# DESIRED BODY WEIGHT AND DIETING BEHAVIOR: FINDINGS FROM THE THIRD NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY 1988 - 1994

**THESIS**

Presented to the Graduate College of
Southwest Texas State University
in Partial Fulfillment of
the Requirements

For the Degree of

Master of SCIENCE

By

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San Marcos, Texas
August 2003

## DEDICATION

I would like to dedicate this paper and research to my mother, Frances Ruiz Moran, and my brother, Thomas Roland Sunbury. Thank you for all your sacrifice and assistance over the years, for listening, and being there when 'raccoon stealth' was needed.

With support from family and friends we will not contribute to Figures 7 and 8.

## ACKNOWLEDGMENTS

I would like to begin by thanking the faculty and staff in the department of Health Services Research at Southwest Texas University. Over the years, I felt that we have enjoyed the most enthusiastic and eruditive professors. I have had the honor of having some of these faculty members on my thesis committee. I remember when Dr. Charles Johnson took the time to talk to a confused graduate student about the department. His enthusiasm, knowledge, and student support are the reasons I chose Health Services Research. Dr. Ram Shanmugam instructs students on the art form known as regression and is always willing to converse on various techniques. Dr. Jean Brender provides our Epidemiology classes with the evidence and the tools to evaluate current health topics. Her classes made me aware of my own health risks and prompted me to seek advice from a healthcare professional. As my chairperson, her advice and dialogue have been invaluable. I would like to include a special thank you to Sonia Villalpando who helped keep the communication open between Austin and San Marcos. Thanks to all of these wonderful professors and staff at SWT for helping me change my outlook and health outcome.

I would also like to thank all of those friends who edited or let me talk about this study; Ann Permann, Dr. Edli Colberg, Jesse Lujan, Dr. Richard Allgeyer, Xiao-Ling Huang, Greg Morrow, Jerry Jirimutu, Monica Smoot, and Nancy Ball. A special thank you to Helen Lagow for letting me 'borrow' her brain food.

I would also like to thank those involved with the National Health and Nutrition Examination Surveys in every step of the process, from sample design, implementation,

data cleaning, and especially all those that participated in the study. Their patience and time contributes to our knowledge of health in the country. This study would be nothing without their beneficence.

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## DESIRED BODY WEIGHT AND DIETING BEHAVIOR: FINDINGS FROM THE THIRD NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY, 1988 - 1994

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**August 2003**

**SUPERVISING PROFESSOR: Jean Brender**

Most body image surveys rely on convenience sampling and self-reported height and weight. This cross-sectional data is a subset of the 1988 – 1994 National Health and Nutrition Examination Survey (NHANES) public use data files which are available from the National Center for Health Statistics. NHANES is a population-based survey of the U.S. population in which weight and height are measured. Adult questionnaire and medical examination information were merged to analyze the probability of someone rating their weight goals. The study sample consisted of 9,116 people who wanted to weigh less, 6,075 who wanted to weigh the same and 1,297 people who wanted to weigh more. The greatest predictor of someone wanting to weigh less was how they rated their

2652.07). A lesser factor was a person's measured body mass index (adjusted OR = 25.99, 95% CI = 16.47 – 41.01).

NHANES III was also analyzed to determine who had attempted weight loss within the last year. The study sample consisted of 10,519 adults who had attempted to lose weight and 5,969 people who had made no such attempt. Odds were highest for persons who wanted to weigh less, (adjusted OR = 12.55, 95% CI = 6.02 – 26.13) and less for Mexican-Americans (adjusted OR = 0.84, 95% CI = 0.74 – 0.97) Mexican-Americans were less likely to attempt weight loss even though there was an indication by BMI that it might be appropriate for them to try to lose weight. This study shows that subgroups in this country who are already overweight or obese had made no such attempt at weight loss and felt they wanted to weigh the same or more.

# CHAPTER I

# INTRODUCTION

## Definition and Classification of Overweight and Obesity

Body Mass Index (BMI) is a non-invasive measure used to estimate a patient's risk for some morbidities and mortality. BMI describes weight relative to height and is calculated by dividing a patient's weight in kilograms by their height in meters squared and has been positively correlated with total body fat content (Gray & Fujioka, 1991). In 1998, the National Heart, Lung, and Blood Institute (NHLBI) reviewed published scientific literature and adopted specific Body Mass Index (BMI) and waist circumference categories that have been found to correlate positively with relative risks of disease (Table 1).

Table 1.Classification of Overweight and Obesity by BMI, Waist Circumference and Associated Disease Risk[a]

| | Disease Risk[a] Relative to Normal Weight and Waist Circumference | | |
|---|---|---|---|
| | BMI ($kg/m^2$) | Men <103 cm (<41 in)<br>Women <89 cm (<36 in) | Men ≥ 103 cm (≥41 in)<br>Women ≥ 89 cm (≥36 in) |
| Underweight | < 18.5 | No Evidence | No Evidence |
| Normal[b] | 18.5 – 24.9 | No Evidence | No Evidence |
| Overweight | 25.0 – 29.9 | Increased | High |
| Obesity | 30.0 – 39.9 | High – Very High | Very High |
| Extreme Obesity | ≥ 40.0 | Extremely High | Extremely High |

[a]Disease risk for type 2 diabetes, hypertension, and CVD.
[b]Waist circumference in the higher category is a sign of increased health risk even in persons of normal weight.

Trends in the Prevalence of Overweight and Obesity

The prevalence of overweight in men increases as they age from their twenties to thirties and then rate trend levels off until they reach their seventies (Figure 1). While the prevalence of overweight in women is less than men at all age levels, the number of overweight women increases at each age grouping (Figure 2).

Figure 1. U.S. Prevalence of Overweight Men by Age and Survey

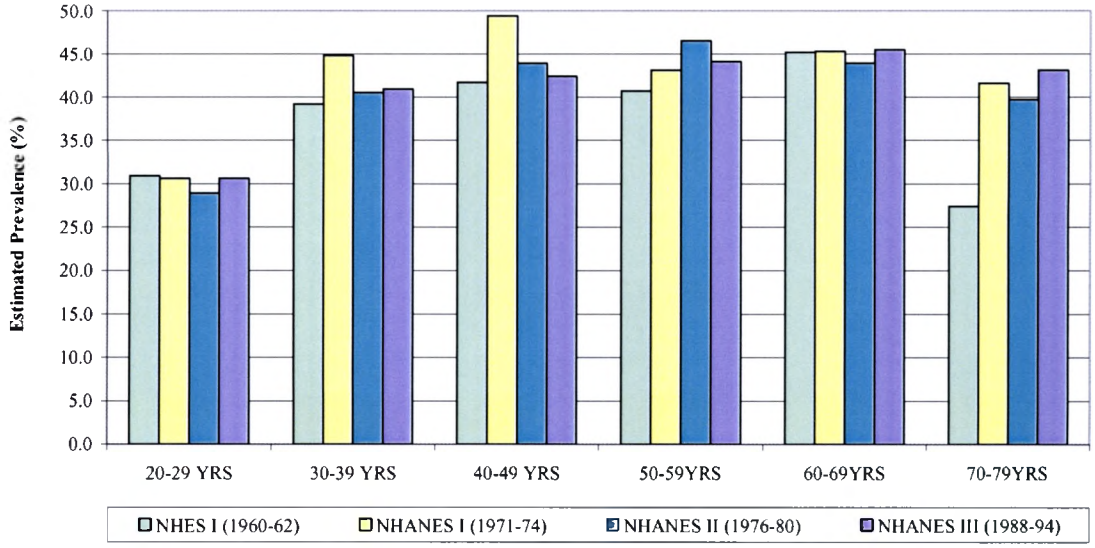
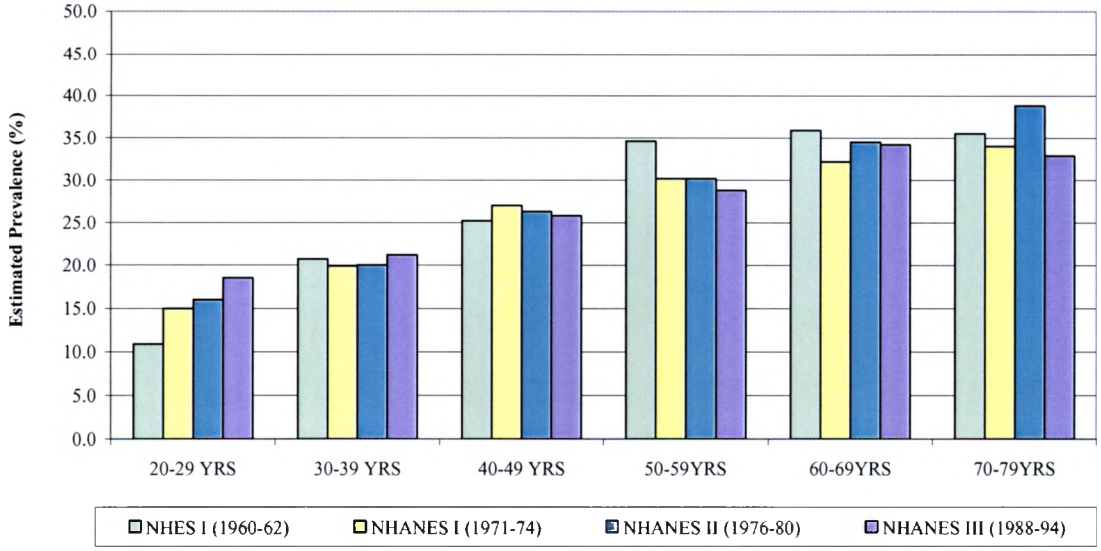



