females were more likely to show more body weight discrepancy or less body weight satisfaction, as were respondents with greater perceived susceptibility to becoming overweight or obese, which is similar to other studies (16). However, respondents with greater self-efficacy had less body weight discrepancy or more body weight satisfaction between his/her ideal body weight and current body weight.

Results of regression analysis also demonstrated that age, perceived susceptibility and perceived benefits were associated with use of more healthy weight control behaviors. In other words, older individuals, individuals with more perceived susceptibility to becoming overweight or obese, and greater perceived benefits of weight control, were more likely to engage in healthy weight control behaviors. Individuals with greater perceived severity and perceived benefits to becoming overweight or obese were more likely to engage in unhealthy weight control behaviors. Alternatively, individuals more education were less likely to use unhealthy weight control behaviors. These findings may have important implications on the type of weight related initiatives that are implemented. For example, public health programs that are specific to the needs of women may be more beneficial in getting them to lose or control their weight, as women hold beliefs and perceptions of body size and weight control that differ from that of men. These types of strategies may be warranted given the findings of this study.
The results on self-efficacy show that self-efficacy is indeed an important predictor of body weight satisfaction and use of healthy weight control behaviors. Bandura suggests that a person will succeed in overcoming challenging health situations if one has belief in his or her ability to perform the behavior (21). Additionally, self-efficacy may also be a barrier to effective weight control. In the case of weight control, self-efficacy is an important mediator in weight loss behaviors and in maintaining weight control (26). Linde and colleagues (2006) in their evaluation of overweight participants self-efficacy toward weight change found that eating and exercise self-efficacy beliefs were strongly associated with weight loss behaviors and that self-efficacy beliefs prospectively predicted weight control behavior (27).

In our sample we found that as self-efficacy increased, ideal-current body weight discrepancy increased (more body weight satisfaction) ($\beta = 1.486, p = <.001$) and healthy weight control behavior increased as perceived self-efficacy increased ($\beta = 0.474, p < .05$). These results have important implications in health education practice. Public health programs that increase participants’ self-efficacy may be a significant component in addressing weight control and as such future research is suggested to examine self-efficacy, behavior change and weight control among the greater adult Bermudian population.

**Strengths and Limitations**

This study provided important information on current perceptions, knowledge and beliefs, concerning body weight and weight control behaviors, which had never been collected before in Bermuda. These findings may contribute to the literature concerning weight control behavior among women and individuals with a lower level of education.
who may be more likely to use unhealthy weight control behaviors, as demonstrated in this study.

There are a few limitations that must be mentioned. Our sample consisted of predominately Black adult Bermudians, limiting the overall generalizability of our findings. Due to the limited diversity in our sample, we were not able to examine ethnic differences in perceptions of weight and weight control behavior. To minimize these limitations we recruited participants from various locations around the island, on different days and times of the week. The study used a cross-sectional design and convenience sampling technique and therefore the results should be interpreted with caution as we could not determine a cause and effect relationship between body weight status and use of healthy weight control behaviors. Future research is suggested to determine the perceptions and beliefs of adult Bermudians concerning weight control behaviors.

Some limitations need to be mentioned concerning the Weight Control Behavior Scale (WCBS). We used the WCBS to assess a host of weight control strategies. The WCBS looked at weight loss strategies as opposed to weight control strategies, which we were interested in evaluating. It is possible respondents did not try to lose weight in the past year, therefore indicating “no” to the question, but did apply weight control strategies in the past year. If respondents used the list of strategies to control their weight, they may have incorrectly completed the scale when they should have moved on to the next section. Therefore, overestimating the true proportion of respondents who tried to lose weight based on the list of weight control strategies.
Conclusions

Our study demonstrates that women, and men to a lesser extent, may hold incorrect perceptions about their current weight status, which may in turn affect their weight control efforts. It is possible that misperceptions of weight status may contribute to normal weight men and women trying to lose weight when they should be trying to maintain their weight, however, they were less likely to do so in this study. The majority of participants who tried to lose weight in the past year used mostly healthy weight control behaviors to lose weight, such as eating less fat and low calorie foods. However, women were more likely than men to engage in unhealthy weight control behaviors such as using appetite suppressants that may adversely affect their health over time.

Few studies have explored adult Bermudians perceptions of body weight and weight control behavior. The results of this study are of no surprise given the growing rate of overweight and obese adults in Bermuda. It is possible that misperceptions of body weight may result in a failure of an individual to recognize his or her risk status and one’s ability to take action to prevent a host of chronic health conditions. In light of the negative health consequences from unhealthy weight control practices, understanding beliefs concerning weight control is important in developing lifestyle approaches that encourage maintaining a healthy weight throughout the lifespan. Overweight men and women need to be encouraged to make healthy choices to reduce their weight. Developing an understanding of these associations will allow public health practitioners to better focus interventions that aim at clarifying definitions of body weight and healthy weight control behavior, especially among weight challenged individuals in which body weight presents a health threat.
Acknowledgments

This study was supported by the Hulda Crooks Research Grant and the Center for Health Research, School of Public Health, Loma Linda University. We would also like to thank the Bermuda Hospitals Board for their participation.
### Table 1. Selected Characteristics of Study Participants by Gender

<table>
<thead>
<tr>
<th></th>
<th>Men (n=207)</th>
<th></th>
<th>Women (n=255)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Race</strong></td>
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<td>82.9</td>
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<td>0.4</td>
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<td>Asian</td>
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<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black &amp; White</td>
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<td>5.6</td>
<td></td>
<td></td>
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<tr>
<td><strong>Age (y)</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-21</td>
<td>193</td>
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<td>252</td>
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<tr>
<td>22-34</td>
<td>26.3</td>
<td>21.4</td>
<td></td>
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<td>35-44</td>
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<td>34.5</td>
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<td>55-64</td>
<td>13.2</td>
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<td>65 and over</td>
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<td><strong>Education</strong></td>
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<td>229</td>
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<tr>
<td>Primary/Middle School</td>
<td>4.5</td>
<td>1.6</td>
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<td>Secondary/Grammar School</td>
<td>34.8</td>
<td>30.6</td>
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<td>Technical/Vocational</td>
<td>23.4</td>
<td>20.8</td>
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<td>University- Undergraduate</td>
<td>19.9</td>
<td>22.9</td>
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<td>University- Graduate</td>
<td>16.4</td>
<td>17.1</td>
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<tr>
<td><strong>Income ($)</strong></td>
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<td></td>
<td></td>
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<td>Under 25,000</td>
<td>3.0</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25,001- 50,000</td>
<td>8.1</td>
<td>13.6</td>
<td></td>
<td></td>
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<tr>
<td>50,001-75,000</td>
<td>24.7</td>
<td>24.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75,001-100,000</td>
<td>15.2</td>
<td>18.1</td>
<td></td>
<td></td>
</tr>
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<td>100,000-125,000</td>
<td>10.6</td>
<td>9.5</td>
<td></td>
<td></td>
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<tr>
<td>125,001-150,000</td>
<td>11.6</td>
<td>8.6</td>
<td></td>
<td></td>
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<tr>
<td>150,001-175,000</td>
<td>8.1</td>
<td>3.3</td>
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<td></td>
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<tr>
<td>175,001-200,000</td>
<td>4.0</td>
<td>2.5</td>
<td></td>
<td></td>
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<tr>
<td>Over 200,000</td>
<td>3.0</td>
<td>2.5</td>
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<td><strong>Employment status</strong></td>
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<td>3.5</td>
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<td>Unemployed-seeking work</td>
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<td>2.4</td>
<td></td>
<td></td>
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<tr>
<td>Student</td>
<td>1.0</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>0</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to work</td>
<td>0</td>
<td>0.4</td>
<td></td>
<td></td>
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<td><strong>Marital Status</strong></td>
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<td>50.5</td>
<td>252</td>
<td>39.3</td>
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<tr>
<td>Divorced</td>
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<td>18.3</td>
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<td></td>
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<tr>
<td>Widowed</td>
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<td>2.8</td>
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<td></td>
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<tr>
<td>Separated</td>
<td>1.5</td>
<td>4.0</td>
<td></td>
<td></td>
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<tr>
<td>Never married</td>
<td>27.5</td>
<td>27.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member of unmarried couple</td>
<td>8.3</td>
<td>8.3</td>
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</table>

*p<.05
Table 2. Percentage of Participants Who Tried to Lose Weight by Accuracy of Weight Category Estimation and Gender

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Normal Weight (n=54)</th>
<th>Overweight (n=100)</th>
<th>Obese (n=141)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men (n=106)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underestimate (n=8)</td>
<td>-</td>
<td>40.0</td>
<td>66.7</td>
</tr>
<tr>
<td>Accurate (n=88)</td>
<td><strong>14.3</strong></td>
<td><strong>54.8</strong></td>
<td><strong>85.7</strong></td>
</tr>
<tr>
<td>Overestimate (n=10)</td>
<td>40.0**</td>
<td>80.0</td>
<td>-</td>
</tr>
<tr>
<td>Women (n=189)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underestimate (n=13)</td>
<td>-</td>
<td>85.7</td>
<td>87.5</td>
</tr>
<tr>
<td>Accurate (n=152)</td>
<td><strong>58.7</strong></td>
<td><strong>81.1</strong></td>
<td><strong>89.1</strong></td>
</tr>
<tr>
<td>Overestimate (n=24)</td>
<td>100.0**</td>
<td>90.0</td>
<td>-</td>
</tr>
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</table>

*p<.01  **p<.001
Table 3. Healthy and Unhealthy Behaviors Used by Participants Who Tried Lose Weight in the Past Year by Gender