Figure 2. U.S. Prevalence of Overweight Women by Age and Survey

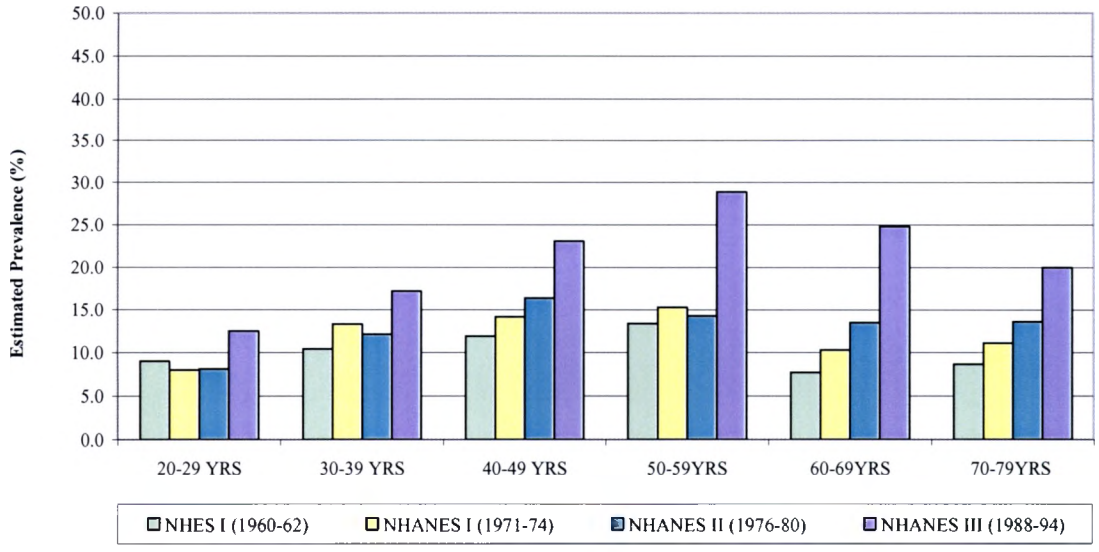


Disturbing trends are seen in the number of obese men (Figure 3), which rose dramatically from NHANES II to NHANES III. The highest percentage of obesity is estimated at 28.9% for men and 35.6% for women aged 50 – 59 years. Thirty percent of men in their twenties are overweight and this increases to approximately forty percent as they reach their thirties. Since the 1960s, overweight men between 40 through 70 years of age have contributed 40 to 45% of the U.S. Population.

There are fewer overweight women in their twenties than overweight men (on average approximately 15% compared to 30%, respectively), however the prevalence of overweight women in this age group has been increasing every decade (10.9% in 1960 to 18.5% in 1994). Every ten years an estimated 10% of women enter into the overweight BMI category.

The rate of obesity (BMI $\geq$ 30 kg/m$^2$) increased from NHANES II (1976 – 80) to NHANES III (1988 – 1994) in all male age groups (Figure 3). The largest increases were

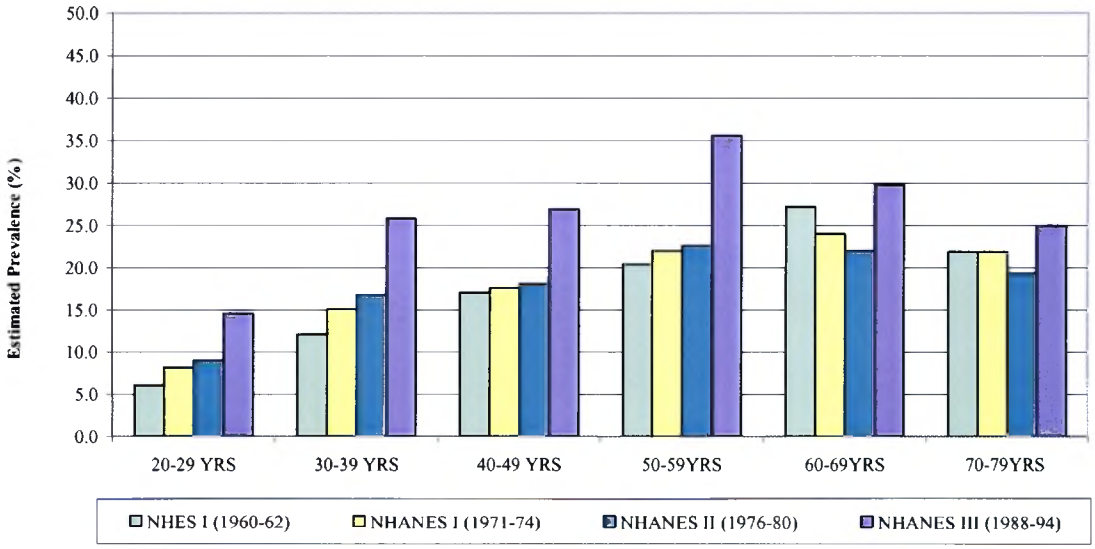
Figure 3. U.S. Prevalence of Obese Men by Age and Survey



seen in men age 50 – 59 years (approximately 14.6% increase) and men age 60 – 69 years (approximately 11.3% increase).

The rate of obesity (BMI ≥ 30 kg/m$^2$) increased from NHANES II (1976 – 80) to NHANES III (1988 – 1994) in all age groups for women (Figure 4). The largest increases were seen in women age 50 – 59 years (approximately 13.0% increase) and women age 40 – 49 years (approximately 8.8% increase). For age groups 20 – 29 through 50 –59, the trend in obesity increased by small increments for every health survey until NHANES III (1988 – 1994).

Figure 4. U.S. Prevalence of Obese Women by Age and Survey




By using BMI classification categories and data from the 1999 and 2000 National Health and Nutrition Examination Survey (NHANES), the estimated prevalence of overweight and obesity for United States adults is now 61% (Flegal, K.M., Carroll, M.D., Ogden, C.L., Johnson, C.L., 2002). Similar increases in excess weight have also been seen throughout the world. Healthcare workers are raising concerns at what is being

called an 'obesity epidemic' and possible implications on the public's health in the future (Rössner, 2002).

Health Risk Associated with Excessive Weight

Excessive unhealthy weight has been associated with increased risks of abnormal glucose tolerance, gallbladder disease, cardiovascular disease, hypertension, high cholesterol, osteoarthritis, respiratory problems, reproductive complications, and certain cancers (Mokdad, Bowman, Ford, Vinicor, Marks, & Koplan, 2001; Must, Spadano, Coakley, Field, Colditz, & Dietz, 1999). In order to support BMI as a diagnostic tool for weight management evaluation, the NHLBI has also recommended the use of sex-specific waist circumference cut-off points to estimate abdominal adiposity. The increased presence of abdominal adiposity or excess fat in the abdomen has also been associated with increased risk of negative health conditions: specifically Type 2 diabetes, cardiovascular disease, and dyslipidaemia (Després, Lemieux, & Prud'homme, 2001; Zhu, Wang, Heshka, Heo, Faith, & Heymsfield, 2002; Molarius & Seidell, 1998). When BMI, waist circumference, and medical history are combined, health professionals can perform a more comprehensive evaluation of a patient's health status and determine a course of treatment.

Despite the severity of these illnesses, 78% of US citizens did not regard weight as a serious health concern (Lee & Oliver, 2002). Most Americans continue to see obesity as an individual failure rather than complicated interactions of environmental factors and genetics. Genetics has been determined to account for an estimated 30% increase in the prevalence of overweight and obesity. Therefore, the rest of the increase

must be explained by environmental factors. Increased caloric intakes with a decrease in physical activity are two problems most industrialized societies are experiencing. These environmental factors contribute to an increase in overweight and obesity prevalence; however, researchers have found that different cultures are more or less accepting of excess weight.

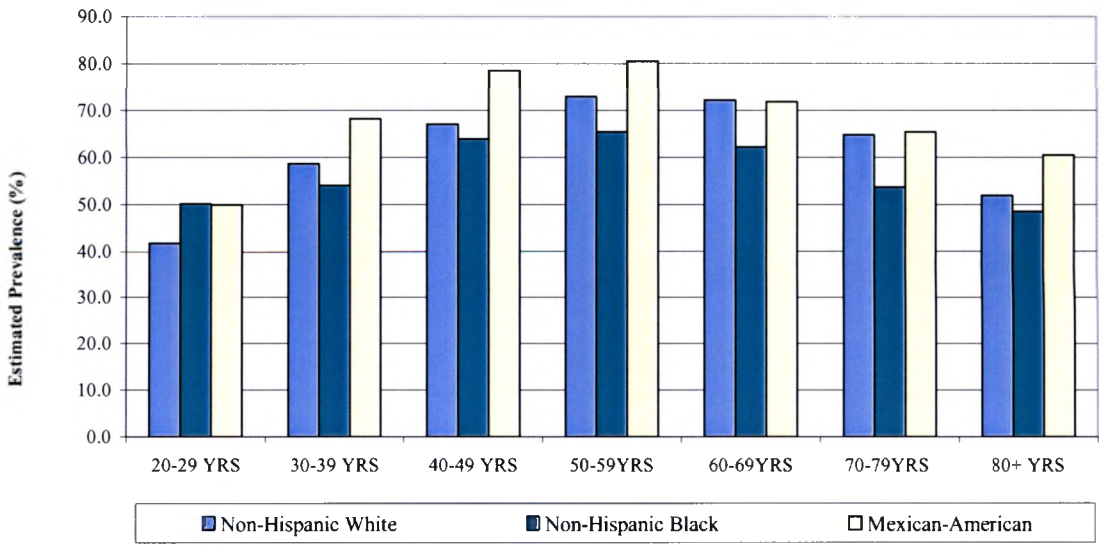
# CHAPTER II

# LITERATURE REVIEW

## Racial/Ethnic and Sex Differences in the Desire to be Thin

Racial/ethnic and sex differences exist in the prevalence of overweight and obesity. Figures 5 through 8 reports the estimated prevalence from, NHANES III data, of those with a BMI $\geq$ 25.0 kg/m$^2$ in the United States by age and race/ethnicity.

Figure 5. U.S. Prevalence of Men (BMI $\geq$ 25.0 kg/m$^2$) by Age, NHANES III (1988 – 1994)




Mexican-American men have a higher prevalence of overweight and obesity at most age levels. By comparison, Non-Hispanic Black men have the smallest prevalence for most age levels when contrasted against Non-Hispanic Whites and Mexican-

Americans. For women who have a BMI ≥ 25 kg/m$^2$ there is clearly a difference for race/ethnicity in all age groups. There are more overweight and obese Non-Hispanic Black and Mexican-American women than Non-Hispanic White women.

Figure 6. U.S. Prevalence of Women (BMI ≥ 25.0 kg/m$^2$) by Age, NHANES III (1988 – 1994)

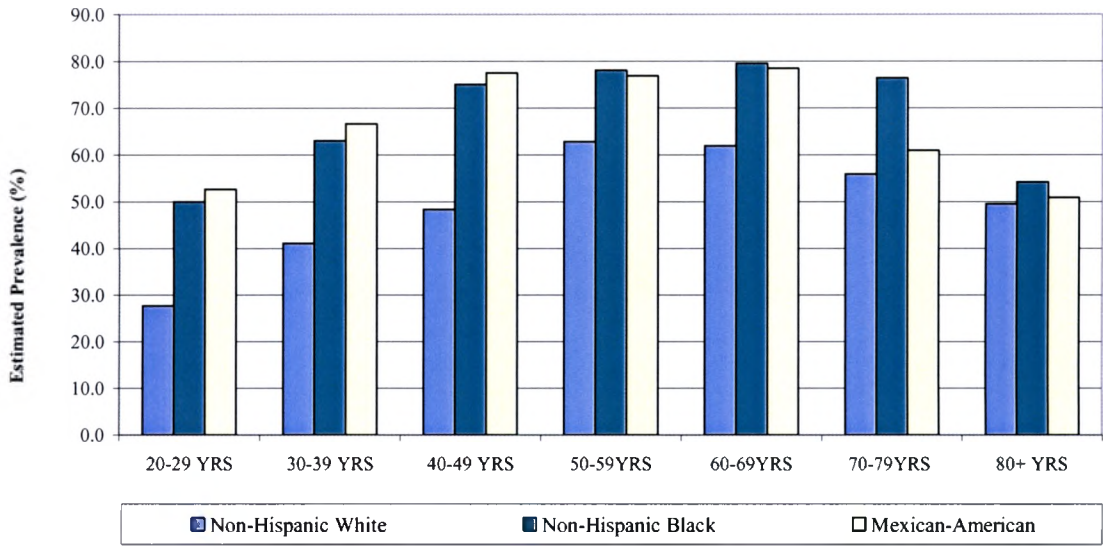
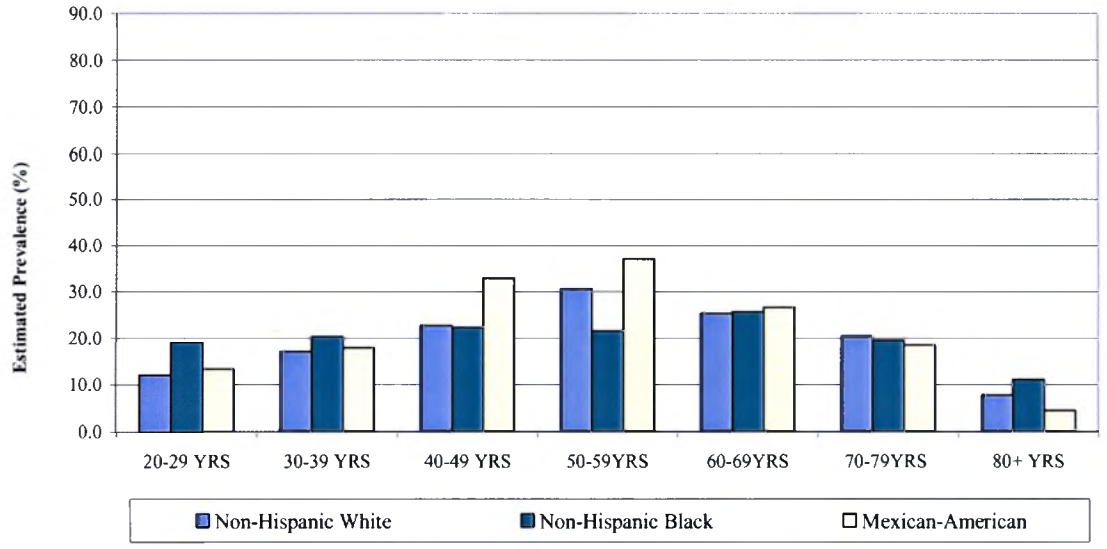


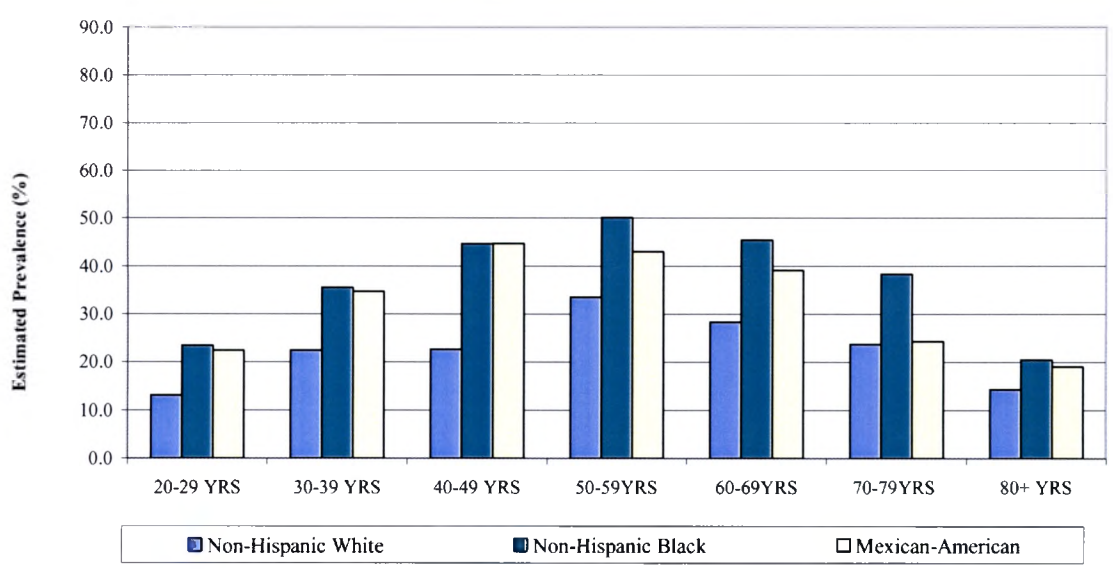

Figure 7. U.S. Prevalence of Men (BMI ≥ 30.0 kg/m$^2$) by Age, NHANES III (1988 – 1994)