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Men n = 107</th>
<th>Women n = 197</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthy Weight Control Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase exercise</td>
<td>94.9%</td>
<td>92.9%</td>
</tr>
<tr>
<td>Eat more fruits and vegetables</td>
<td>93.5%</td>
<td>94.2%</td>
</tr>
<tr>
<td>Eat less fat**</td>
<td>84.5%</td>
<td>92.1%</td>
</tr>
<tr>
<td>Eliminate snacking</td>
<td>81.3%</td>
<td>83.9%</td>
</tr>
<tr>
<td>Eliminate sweets and junk</td>
<td>81.9%</td>
<td>86.7%</td>
</tr>
<tr>
<td>Reduce calories</td>
<td>78.2%</td>
<td>80.9%</td>
</tr>
<tr>
<td>Reduce amount of food**</td>
<td>74.4%</td>
<td>86.7%</td>
</tr>
<tr>
<td>Eat low calorie food</td>
<td>67.1%</td>
<td>72.2%</td>
</tr>
<tr>
<td>Eat less meat</td>
<td>65.8%</td>
<td>63.8%</td>
</tr>
<tr>
<td>Eat less high carbohydrate foods</td>
<td>71.4%</td>
<td>76.9%</td>
</tr>
<tr>
<td>Change type of food eaten</td>
<td>78.6%</td>
<td>78.8%</td>
</tr>
<tr>
<td>Drink less alcohol</td>
<td>60.4%</td>
<td>55.4%</td>
</tr>
<tr>
<td>Diet centers with food*</td>
<td>4.6%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Weight loss group*</td>
<td>5.3%</td>
<td>14.3%</td>
</tr>
<tr>
<td>Reduce carbohydrates</td>
<td>61.4%</td>
<td>64.4%</td>
</tr>
<tr>
<td>Total healthy weight control behavior score</td>
<td>$M=64.9 \ (SD=21.2)$</td>
<td>$M=67.8 \ (SD=20.1)$</td>
</tr>
<tr>
<td><strong>Unhealthy Weight Control Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skip meals</td>
<td>55.5%</td>
<td>59.8%</td>
</tr>
<tr>
<td>Fast</td>
<td>32.5%</td>
<td>29.3%</td>
</tr>
<tr>
<td>Diet pills**</td>
<td>8.4%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>5.8%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Appetite suppressants***</td>
<td>7.6%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Liquid diets</td>
<td>13.0%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Increase cigarettes smoked</td>
<td>11.0%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Laxatives or enemas</td>
<td>5.3%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Diuretics</td>
<td>7.3%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Total unhealthy weight control behavior score</td>
<td>$M=15.9 \ (SD=16.2)$</td>
<td>$M=19.3 \ (SD=17.7)$</td>
</tr>
</tbody>
</table>

*p<.05  **p<.01  ***p<.001
Table 4. Regression of Ideal-Current Body Weight Discrepancy, Healthy and Unhealthy Weight Control Behaviors onto Age, Gender, Education, Income, and Health Belief Model Variables

<table>
<thead>
<tr>
<th>Regression Model</th>
<th>R²</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p-value</th>
<th>95% CI Lower Bound</th>
<th>95% CI Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable: Ideal-Current Body Weight Discrepancy</strong></td>
<td>0.249</td>
<td>- .001</td>
<td>.021</td>
<td>- .002</td>
<td>.960</td>
<td>- .042</td>
<td>.040</td>
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<tr>
<td>Age</td>
<td></td>
<td>-1.609</td>
<td>.526</td>
<td>-1.444</td>
<td>.002</td>
<td>-2.642</td>
<td>.576</td>
</tr>
<tr>
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<td>- .320</td>
<td>.181</td>
<td>.078</td>
<td>.077</td>
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<tr>
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<td>.094</td>
<td>- .024</td>
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<tr>
<td>Income</td>
<td></td>
<td>-1.885</td>
<td>.267</td>
<td>- .340</td>
<td>.000</td>
<td>-2.410</td>
<td>-1.360</td>
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<tr>
<td>Perceived Susceptibility</td>
<td></td>
<td>.178</td>
<td>.333</td>
<td>.024</td>
<td>.593</td>
<td>- .477</td>
<td>.833</td>
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<tr>
<td>Perceived Severity</td>
<td></td>
<td>1.486</td>
<td>.336</td>
<td>.199</td>
<td>.000</td>
<td>.825</td>
<td>2.147</td>
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<tr>
<td>Perceived Self-efficacy</td>
<td></td>
<td>- .082</td>
<td>.314</td>
<td>- .012</td>
<td>.795</td>
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<tr>
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<td>.055</td>
<td>.017</td>
<td>.165</td>
<td>.001</td>
<td>.022</td>
<td>.089</td>
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</table>

| **Dependent variable: Total Weight Control Behavior** | 0.148 | .160  | .410  | .020  | .696 | - .647 | .967 |
| Age              |    | - .131 | .142  | - .046 | .355 | - .410 | .148 |
| Gender (ref: females) |    | .017  | .074  | .011  | .825 | - .130 | .163 |
| Education        |    | .899  | .215  | .220  | .000 | .475  | 1.322 |
| Income           |    | .562  | .280  | .103  | .045 | .012  | 1.112 |
| Perceived Susceptibility |    | .352  | .266  | .068  | .187 | - .171 | .875 |
| Perceived Severity |    | .956  | .257  | .190  | .000 | .451  | 1.462 |
Table 4 (Continued). Regression of Ideal-Current Body Weight Discrepancy, Healthy and Unhealthy Weight Control Behaviors onto Age, Gender, Education, Income, and Health Belief Model Variables