Personal attitudes toward weight status as being overweight and obese vary according to racial/ethnic groups and sex. Stevens, Kumanyika, & Keil (1994) found that

African-American women were less preoccupied with dieting, more tolerant of excess weight than Anglo women, and almost three times as likely to find themselves attractive even if they were overweight. Kumanyika, Wilson & Guilford-Davenport (1993) used a

Figure 8. U.S. Prevalence of Women (BMI ≥ 30.0 kg/m$^2$) by Age, NHANES III (1988 – 1994)




self-administered questionnaire in the District of Columbia and found that African-American women recognized that they were overweight and that being overweight increased one's risk for having a heart attack and diabetes. Serdula, Mokdad, Williamson, Galuska, Mendlein, & Heath (1999) examined the data obtained from 107,804 US adults (age 18 years and older) who participated in the 1996 Behavioral Risk Factor Surveillance System (BRFSS), (a random-digit telephone survey conducted by state health departments to provide state level estimates), to obtain a prevalence rate for those persons trying to lose weight or maintain their current weight. Sixty-four percent of males and 78.0% of females were trying to lose or maintain their weight. However, only 21.5% of males and 19.4% of females were following recommended weight loss guidelines that include reduced caloric intake and increased physical activity. Increasing

the amount of physical activity was least common among the self-reported obese, the least educated, and the oldest participants. Serdula et al. (1999) also found sex differences among those trying to lose weight. For example, 30% of normal weight women reported trying to lose weight and trying to lose weight at lower Body Mass Index (BMI) levels than males. The authors theorize that this sex difference in weight loss attempt could be the result of a greater societal pressure on women to be thin. The BRFSS relies on self-reported height and weight status. One of the limitations to this study is that respondents tend to underreport weight (Rowland, 1990). Therefore, the prevalence of overweight is likely to be underestimated by BRFSS.

According to a NHANES III evaluation of 1,932 adolescents, Strauss (1999) found that girls were more than twice as likely as boys to want to weigh less. According to self-perceived weight status, normal-weighted white girls were significantly more likely than normal-weighted black girls to consider themselves overweight. Strauss (1999) mentions how adolescent's self-perceived weight status has been significantly associated with maternal weight status, but no research has been done to evaluate the adult NHANES population. In past surveys the under- or over-estimation of anthropomorphic measures has been found to be dependent on certain demographic factors. Studies have shown a relationship between body image discrepancy and body mass index across ethnic groups (Fitzgibbon, Blackman, & Avellone, 2000). For example, Black and Hispanic women did not report body discrepancy until they were overweight, while white women experienced body discrepancy at a lower BMI level, and below the BMI overweight criterion. Although the study of Fitzgibbon et al. (2000) does pose questions about the impact of societal pressures on body image and race, the

community sample size of 389 white, Hispanic, and black women that was used could have allowed for some bias in the conclusions.

Cachelin, Rebeck, Chung, & Pelayo (2002) obtained a larger sample of 801 participants. After controlling for age, education, and body weight, they reported that women were more dissatisfied with their size than men and identified thinner female figures as more attractive and acceptable. They obtained an adequate representation of the Asian population and concluded that Asian women reported less body dissatisfaction than the other groups.

Paeratakul, White, Williamson, Ryan, & Bray (2002) evaluated a larger sample of 5,440 adults who responded to the 1994 - 1996 Continuing Survey of Food Intakes by Individuals and the Diet and Health Knowledge Survey. The results supported previous community studies, which found that perceiving one's self as overweight was significantly higher for women, whites, higher BMI, higher income, and higher education. Yet this study does not address the issue of body size satisfaction.

Body size satisfaction can also be a predictor of desire to lose weight. Anderson, Eyler, Galuska, Brown, & Brownson (2002) used data from the National Institutes of Health Women's Health Initiative to examine the relationship between body size satisfaction in overweight and obese women 40 years and older who were trying to lose weight. They found that women who were not satisfied with their body size were nine times more likely to report trying to lose weight. In the same study, BMI, race/ethnicity, and age were also found to be significant predictors of desire to lose weight.

Most of the research that has evaluated body size satisfaction has been done in the context of eating disorders or ethnic differences. Anderson et al. (2002) showed that

overweight and obese non-white women were significantly more likely to be more satisfied with their body size than white women. However, there is no knowledge of this study being done on a nationally representative sample of US adults.

## Research Questions

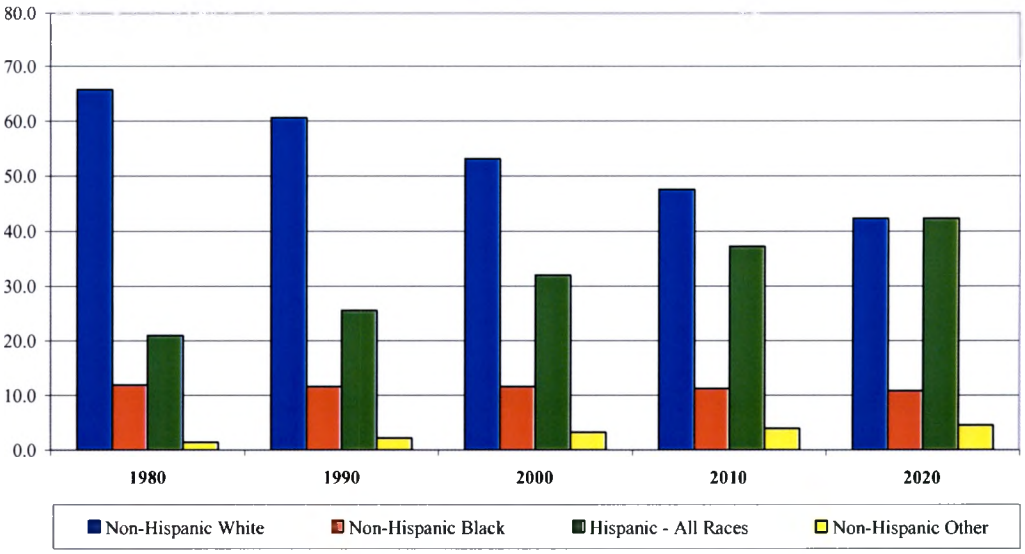
The main objectives of this study are to use the National Heart, Lung, and Blood Institute (NHLBI) BMI categories to measure a) the probability of wanting to weigh less as a function of BMI while controlling for selected sociodemographic factors and b) the probability of dieting as a function of wanting to weigh less while controlling for selected sociodemographic factors and self-rated weight.

## Significance of the Study

Texas and the nation will be experiencing demographic changes in the years to come. The population will become more ethnically diverse and older. There is a chronic disease burden on minorities that impacts the cost of health care. Figure 9 examines actual U.S. Census counts from 1980 through 2000. The proportion of Non-Hispanic Whites has decreased in Texas from 1980 while the number of Hispanics has increased. Population projections for the next 20 years show the Hispanic population matching the Non-Hispanic White population in 2020.

Researchers need to increase awareness that there might be differences in weight loss motivation. More dialogue about these differences maybe needed so that treatments can be tailored for specific populations with these perceptions in mind.

Figure 9. Proportion of Texas Population by Race/Ethnicity (1980 – 2020)




Minorities might not feel a societal pressure to be thin like Anglo women, but they may understand the risks and health burdens that excess weight can bring. Education is the key to both preventing further rises in the prevalence of overweight and obese people and promoting weight loss in those people who are already overweight and obese.

Data from intensive weight reduction programs have shown that certain cultural factors negatively impact weight control efforts for black women as compared to white women. Using the NHLBI guideline algorithm, health professionals can identify persons needing treatment for excess weight. But do people see their unhealthy excess weight as a health problem?

# CHAPTER III

# METHODS

## Data Source

This study used existing data being made available from the National Center for Health Statistics (NCHS) web site. NHANES III (1988-1994) is a complex cross-sectional, multistage probability sample of the civilian, noninstitutionalized population of the United States who are aged 2 months or older. One of the purposes of the NHANES is to provide estimates of prevalence data for certain diseases, risk factors, and to describe the health of the nation. NHANES III was conducted in two phases. Phase I was from October 18, 1988 through October 24, 1991 and Phase II was from September 20, 1991 through October 15, 1994. Both phases had equal sizes and length of time. In order to ensure adequate inferences, over-sampling of select populations was needed. Some of these racial populations include Mexican-Americans and non-Hispanic blacks who contribute 30% of the sample population, but only 12% and 5% of the US population, respectively.

The survey consists of two parts: a home interview and standardized medical examination in a mobile examination center (MEC) or a limited examination at the subject's home for subjects unwilling or unable to travel. In both physical examination

settings, body weight and height were measured using standardized equipment and procedures by trained facilitators.

The complex survey design and sampling weights that were used for NHANES III are incorporated into data analysis by using SUDAAN. The sampling weights have been calculated to take into account unequal selection probabilities resulting from the cluster design and over sampling of non-Hispanic blacks and Mexican Americans as well as young children and the elderly. Further NHANES survey design and operation details are available elsewhere (Ezzati et al., 1992; National Center for Health Statistics, 1994).

Data Procedures

Data from the NHANES III (1988-1994) were used to address the study objectives with the use of a cross-sectional study design and analysis. The NCHS website contains public use data files and documentation. The Adult and Exam executable files (containing DAT files and SAS code) were downloaded to a computer hard drive. The SAS code assigns variable names, variable descriptions, and format options to the DAT file for the user to create permanent SAS data sets. Modifications to the SAS code have been included in Appendix A.

The Adult data set contains interview responses for 20,050 sample persons aged 17 year and older and the Exam data set contains MEC and Home interview responses and medical results for 31,311 sample person aged 2 months and older. The NCHS advises that both files be sorted by the sample person's sequence number, a unique identifier given to each participant in the survey, before merging files by sequence number. SAS code for this procedure is listed in Appendix B.

After the Adult and Exam data sets were sorted and merged by the sample person's sequence number, another data set was created to contain a subset of variables. Each sample person's record contains sampling weights and sample design information (such as 'pseudo-PSU and pseudo-strata'), which is needed by the statistical software. To increase computer processing time, ease human analysis, and maintain vital sample design information, some extraneous variables not needed for the analysis were deleted. Socioeconomic variables, BMI, and study variables were retained and placed in a new data set. SAS code for this procedure is listed in Appendix C.

Recoding

Years of age (continuous variable) were recoded to form NCHS suggested age groups (20 – 39 years, 40 – 59 years, and 60 year and older) and BMI (continuous variable) was recoded to adapt to NHLBI BMI categories that correlate with disease risks (Table 1). Completed years of education were recoded as 'less than high school', 'high school', or 'more than high school'. 'Blanks' and 'Don't know' responses were recoded as null. SAS code for this procedure is listed in Appendix D.

Study Population

NHANES III enrolled 39, 695 eligible sample persons from 19, 528 households. Among these eligible subjects, 33,994 (82% weighted response rate) were interviewed and 31,311 sample person participated in the MEC or Home examination. Adults who were at least 20 years or older and who completed both the home questionnaire and medical examination were considered for the study. Excluded persons were those that

did not complete the home questionnaire and medical examination, pregnant women, interview or medical examination status that was determined "incomplete" or "unreliable" by NHANES III staff, and adults who answered "blank" or "don't know" to the study variables.

Study Anthropomorphic Variables

Upon examination, each sample participant was given foam slippers, paper pants and shirt and asked to change out of their street clothes. The following variables were measured as part of the standard medical examination.

1) Measured height – measurement was recorded to the nearest 0.1 centimeters with a Holtain Height Stadiometer that was re-calibrated between examinees. This measurement was converted to meters and reported to the nearest 0.1 meter.
2) Measured weight – measurement was recorded to the nearest 0.01 kilograms with a Toledo 2181 self-zeroing weight scale.
3) Body Mass Index (BMI) – this was calculated by dividing measured weight in kilograms by measured height in meters squared. NHANES III Exam file does report a calculated BMI entry for each MEC or home examinee with measured height and weight, however, due to some errata, the experimenter validated these calculations. BMI errata can be found at the following web site: http://www.cdc.gov/nchs/about/major/nhanes/nhanes3/attachmentc.htm

Questionnaire Information

Sample persons were asked the following questions about their self-rated weight status: "Do you consider yourself now to be overweight, underweight, or about the right weight?"; their history of weight loss attempts: "During the past 12 months, have you tried to lose weight? and about their desired weight; "Would you like to weigh more, less, or stay about the same?"

Post analysis evaluated the number of sample persons who had some communication with a healthcare professional: "About how long has it been since you last saw or talked to a medical doctor or other health professional about your health? Include health professionals seen while a patient in a hospital." The response was given in months.

Covariates or confounders may have modified the effect of the relationship of weight perception and weight loss attempt. Certain variables were included in the analysis as possible covariates including age, race/ethnicity, level of education, sex, and BMI.

Analysis Techniques

SUDAAN analyzed a subpopulation of NHANES III data meeting variable specifications (20 years and older) and pregnancy status (pregnant women were excluded). Descriptive statistics were calculated on the remaining sample population. The sample population was evaluated to ensure that it met assumptions for logistic regression. Any multicollinearity was addressed to determine the best model for the variables of interest. Differences in the proportion of adults who desired to weigh less

were evaluated with multinomial logistic regression. Logistic regression was used to estimate the proportion and odds ratios of adults dieting within the past year. Regression was used to assess the influence of sex, education, and on the risk of dieting, desire to weight less or more, and self-perception of weight status while controlling for BMI, sex, and race. To account for the NHANES unequal probability of selection of subpopulations (such as race or age), clustering, stratification, and nonresponse adjustments, SUDAAN (version 8.0.1) was used to provide point estimates and variances.

Statistical Analysis with Survey Data

SAS assumes Simple Random Sample (SRS) so SUDAAN had to be used in order to calculate estimated regression coefficients, their standard errors, goodness-of-fit and residual analysis. Taylor linearization method was used to estimate the covariance matrix of β-hat. The approximate degrees of freedom associated with the covariance matrix β-hat is the number of PSUs minus the number of strata, which were used in calculated hypothesis tests and confidence intervals. For variance estimation purposes, the NHANES III complex sampling plan is described as 98 "pseudo-PSUs" and 49 "pseudo-strata" which calculates to 49 degrees of freedom for most hypothesis tests. Sampling at the first PSU stage is assumed to be with replacement

# CHAPTER IV

# RESULTS

## Descriptive Analysis

The NHANES III (1988-1994) included 20,050 adults 17 years and older. Of those, 1,888 (10.1%) persons completed the home interview, but were not willing or able to attend the medical examination. Approximately 17,705 (88.5%) completed the home interview and the MEC examination, and 457 (1.4%) completed the home interview and the home medical examination (Table 3). SAS and SUDAAN code to generate descriptive statistics are included in Appendix D.

Table 2. Comparison of NHANES III Interview Status by Age and Race/ethnicity

| Characteristic | Interviewed, not examined | | Interviewed, MEC-examined | | Interviewed, Home-examined | |
|---|---|---|---|---|---|---|
| | n | %[a] | n | %[a] | n | %[a] |
| Total | 1,888 | | 17,705 | | 457 | |
| **Race/Ethnicity** | | | | | | |
| Non-Hispanic white | 1,063 | 83.4 | 7,080 | 75.0 | 340 | 88.3 |
| Non-Hispanic black | 382 | 7.9 | 5,042 | 11.6 | 62 | 7.5 |
| Mexican-American | 396 | 3.7 | 4,865 | 5.5 | 45 | 1.5 |
| Other | 47 | 5.1 | 718 | 7.9 | 10 | 2.8 |
| **Age (years)** | | | | | | |
| 17 – 19 | 93 | 5.6 | 1,132 | 5.7 | - | - |
| 20 – 39 | 528 | 37.9 | 6,836 | 44.9 | 13 | 5.2 |
| 40 – 59 | 395 | 28.2 | 4,435 | 29.8 | 22 | 11.5 |
| ≥ 60 | 372 | 28.3 | 5,302 | 19.6 | 422 | 83.3 |

[a]Percentages are weighted to account for NHANES III sample design.

Excluded participants from the study were those who did not receive a medical examination (n=1,888), were under 20 years of age (n=1,225), were pregnant (n=288), had an unreliable interview (n=51), with missing BMI (n=61), with missing education (n=124), with missing weight perception (n=12), with missing weight goal (n=9), and with missing diet history (n=5). Eight people met multiple exclusion criteria.