<table>
<thead>
<tr>
<th>Regression Model</th>
<th>R²</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p-value</th>
<th>95% CI</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bound</td>
</tr>
<tr>
<td>Dependent variable: Healthy Weight Control Behaviors</td>
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<td>.043</td>
<td>.014</td>
<td>.156</td>
<td>.002</td>
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<td>.083</td>
<td>.334</td>
<td>-.013</td>
<td>.805</td>
<td>.740</td>
<td>.575</td>
</tr>
<tr>
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<td>.116</td>
<td>.008</td>
<td>.881</td>
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</tr>
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<td>.007</td>
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<td>.262</td>
<td>.000</td>
<td>.527</td>
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</tr>
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<td>.228</td>
<td>.076</td>
<td>.138</td>
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<td>.048</td>
<td>.900</td>
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<td>.209</td>
<td>.150</td>
<td>.004</td>
<td>.202</td>
<td>1.025</td>
</tr>
<tr>
<td>Dependent variable: Unhealthy Weight Control Behaviors</td>
<td>0.081</td>
<td>.011</td>
<td>.007</td>
<td>.085</td>
<td>.107</td>
<td>-.002</td>
</tr>
<tr>
<td>Age</td>
<td>.261</td>
<td>.169</td>
<td>.083</td>
<td>.123</td>
<td>-.071</td>
<td>.593</td>
</tr>
<tr>
<td>Gender (ref: females)</td>
<td>-.146</td>
<td>.058</td>
<td>-.131</td>
<td>.013</td>
<td>-.260</td>
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<td>.065</td>
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<td>.115</td>
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<td>Perceived Severity</td>
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<td>-.060</td>
<td>.264</td>
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<tr>
<td>Perceived Self-efficacy</td>
<td>.344</td>
<td>.105</td>
<td>.173</td>
<td>.001</td>
<td>.136</td>
<td>.551</td>
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</tbody>
</table>
References


A. Summary and Findings

In this study I examined adult Bermudians perceptions of weight, body image and weight control behaviors. I also evaluated if the health belief model (HBM) variables were associated with ideal-current body weight discrepancy and weight control behaviors. The results of this study indicate that obesity continues to be a serious public health issue among adult Bermudians, which may have important implications on the health and quality of life of this population over the lifespan.

The outcomes of this study are consistent with current literature on body weight perceptions and weight status (Viner, Haines, Taylor, Head, Booy, & Stansfeld, 2006). In another study of the adult Bermuda population, less than half (45.5%) of the respondents correctly estimated their current weight to be overweight (men = 37.1% women = 53.1%), with women more likely to overestimate their current weight compared to men (Government of Bermuda, 2007), which is similar to studies reported on the adult U.S. population (Gucciardi, Wang, Badiani, & Steward, 2007; Crawford & Owen, 1994; Crawford & Campbell, 1999). However in this study, across all weight categories, participants were mostly accurate in their assessment of their current body weight. For example, among overweight participants, 81.2% of men and 76.4% of women correctly categorized themselves as overweight, while 90.4% of men and 84.5% of women correctly categorized themselves as normal weight.
In assessing how adult Bermudians felt about their shape and size, I found significant results concerning perceived ideal body image, and the shape men and women would prefer. There have been no studies in the adult Bermuda population related to body image and therefore no direct comparisons could be made with this study. Men preferred a mean ideal body image of 5.46, a normal body shape, while women selected a mean ideal body image of 4.17, an underweight body shape (p<.001). Women across all weight categories desired a body shape that was underweight (p<.001). These results are in contrast to recent studies in the Caribbean showing a continuing increase in the acceptance among females of overweight or obese female figures (Fraser, 2003).

There remains a gap in the literature related to the role gender plays in perceptions of weight status and weight control. Research shows, however, that concerns regarding body weight and weight control have traditionally been seen as a feminine behavior (Grogan & Richards, 2002). In this study, among participants that accurately categorized their weight status, more normal weight women (58.7%) (p<.001), and overweight women (81.1%) (p<.01) tried to lose weight when compared to men (14.3%, 54.8% respectively). Additionally, as demonstrated in other research (Markey & Markey, 2005), healthy and unhealthy weight control behaviors were used by adults to lose weight, with women reporting more use of unhealthy behaviors, such as taking over the counter appetite suppressants and diet pills, than men.

There is limited research evaluating body weight perceptions and weight control behavior using behavioral theory. To date, no studies have been conducted among the adult Bermuda population assessing their beliefs, knowledge and practices on weight loss or weight control behavior. In my assessment of the variation in ideal-current body
weight discrepancy with independent variables, females showed less body weight satisfaction, which is no surprise. In many studies, including this one, women were more likely to be less satisfied with their body size and shape when compared to men, which indicates gender differences in perceptions of body size (Neibors & Sobal, 2007; Watkins, Christie, & Chally, 2008; McCreary & Sadava, 2001). The significant association between ideal-current body weight discrepancy and self-efficacy are important to consider. Increased self-efficacy to control or maintain weight was associated with greater body weight satisfaction. Bandura (1994) suggests that self-efficacy beliefs influence how people feel and think about weight control, and it is these beliefs that motivate an individual to initiate and maintain weight control practices. Therefore, in order to initiate or maintain weight control behavior such as dieting and exercise, an individual must feel they are competent to implement the change. In other words, public health interventions that increase a person’s self-efficacy may be essential in initiating weight loss and in maintaining weight control.

Healthy weight control behaviors were more likely to be utilized by older participants, as well as respondents with greater susceptibility and those with a greater perception of the benefits of weight control. Alternately, those with less education were more likely to engage in unhealthy weight control behaviors. Respondents with a higher perception of the severity (seriousness) associated with becoming overweight or obese, and those with a higher perception of the benefits of weight control, were also more likely to engage in unhealthy weight control behavior. In parallel with the HBM, these findings indicate that for successful weight control behavior to occur, a person must feel threatened by one’s current behavior (perceived susceptibility), believe that the outcomes
of overweight are serious, and believe that a specific change will be beneficial (Strecher & Rosenstock, 1997).

B. Implications for Health Education Practice

The increasing rate of obesity has led to calls for more effective public health strategies addressing the risks of obesity and weight control. These findings will increase public health practitioners knowledge of the beliefs held by the adult Bermuda population concerning body weight and weight control. Theoretically, knowing how this population perceives body weight may also help in improving the effectiveness of weight control initiatives.

Enhancing our comprehension of these associations will ultimately allow public health educators to develop programs that aim at clarifying definitions of body weight and healthy weight control behavior, especially among weight challenged individuals in which body weight presents a health threat (Martinez-Gonzalez, Martin-Almendros, Gibney, Kearney, and Martinez, 1999; Bennett and Wolin, 2006; Crawford and Campbell, 1999). In light of the negative health consequences from unhealthy weight control practices, understanding weight control behaviors is important in developing lifestyle approaches that encourage maintaining a healthy weight throughout the lifespan.

This research adds to the data on this population’s health beliefs by examining the relationship between body weight perceptions, body image and weight control behavior among both men and women. More specifically, the information obtained from this study contributes to limited literature on the association of body weight status, weight control behavior and the health belief model.
C. Recommendations for Future Study

The literature suggests that perceptions of body weight and weight control strategies likely differ depending on the socioeconomic status or racial/ethnic background of the population (Thomas, Moseley, Stallings, Nichols-English, Wagner, 2008). The research design of this study prevented us from collecting data from a more ethnically representative sample, and therefore we are unable to generalize the results of this study to the larger adult Bermuda population. Future research is needed to examine sociodemographic differences of body weight perceptions, body image and weight control behavior among a more representative sample of adult Bermudians. Additionally, the results of this study indicate that education regarding appropriate body weight and healthy weight control behaviors is necessary in this population. Health educators should encourage overweight adults to lose weight using healthy weight control behaviors such as diet modification and increased exercise. Alternately, normal weight adults need to be encouraged to accept their body size and to make healthy lifestyle choices to prevent weight gain.

Further directions for research should include efforts to determine the cultural and intrapersonal factors that motivate adult Bermudians to lose weight and reshape their bodies, such as attitudes by family, friends, or the media, especially between men and women. This should also include an assessment of culturally appropriate methods that aim at correcting one’s perception of weight and body image, and identifies healthy eating and exercise behaviors that may aid overweight and obese adult Bermudians in their weight loss attempts.
This study provides important information related to adult Bermudians knowledge, beliefs, practices and perceptions of body weight and weight control behavior that previously was not available. Correcting body weight misperceptions may be essential in enrolling individuals into weight control initiatives. Research suggests it is important to address perceptions of body image, weight loss strategies, ideal body image and perceived risk of disease associated with being overweight (Baptiste-Roberts, Gary, Bone, Hill, & Brancati, 2006). Designing various health messages that encourages lifestyle change may be challenging among various subpopulations. As such, it is fundamental that intervention efforts employ culturally defined strategies, as uniform approaches may have limited impact on initiating and maintaining weight control.
References


APPENDIX A: IRB APPROVAL

INSTITUTIONAL REVIEW BOARD
Initial Approval Notice - Expedited Review
OFFICE OF SPONSORED RESEARCH 11188 Anderson Street Loma Linda, CA 92505
(909) 558-4501 (fax) (909) 558-0711 (Eoo)

To: Modesta, Naenl N
Department: Health Promotion & Education
Protocol: Body weight perceptions and weight control behavior among adult Bermudians

This study was reviewed and approved administratively on behalf of the IRB. This decision includes the following determinations:

Risk to research subjects: Minimal
Approval period begins 09-Oct-2008 and ends 08-Oct-2009
Stipulations of approval:

Consent Form
Unless IRB has given a specific waiver of informed consent (as documented in the approval stipulations above) the IRB approved and stamped consent form accompanies this letter. This now becomes the official master consent form for making copies to provide to study participants.

Adverse Events / Protocol Changes
The IRB should be notified in writing of any modifications to the approved research protocol. Adverse effects must be reported to the IRB in accordance with institutional policy. If sponsor or contractual adverse event reporting requirements differ from requirements for reporting to IRB, all reporting requirements must still be met.

Protocol Review
Your protocol is tentatively scheduled for review and renewal at least two weeks prior to the approval end-date indicated above. To assure uninterrupted approval of this project, you will be sent a report form to request renewal by completing and timely returning to Office of Sponsored Research. Anticipate the approval expiration so your study does not lapse; contact IRB for assistance if necessary. In addition to reporting the requested renewal status information, you may also use the form to close the study at that time, if applicable.