Table 3. NHANES III Final Sample Characteristics for Men

| Characteristic | Sample Size | Sample Percent | Estimated Population Size | Weighted Percent (S.E.)[b] |
|---|---|---|---|---|
| | n | % | | % |
| Total | 7,828 | 47.5 | 83,651,060 | 48.4 |
| **Age (years)** | | | | |
| 20 – 39 | 3,074 | 39.3 | 40,084,784 | 47.9 (1.1) |
| 40 – 59 | 2,055 | 26.3 | 26,640,754 | 31.9 (0.8) |
| ≥ 60 | 2,699 | 34.5 | 16,925,522 | 20.2 (0.9) |
| **Race/Ethnicity** | | | | |
| Non Hispanic - white | 3,254 | 41.6 | 64,180,014 | 76.6 (1.3) |
| Non Hispanic - black | 2,075 | 26.5 | 8,415,772 | 10.1 (0.6) |
| Mexican-American | 2,216 | 28.3 | 4,617,686 | 5.5 (0.5) |
| Other | 283 | 3.6 | 6,437,589 | 7.7 (0.9) |
| **Body Mass Index[a]** | | | | |
| Underweight | 125 | 1.6 | 984,227 | 1.2 (0.2) |
| Normal | 2,983 | 38.1 | 32,944,426 | 39.4 (1.0) |
| Overweight | 3,131 | 40.0 | 33,381,765 | 39.9 (0.6) |
| Obese | 1,589 | 20.3 | 16,340,642 | 19.5 (0.7) |
| **Education Level** | | | | |
| Less than High school | 3,399 | 43.4 | 21,411,945 | 25.6 (1.1) |
| High school | 2,143 | 27.4 | 25,643,580 | 30.7 (0.9) |
| More than High school | 2,286 | 29.2 | 36,595,536 | 43.7 (1.4) |

[a] NHLBI weight categories are specified in Table 1. Calculated BMI from medical examination measurements
[b] Standard error

The study sample consists of 16,488 persons. Sample characteristics for men are presented in Table 3 and sample characteristics for women are presented in Table 4. There were 7,828 men and 8,660 women representing an estimated 83.7 and 89.1 million U.S. adults, respectively. Sample men made up 39.3% (n=3,074) of those aged 20 through 39 years, but the weighted percentage was 47.9%. Sample women displayed a similar sample distribution of 39.5% (n=3,422), however only contributed 43.3% to the

youngest age category for women. Men between the ages of 40 and 49 years (n=2,055), generated 26.3% of the sample males, but were weighted as 31.9%. Elderly men and women over the age of 60 years were over sampled at 34.5% and 33.4% respectively, however they only yielded 20.2% and 25.3% of the population proportion, respectively.

Table 4. NHANES III Final Sample Characteristics for Women

| Characteristic | Sample Size | Sample Percent | Estimated Population Size | Weighted Percent (S.E.) [b] |
|---|---|---|---|---|
| | n | % | | % |
| Total | 8,660 | 52.5 | 89,124,694 | 51.6 |
| **Age (years)** | | | | |
| 20 – 39 | 3,422 | 39.5 | 38,554,753 | 43.3 (1.2) |
| 40 – 59 | 2,343 | 27.1 | 27,982,961 | 31.4 (0.7) |
| ≥ 60 | 2,895 | 33.4 | 22,586,980 | 25.3 (1.2) |
| **Race/Ethnicity** | | | | |
| Non Hispanic - white | 3,725 | 43 | 67,989,605 | 76.3 (1.3) |
| Non Hispanic - black | 2,463 | 28.4 | 10,297,321 | 11.6 (0.6) |
| Mexican-American | 2,106 | 24.3 | 3,954,850 | 4.4 (0.5) |
| Other | 366 | 4.2 | 6,882,918 | 7.7 (0.9) |
| **Body Mass Index[a]** | | | | |
| Underweight | 252 | 2.9 | 3,248,482 | 3.6 (0.3) |
| Normal | 3,196 | 36.9 | 40,684,002 | 45.7 (1.0) |
| Overweight | 2,624 | 30.3 | 22,968,382 | 25.8 (0.7) |
| Obese | 2,588 | 29.9 | 22,223,828 | 24.9 (0.9) |
| **Education Level** | | | | |
| Less than High school | 3,410 | 39.4 | 22,001,448 | 24.7 (1.1) |
| High school | 2,848 | 32.9 | 32,299,970 | 36.2 (0.9) |
| More than High School | 2,402 | 27.7 | 34,823,277 | 39.1 (1.2) |

[a] NHLBI weight categories are specified in Table 1. Calculated BMI from medical examination measurements
[b] Standard error

Further evidence of over sampling occurs among the racial/ethnic categories. Non-Hispanic whites form 41.6% of the male and 43.0% of the female sample, but are weight adjusted to provide 76.6% of that male distribution and 76.3% of that female racial/ethnic distribution. This greater onus for such a small sample explains why they both have the largest standard error (1.3%) for this category. Non-Hispanic blacks and Mexican-American men roughly share the sample distribution at 26.5% and 28.3%, respectively; however their weighted proportions are 10.1% and 5.5% of the population.

Non-Hispanic black and Mexican-American females have equivalent weighted proportions at 11.6% and 4.4% of the population. However, these women exhibit a 28.4% sample proportion for Non-Hispanic blacks and 24.3% of Mexican-Americans. There were only 126 (1.6%) men and 252 (2.9%) women who had a measured BMI (< 18.5 $kg/m^2$) classifying them as underweight. Normal weighted (BMI ≥ 18.5 $kg/m^2$ and < 25.0 $kg/m^2$) men (n=2,983) made up 26.5% of the male distribution, but 39.4% of the population distribution. Normal weighted women (n=3,196) contributed 36.9% of the female weight distribution and 45.7% to the weighted female distribution. The sample sizes of overweight (BMI ≥ 25.0 $kg/m^2$ and < 30.0 $kg/m^2$) men (n=3,131) and women (n=2,624) appear to be roughly equivalent; however, overweight men make up 39.9% of all adult males while there are an estimated 25.8% of overweight women. Obesity (BMI ≥ 30.0 kg/m2) was more evident among women (n=2,588 and 29.9% of women) with a weighted 24.9%, while men (n=1,589 and 19.5% of men) were adjusted to account for 19.5% of the male population.

Men and women with less than a high school education made up 43.4% and 39.4% of the their samples respectively, but roughly a quarter of the U.S. adult population for each sex. High school graduates fulfilled 27.4% of the sample and 30.7% of the weighted population for men and 32.9% of the sample and 36.2% of the weight population for women. Less women (39.1% weighted) than men (43.7% weighted) had more education after high school.

Table 5 contains sample sizes, estimated population sizes, estimated proportions and their standard errors for the weight related categorical study variables by sex. When respondents were asked to rate their weight status, 7.1% (n=621) of men claimed that

they were underweight as compared to 3.9% (n=433) of women. More men (48.8%) also rated themselves as 'about the right weight', contrasted to the 34.0% of women. Finally, fewer men rated themselves as overweight (44.1%) as compared to (62.1%) women.

Table 5. NHANES III Weight Related Characteristics by Sex

| | MEN | | | WOMEN | | |
|---|---|---|---|---|---|---|
| **Characteristic** | **Sample Size** | **Estimated Population Size** | **Weighted Percent (S.E.) [a]** | **Sample Size** | **Estimated Population Size** | **Weighted Percent (S.E.) [a]** |
| | n | | % | n | | % |
| Total | 7,828 | 83,651,060 | 48.4 | 8,660 | 89,124,694 | 51.6 |
| **Self-rated weight** | | | | | | |
| Underweight | 621 | 5,913,292 | 7.1 (0.5) | 433 | 35,034,73 | 3.9 (0.2) |
| About the right weight | 4,178 | 40,812,465 | 48.8 (0.7) | 3,052 | 30,319,319 | 34.0 (0.8) |
| Overweight | 3,029 | 36,925,303 | 44.1 (0.8) | 5,175 | 55,301,902 | 62.1 (0.9) |
| **Would you like to weigh...** | | | | | | |
| Less | 3,390 | 42,454,972 | 50.8 (0.9) | 5,726 | 63,318,440 | 71.0 (0.8) |
| Stay about the same | 3,617 | 32,159,941 | 38.4 (0.8) | 2,458 | 21,966,344 | 24.6 (0.7) |
| More | 821 | 9,036,147 | 10.8 (0.6) | 476 | 3,839,910 | 4.3 (0.3) |
| **During the past 12 months, have you tried to lose weight?** | | | | | | |
| Yes | 2,021 | 25,206,314 | 30.1 (0.7) | 3,948 | 45,031,693 | 50.5 (1.1) |
| No | 5,807 | 58,444,746 | 69.9 (0.7) | 4,712 | 44,093,001 | 49.5 (1.1) |

[a]Standard error

When asked if they 'would like to weigh less, stay about the same, or weigh more', an estimated 71.0% of women desired to weigh less, while only a little more than half of men desired to weigh less. More men (38.4%) than women (24.6%) answered that they would like to 'stay about the same', and only 4.3% of women and 10.8% of men responded that they would like to weigh more.