Records
All records relating to this project, including signed consent forms, must be kept on file for three years following completion of the study. Please note the PI's name and the IRB number assigned to this IRB protocol (as indicated above) on any future communications with the IRB. Direct all communications to the IRB or the Office of Sponsored Research. Thank you for your cooperation in LLU's shared responsibility for the ethical use of human subjects in research.

Signature of IRB Chair/Designee: R. T. Rigsby

Loma Linda University Adviiscnt Health Sciences Center holds Federal Assurance (FHA) N0. 6447 with the U.S. Office for Human Research Protections, and the IRB registration no. 9108262. This Assurance applies to the following institutions: Loma Linda University, Loma Linda University Medical Center (including Loma Linda University Children's Hospital, LLU Community Medical Center, Loma Linda University Behavioral Medicine, and affiliated medical practices groups).

IRB Chair: R. T. Rigsby, M.D.
Department of Meditame
(909) 558-2341, rrigsby@llu.edu

IRB Administrator: Linda G. Helmsley, M.A., Director Office of Sponsored Research Ex. 45570, Fax 90731, ethanai@llu.edu

IRB Specialist: Mark Tostmann Office of Sponsored Research Ex. 42540, Fax 80131, mtestseman@llu.edu
APPENDIX B: INFORMED CONSENT

Loma Linda University

School of Public Health

Body Weight Perceptions and Weight Control Behavior Among Adult Bermudians

Informed Consent

Purpose and Procedures
You have been invited to participate in a research study titled "Body Weight Perceptions and Weight Control Behavior among Adult Bermudians." There will be 400 subjects participating in this study. The purpose of this study is to gain a better understanding of adult Bermudians perceptions regarding appropriate weight for height and body weight control behaviors. If you decide to participate in the study it should take no more than fifteen minutes of your time. Participation in this study involves filling out a questionnaire that asks you questions about your current body weight, overweight, body image and weight control behavior. We will also measure your height, weight, waist and hips.

Risks
This study exposes you to risks not greater than those encountered in day-to-day living.

Benefits
While you will not benefit personally, humanity will benefit by developing a better understanding of body weight perceptions and weight control behavior in order to create interventions that will promote a health perception of body weight and weight control behaviors among Bermudians.

Participants' Rights
Participation in this study is voluntary. Your decision whether or not to participate or terminate at any time will not affect you in any way.

Confidentiality
Your information will be number coded, no names will be recorded, all information will be kept strictly confidential, and stored in a locked file cabinet which is accessible only to the student fellow/investigator. Publication of the study results will describe large numbers of people, never individual people.

Initials
Date
Additional Costs
There is no cost to you for participating in this study.

Impartial and Third Party Contact
If you wish to contact an impartial third party not associated with this study regarding any question or complaint you may have about the study, you may contact the Office of Patient Relations, Loma Linda University Medical Center, Loma Linda, CA 92354, phone (909) 558-4647 or Dr. Cherita Rayner, Bermuda Ethics Committee, Bermuda Hospitals Board, (441) 239-2038 x 3400 for information and assistance.

Informed Consent Statement
Do you have any questions?

Please read the following paragraph, and, if you agree to participate, please sign below.

I have read the contents of the consent form and have listened to the verbal explanation given by the investigator. My questions concerning this study have been answered to my satisfaction. I hereby give voluntary consent to participate in this study. Signing this consent document does not waive my rights nor does it release the investigators, institution or sponsors from their responsibilities. I have been given a copy of this consent form. If you have any questions later, please feel free to contact us.

Kyla Raynor, MPH
Student Fellow/Investigator
School of Public Health
Loma Linda University
(441) 737-0177

Naomi Modeste, DrPH
Principal Investigator
School of Public Health
Loma Linda University
(909) 558-4741

Signature of subject Date
I have reviewed the contents of this consent form with the person signing above. I have explained potential risks and benefits of the study.

Signature of Student Fellow/Investigator Date

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 10/19/09 Void After 10/18/2009

Page 2 of 2
We want your ideas about obesity & weight control

Come participate in a research study on body weight and weight control behavior!

You may be eligible if you are:

- 18-65 years of age
- A Bermudian or permanent resident
- Willing to fill out a brief survey
- Willing to have your height, weight, hips and waist measurements taken

Information collected is anonymous and it will take approximately 15 mins to complete!

Date: 
Time: 
Location: 

If you are interested in participating, stop by or contact Kyla Raynor
Student Fellow/Investigator
Loma Linda University
(441) 737-0177 or kraynor@llu.edu
Hello, my name is Kyla Raynor. I am with Loma Linda University's School of Public Health, Health Promotion and Education Department.

I would like to tell you about a research study that I am conducting.

Would it be convenient for me to talk to you about this study right now? (If not, provide information to contact student fellow/investigator if they are interested in participating at a later date)

The purpose of this study is to learn about adult Bermudians perceptions of body weight, overweight, body image and weight control behavior.

If you agree to participate, you will be asked to answer some questions about your ideal body weight, the weight you consider overweight, your body image and weight control practices. We will also measure your weight, height, waist and hips.