When respondents were asked if they had tried to lose weight within the past year, an estimated 30.1% of men claimed that they had attempted weight loss, while 69.9% of men stated that they had not tried. Half of women had tried to lose weight with the past year of the survey. The analysis of weight related characteristics by sex provides

evidence that sex is not independent of weight related attitudes and should be included as a confounding variable.

Table 6 contains estimated proportions and standard errors for the weight related categorical study variables by BMI classification. There were a total of 377 sample persons that had a measured BMI < 18.5 $kg/m^2$ which classified them as underweight. An estimated 49.6% of those individuals correctly identified themselves as underweight when asked about self-rated weight status. A little more than half stated that they would like to weigh more and approximately 97.0% stated that they had not tried to lose weight within the last year. Respondents with a BMI ≥ 18.5 $kg/m^2$ and < 25.0 $kg/m^2$ were classified as having normal weight (n=6,179). An estimated 65.0% correctly self-rated

Table 6. NHANES III Weight Related Characteristics by BMI Classification

| | BMI Classification[a] | | | |
|---|---|---|---|---|
| **Characteristic** | **Underweight** | **Normal** | **Overweight** | **Obese** |
| | % (S.E.) | % (S.E.) | % (S.E.) | % (S.E.) |
| Total | 377 | 6,179 | 5,755 | 4,177 |
| **Self-rated weight** | | | | |
| Underweight | 49.6 (3.7) | 9.2 (0.6) | 0.7 (0.2)[b] | 0.4 (0.2)[b] |
| About the right weight | 50.2 (3.7) | 65.0 (1.0) | 32.4 (0.8) | 7.5 (0.7) |
| Overweight | 0.3 (0.2)[b] | 25.8 (0.9) | 66.9 (0.8) | 92.2 (0.7) |
| **Would you like to weigh…** | | | | |
| Less | 3.6 (1.7)[b] | 37.9 (0.9) | 73.8 (0.9) | 93.8 (0.6) |
| Stay about the same | 43.0 (3.3) | 49.1 (1.1) | 24.5 (0.8) | 6.0 (0.5) |
| More | 53.4 (3.3) | 13.0 (0.8) | 1.7 (0.3)[b] | 0.3 (0.1)[b] |
| **During the past 12 months, have you tried to lose weight?** | | | | |
| Yes | 3.0 (1.5)[b] | 27.1 (1.1) | 45.2 (1.0) | 64.1 (1.1) |
| No | 97.0 (1.5) | 72.9 (1.1) | 54.8 (1.0) | 35.9 (1.1) |

[a]Estimates are weighted to account for the sample design. All data are percentages except total row.
[b]Unstable percentage due to standard error.

their weight status as 'about the right weight', but 49.0% wanted to stay about the same weight and 37.9% of those with normal weight wanted to weigh less. With the past year, almost 27.1% of normal weighted survey respondents had tried to lose weight.

There were around 66.9% of the 5,755 overweight (BMI $\geq$ 25.0 kg/m$^2$ and <30 kg/m$^2$) adults who accurately rated their weight as 'overweight' and an estimated 32.4% claimed that they were 'about the right weight'. Almost three-fourths of the overweight individuals desired to weigh less and a quarter of them wanted to 'stay about the same'. A little more than of the overweight individuals had not tried to lose weight within the year.

Obesity (BMI $\geq$ 30 kg/m$^2$) was calculated for 4, 177 of the sample persons. Approximately 92.2% correctly identified themselves as 'overweight'. Almost of the obese individuals desired to lose weight (93.8%), but only an estimated 64.1% of individuals had tried to lose weight within year.

Table 7. NHANES III Final Sample Characteristics by BMI Classification

| | BMI classification[a] | | | |
|---|---|---|---|---|
| **Characteristic** | **Underweight** | **Normal** | **Overweight** | **Obese** |
| | % (S.E.) | % (S.E.) | % (S.E.) | % (S.E.) |
| Total | 377 | 6,179 | 5,755 | 4,177 |
| **Mean Age (years)** | 42.6 (1.3) | 42.0 (0.6) | 47.4 (0.5) | 47.5 (0.5) |
| **Race/Ethnicity** | | | | |
| Non-Hispanic white | 2.5 (0.2) | 43.7 (1.0) | 32.6 (0.7) | 21.3 (0.8) |
| Non-Hispanic black | 2.3 (0.2) | 35.9 (1.0) | 32.3 (0.6) | 29.5 (0.9) |
| Mexican-American | 1.3 (0.2) | 33.9 (1.1) | 38.4 (1.0) | 26.4 (1.1) |
| Other | 3.0 (1.0)[b] | 47.4 (2.9) | 29.9 (2.4) | 19.7 (1.8) |
| **Education** | | | | |
| Less than High school | 2.7 (0.4) | 37.4 (1.3) | 33.6 (1.2) | 26.3 (0.9) |
| High school | 1.9 (0.3) | 40.1 (1.1) | 33.3 (0.9) | 24.7 (1.1) |
| More than High school | 2.7 (0.4) | 47.9 (1.4) | 31.4 (1.0) | 18.0 (1.0) |

[a]Estimates are weighted to account for the sample design. All data are percentages except total row.
[b]Unstable percentage due to standard error.

Body mass index classifications were found to be positively correlated with self-rated weight category and inversely related to weight desires. These classifications were also evaluated for some demographic variables maintained in the study sample. The mean age increased for levels of BMI except for the underweight category which was 42.6 years. The greatest percentage of all racial/ethnic groups was found in the normal weight category level, except for Mexican-Americans. Most of the time (38.4%) Mexican-Americans were found to be overweight. There seemed to be a loose inverse relationship between BMI level and education.

Multivariate Analysis

A series of multinomial logistic models were developed to determine the probability of someone's desired weight by self-rated weight status. The dependent variable was desired weight, which was determined from the NHANES III question of whether the participants "would like to weigh more, less, or stay about the same" There were three levels (K=3) to the dependent variable. Independent variables were self-rated weight status (participants were asked if they "perceived themselves to be underweight, overweight, or about the right weight."), BMI, sex, age, level of education, and race-ethnicity. There were only 16,488 observations available for analysis due to subpopulation restriction (no pregnant women, adults under 20 years of age, unreliable survey, etc). SUDAAN output in Appendix H displays the frequency distribution of the response variable and the number of iterations needed to estimate the regression coefficients. There were 9,116 NHANES III respondents who wanted to weigh less, 6,075 who wanted to weigh the same, and 1,297 who wanted to weigh more. SUDAAN

calculated 14 regression coefficients (including K-1 intercepts). A cumulative logit link was specified for the proportional odds model, which produced a common slope but separates intercepts for each of the cumulative logit equations.

Table 8. Multinomial Logistic Regression Analysis of Self-Rated Desired Weight

| Characteristic | Beta | S.E. | Odds Ratio | 95% CI | Adjusted Wald Statistic | *P* |
|---|---|---|---|---|---|---|
| Intercept 1 | -7.76 | 0.26 | -- | -- | | |
| Intercept 2 | -3.68 | 0.22 | 0.03 | 0.02 – 0.04 | | |
| **Self-rated weight** | | | | | 812.14 | < 0.05 |
| Feel underweight | -- | -- | 1.00 | | | |
| Feel about right | 3.69 | 0.15 | 40.16 | 29.67 - 54.35 | | |
| Feel overweight | 7.48 | 0.20 | 1775.27 | 1183.65 - 2662.59 | | |
| **Body mass index**[a] | | | | | 118.04 | < 0.05 |
| Underweight | -- | -- | 1.00 | | | |
| Normal weight | 1.48 | 0.21 | 4.39 | 2.88 - 6.71 | | |
| Overweight | 2.52 | 0.23 | 12.48 | 7.89 - 19.71 | | |
| Obese | 3.26 | 0.23 | 25.99 | 16.47 - 41.01 | | |
| **Sex** | | | | | 209.77 | < 0.05 |
| Male | -- | -- | 1.00 | | | |
| Female | 1.12 | 0.08 | 3.08 | 2.63 - 3.60 | | |
| **Age (years)** | | | | | 29.95 | < 0.05 |
| 20 – 39 | 0.33 | 0.06 | 1.39 | 1.24 - 1.56 | | |
| 40 – 59 | 0.55 | 0.08 | 1.74 | 1.47 - 2.05 | | |
| ≥ 60 | -- | -- | 1.00 | | | |
| **Education** | | | | | 31.63 | < 0.05 |
| Less than High school | -- | -- | 1.00 | | | |
| High school | 0.22 | 0.10 | 1.24 | 1.02 – 1.51 | | |
| More than High School | 0.59 | 0.07 | 1.81 | 1.56 – 2.10 | | |
| **Race/Ethnicity** | | | | | 95.51 | < 0.05 |
| Non Hispanic - white/Other | -- | -- | 1.00 | | | |
| Non Hispanic - black | -0.80 | 0.06 | 0.45 | 0.40 - 0.50 | | |
| Mexican-American | -0.23 | 0.07 | 0.80 | 0.69 - 0.93 | | |

[a] BMI classifications based on NHLBI BMI cut off points and measured height and weight

The adjusted Wald was used to determine any significance for the overall model and was determined to be 366.65 ($p > 0.05$) .The adjusted Wald is similar to the F-statistics based on the Wald chi-square except with adjusted denominator degrees of freedom. A calculated Nagelkerke R-square was not calculated for this multinomial logistic model because R was specified as being independent in the program.