This will take about 15 to 20 minutes of your time.

You will not be paid for your participation in this study.

Possible risks are a breach of confidentiality and privacy. However, to minimize breach of confidentiality, the survey will be anonymous and nothing identifying you will be recorded. Also, all body measurements will be taken in a locked room or behind a fully closed partition.

Possible benefits are: although you will not benefit directly from this study, we hope the results will help us learn about perceptions and behaviors of adult Bermudians concerning body weight and weight control.

Do you have any questions?

You can contact Naomi Modeste, Investigator, at (909) 558- or Kyla Raynor, Student Fellow/Investigator, at 737-0177, if you have questions about this study.

Participation is voluntary. Your decision whether or not to participate or to terminate at any time will not affect you in any way.

Would you like to participate in this study?
APPENDIX E: STUDY QUESTIONNAIRE

Body Weight Perceptions and Weight Control Questionnaire

Please indicate how much you agree with each statement by circling a number on the scale to the right of each statement. There is no right or wrong answers. Your responses will remain anonymous. Please DO NOT include your name on this questionnaire.

<table>
<thead>
<tr>
<th>Health Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. People like me do not become overweight or obese</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I am not worried that I might become overweight or obese</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Overweight or obesity can lead to serious health problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Obesity is a health condition that I take very seriously</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I feel almost sure that I will become overweight/obese</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. In the future I will be able to regularly control my weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I don't know how to control my weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I want to control my weight to improve my appearance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I want to control my weight to maintain my health</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. I am not motivated to control my weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. I do not know where to go for help to control my weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

The following questions ask about your body weight. Please answer these questions based on how you feel at the present moment. Your responses will remain anonymous.

12. Think about your current body weight, do you think you are:
   □ Very underweight
   □ Somewhat underweight
   □ About right
   □ Somewhat overweight
   □ Very overweight
   □ Don’t know Not sure

13. How much do you currently weigh? _______ lbs

14. What is your height? _______ ft _______ inches

15. Thinking about your current weight, what would you ideally like to weigh? _______ lbs

16. What is the most you could weigh and still not consider yourself overweight? _______ lbs

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 12/1/15
Chair R. A. Ogden
17. Have you ever been diagnosed with type I or type II diabetes mellitus by a physician?
   - [ ] Yes
   - [ ] No
   - [ ] Don't know/not sure

Questions 17 and 18 refer to the diagrams below. Please answer each question based on these diagrams. Woman should use the diagram labeled "females" and men should use the diagram labeled "males".

**Female**

**Males**

18. Which picture do you think looks like you at the moment? Number ______

19. Which picture would you like to look like? Number ______
20. In the past year, have you tried to control your weight?

- Yes
- No (if no, go question 47)

Please read each weight loss strategy listed below. Indicate whether you Never, Sometimes or Always use this strategy. Place an X in the box next to behaviors you have done. Think of the behaviors you have done in the past year to try to CONTROL your weight.

<table>
<thead>
<tr>
<th>Weight Loss Strategy</th>
<th>Never</th>
<th>Sometimes</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Increase exercise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Eat more fruit and vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Eat less fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Eliminate snacking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Eliminate sweets and junk food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Reduce calories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Reduce amount of food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Eat low-calorie food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Skip meals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Eat less meat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Fast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Diet pills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Vomiting</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>34. Eat less high-carbohydrate foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Change type of food eaten</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>36. Appetite suppressants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Liquid diets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Drink less alcohol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Increase cigarettes smoked</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Laxatives or enemas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Diet centers with food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Weight loss groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Diuretics (a drug that increases the flow of water from the body)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Reduce carbohydrates (carbs)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

List other behaviors you participate in to lose weight here. Put an X in the Never, Sometimes, or Always box to indicate how often you have done these things in the past year.

<table>
<thead>
<tr>
<th>Weight Loss Strategy</th>
<th>Never</th>
<th>Sometimes</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Please answer the following questions about yourself.

48. What is your age? ________ yrs

49. What is your sex?
   □ Male
   □ Female

50. What is your marital status?
   □ Married
   □ Divorced
   □ Widowed
   □ Separated
   □ Never Married
   □ A member of an unmarried couple

51. What is your religious background?
   □ Anglican
   □ Roman Catholic
   □ Methodist
   □ Pentecostal
   □ Baptist
   □ Jehovah's Witness
   □ AME
   □ Seventh-day Adventist
   □ Presbyterian
   □ Salvation Army
   □ Don't know/Not sure
   □ Other (specify): ____________________________

52. Are you currently:
   □ Employed
   □ Self-employed
   □ Unemployed but seeking work
   □ Homemaker
   □ Student
   □ Retired
   □ Unable to work (Skip to question 54)
53. Which of the following physical activities do you do as part of your work?
Think about only those physical activities that you did for at least 10 minutes at a time.
- ○ Vigorous physical activity (heavy lifting, digging, heavy construction, or climbing up stairs)
- □ Moderate physical activity (carrying light loads)
- □ Walking as physical activity (slow pace)
- □ No job-related physical activity

54. What is the highest grade of school you completed?
- ○ Never attended school or only attended kindergarten
- □ Primary/Middle school
- □ Secondary/Grammar
- □ Technical/Vocational (pre-university)
- □ University-Undergraduate degree
- □ University-Graduate degree or professional qualification
- □ Don’t know/Not sure
- □ Other (specify): ____________________________

55. Which one of these groups best describes your race?
- ○ Black
- □ White
- □ Asian
- □ Portuguese
- □ Black & white
- □ Other (specify): ____________________________

56. What is your total annual household income from all sources?
- □ Under $25,000
- □ $25,001 to $50,000
- □ $50,001 to $75,000
- □ $75,001 to $100,000
- □ $100,001 to $125,000
- □ $125,001 to $150,000
- □ $150,001 to $175,000
- □ $175,001 to $200,000
- □ Over $200,000
- □ Don’t know/Not sure

Thank you for your participation!

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 10/17/18
# 58 2-58 Chair R.T. Riggs
Body Measurement Log

<table>
<thead>
<tr>
<th>Location:</th>
<th>ID No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>BMI</td>
</tr>
<tr>
<td>Weight</td>
<td>Body Fat %</td>
</tr>
<tr>
<td>Waist</td>
<td>W/H ratio</td>
</tr>
<tr>
<td>Hip</td>
<td></td>
</tr>
</tbody>
</table>

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 10/17/08
# 58267 Chair R. Ries"
Apppendix F: Participant Reference Sheet

Body Weight Perceptions and Weight Control Behavior among adult Bermudians Study

Body Weight

Large population studies show that people who live the longest have a BMI between 18.5 and 24.9. A BMI over 25 indicates overweight while a BMI of 30 or greater indicates obesity.1

Using the table provided check your BMI. If you are overweight, losing even 10-15 lbs can greatly reduce the risk for high blood pressure, diabetes, certain cancers, and heart disease.

<table>
<thead>
<tr>
<th>Height</th>
<th>Normal BMI 19-24 Weight (lbs)</th>
<th>Overweight BMI 25-29 Weight (lbs)</th>
<th>Obese BMI 30+ Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'10&quot;</td>
<td>91-118</td>
<td>119-142</td>
<td>143+</td>
</tr>
<tr>
<td>5'0&quot;</td>
<td>97-127</td>
<td>128-152</td>
<td>153+</td>
</tr>
<tr>
<td>5'2&quot;</td>
<td>104-135</td>
<td>136-163</td>
<td>164+</td>
</tr>
<tr>
<td>5'4&quot;</td>
<td>110-144</td>
<td>145-173</td>
<td>174+</td>
</tr>
<tr>
<td>5'6&quot;</td>
<td>116-154</td>
<td>155-185</td>
<td>186+</td>
</tr>
<tr>
<td>5'8&quot;</td>
<td>125-163</td>
<td>164-196</td>
<td>197+</td>
</tr>
<tr>
<td>5'10&quot;</td>
<td>132-173</td>
<td>174-208</td>
<td>209+</td>
</tr>
<tr>
<td>6'0&quot;</td>
<td>140-183</td>
<td>164-220</td>
<td>221+</td>
</tr>
<tr>
<td>6'2&quot;</td>
<td>148-193</td>
<td>194-232</td>
<td>223+</td>
</tr>
</tbody>
</table>

To achieve and/or maintain a healthy weight:

- Learn to enjoy eating lower calorie foods such as fruits, vegetables, and salads
- Limit high calorie desserts such as ice cream, cake, cheesecake, and pastry
- Limit frequent eating at fast food outlets and restaurants
- Keep portion sizes moderate and limit second helpings
- Avoid junk foods and typical snacks, especially soft drinks
- Eat slowly and enjoy your meals
- Aim for 60 minutes of moderate-to-vigorous intensity physical activity most days of the week

Percent Body Fat

Regular exercise improves body composition by burning fat and building muscle. Weight, however, may change very little. A lower range in body fat is seen in younger adults and higher ranges for older adults.

<table>
<thead>
<tr>
<th>Percent Body Fat Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>Overweight</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>Obese level 1 (high risk)</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>Obese level 2 (very high risk)</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>Men</td>
</tr>
</tbody>
</table>

Waist-to-hip Ratio

What does waist to hip ratio tell me? This measure is the best test to evaluate the risk of excess weight. Fat in the abdomen is most closely linked to the risk of diabetes, high blood pressure, heart disease, and breast cancer. Measure your waist at the level of your navel while standing relaxed. Waist-to-hip ratio is an even better indicator of risk than weight or BMI.

<table>
<thead>
<tr>
<th>Waist-to-hip Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
</tr>
<tr>
<td>Women &lt;0.80</td>
</tr>
<tr>
<td>Men &lt;0.95</td>
</tr>
<tr>
<td>Moderate risk</td>
</tr>
<tr>
<td>Women 0.81-0.85</td>
</tr>
<tr>
<td>Men 0.96-1.0</td>
</tr>
<tr>
<td>High risk</td>
</tr>
<tr>
<td>Women &gt;0.85</td>
</tr>
<tr>
<td>Men &gt;1.0</td>
</tr>
</tbody>
</table>


2 Adventist Health Study 2, Healthy Living Guidelines Part 1.