The probability of someone wanting to lose weight was the greatest when that person also felt overweight (adjusted OR = 1775.27, 95% CI: 1183.65 – 2662.59). The adjusted Wald statistic was 812.14 ($p < 0.05$). Even when someone felt their weight was 'about right', there was a 40% chance that they wanted to lose weight. As BMI increased from underweight to obese individuals there were increased odds of someone wanting to weigh less.

Females were almost three times as likely as males to want to weigh less (adjusted OR = 3.08, 95% CI: 2.63 – 3.60). The adjusted Wald was 209.77 ($p < 0.05$). Even for controlling for all other variables in the model, both age groups (20 –39 years and 40 – 59 years) were found to be at an increased odd of wanting to weigh less. It was shown in Figure 3 and Figure 4 that persons aged 50 – 59 years had the highest prevalence of obesity. As education increased from high school graduate to more than high school, there was also an increase in the odds that someone would want to weigh less. For racial/ethnic groups Non-Hispanic Black and Mexican-American both odds were less than one and significant, therefore if persons were among those racial/ethnic groups, they were less likely to want to weigh less.

A second model (Table 9) was formulated to predict the probability that someone would want to weigh less with all the previous independent variables (self-rated weight, BMI, sex, age, education level, and race) with an additional two interaction terms. The interaction term BMI * DMARETHN was to determine if there was any effect between BMI and race and HSSEX * DMARETHN was to determine if there was any effect between sex and race. SUDAAN code for the multinomial logistic regression with interaction terms and its output is located in Appendix I and J, respectively.

Table 9. Multinomial Logistic Regression Analysis of Desired Weight and Interaction Terms

| Characteristic | Beta | S.E. | Odds Ratio | 95% CI | Adjusted Wald Statistic | *P* |
|---|---|---|---|---|---|---|
| Intercept 1 | -7.87 | 0.28 | -- | -- | | |
| Intercept 2 | -3.79 | 0.23 | 0.02 | 0.01 - 0.04 | | |
| **Self-rated weight** | | | | | 788.65 | < 0.05 |
| Feel underweight | -- | -- | 1.00 | | | |
| Feel about right | 3.68 | 0.15 | 39.52 | 28.99 - 53.88 | | |
| Feel overweight | 7.47 | 0.21 | 1756.17 | 1162.91 - 2652.07 | | |
| **Body mass index**[a] | | | | | | |
| Underweight | -- | -- | 1.00 | | -- | |
| Normal weight | 1.53 | 0.23 | 4.63 | 2.90 - 7.40 | | |
| Overweight | 2.64 | 0.26 | 14.01 | 8.26 - 23.74 | | |
| Obese | 3.34 | 0.28 | 28.29 | 16.07 - 49.83 | | |
| **Sex** | | | | | | |
| Male | -- | -- | 1.00 | | -- | |
| Female | 1.21 | 0.09 | 3.37 | 2.82 - 4.02 | | |
| **Age (years)** | | | | | 31.88 | < 0.05 |
| 20 – 39 | 0.34 | 0.06 | 1.40 | 1.25 - 1.57 | | |
| 40 – 59 | 0.56 | 0.08 | 1.75 | 1.48 - 2.07 | | |
| ≥ 60 | -- | -- | 1.00 | | | |
| **Education** | | | | | 32.23 | < 0.05 |
| Less than High school | -- | -- | 1.00 | | | |
| High school | 0.21 | 0.10 | 1.24 | 1.02 – 1.51 | | |
| More than High School | 0.60 | 0.07 | 1.81 | 1.56 – 2.11 | | |
| **Race/Ethnicity** | | | | | -- | |
| Non Hispanic - white/Other | -- | -- | 1.00 | | | |
| Non Hispanic - black | -0.16 | 0.36 | 0.85 | 0.41 - 1.77 | | |
| Mexican-American | 0.43 | 0.37 | 1.54 | 0.74 - 3.22 | | |
| **BMI*Race/Ethnicity** | | | | | 1.03 | >0.05 |
| Underweight*NH Wh/Other | -- | -- | 1.00 | | | |
| Underweight*NH Black | -- | -- | 1.00 | | | |
| Underweight*Mex-Amer | -- | -- | 1.00 | | | |
| Normal Wt*NH Wh/Other | -- | -- | 1.00 | | | |
| Normal Wt*NH Black | -0.39 | 0.37 | 0.67 | 0.32 - 1.42 | | |
| Normal Wt*Mex-Amer | -0.30 | 0.36 | 0.74 | 0.36 - 1.51 | | |
| Overwt*NH Wh/Other | -- | -- | 1.00 | | | |
| Overwt*NH Black | -0.56 | 0.39 | 0.57 | 0.26 - 1.25 | | |
| Overwt*Mex-Amer | -0.69 | 0.38 | 0.50 | 0.23 - 1.07 | | |
| Obese*NH Wh/Other | -- | -- | 1.00 | | | |
| Obese*Nh Black | -0.42 | 0.42 | 0.66 | 0.28 - 1.53 | | |
| Obese*Mex-Amer | -0.44 | 0.47 | 0.64 | 0.25 - 1.66 | | |
| **Sex*Race/Ethnicity** | | | | | 13.76 | <0.05 |
| Male*NH Wh/Other | -- | -- | 1.00 | | | |
| Male*NH Black | -- | -- | 1.00 | | | |
| Male*Mex-Amer | -- | -- | 1.00 | | | |
| Female*NH Wh/Other | -- | -- | 1.00 | | | |
| Female*NH Black | -0.46 | 0.11 | 0.63 | 0.50 - 0.79 | | |
| Female*Mex-Amer | -0.51 | 0.13 | 0.60 | 0.46 - 0.77 | | |

[a] BMI classifications based on NHLBI BMI cut off points and measured height and weight

The interaction term BMI * DMARETHN did not add significantly to the multinomial logistic model. The adjusted Wald was 1.03 ($p > 0.05$). The interaction term HSSEX * DMARETHN did add to the model with the adjusted Wald at 13.76 ($p > 0.05$). Two odds ratios were calculated showing that Non-Hispanic females (adjusted OR = 0.63, 95% CI: 0.50 – 0.79) and Mexican- American (adjusted OR = 0.60, 95% CI: 0.46 – 0.77) females were less likely to want to weigh less when controlling for all other confounding variables.

Another research question addressed in this paper was weight loss attempts within the past 12 months. Survey participants were asked if, " they had tried to lose weight within the past 12 months" and a dichotomous response was recorded. Weight loss attempt (Yes/No) was recoded as the dependent variable and BMI, sex, age, education status, race, self-rated weight status and desired weight were the independent variables (Table 10).

The logistic model to predict weight loss attempt had 10,519 persons claiming that they had not tried to lose weight within 12 months and 5,969 persons said that they had tried to lose weight. The adjusted Wald statistic for this model was 133.42 ($p < 0.05$). Cox-Snell R-square was given as 0.28 (28%). Persons who wanted to weigh less were twelve times as likely to have tried to lose weight in the last 12 months. Even persons who wanted to weigh the same had tried to lose weight (adjusted OR = 2.36, 95% CI: 1.15 – 4.79). As BMI increased, there were increased odds that those persons had tried to lose weight. Females were almost twice as likely to have attempted weight loss than men (adjusted OR = 1.99, 95% CI: 1.79 – 2.20). If a participant felt overweight they were 2.86 times as likely to have attempted weight loss (95% CI: 1.51 – 5.41). As

the level of education increased, so did the chances that a person would attempt weight loss.

Table 10. Logistic Regression Analysis of Weight Loss Attempt Within 12 Months

| Characteristic | Beta | S.E. | Odds Ratio | 95% CI | Adjusted Wald Statistic | *P* |
|---|---|---|---|---|---|---|
| **Intercept** | -5.33 | 0.48 | -- | -- | | |
| **Desired Weight** | | | | | | |
| Weigh less | 2.53 | 0.37 | 12.55 | 6.02 - 26.13 | 151.57 | < 0.05 |
| Weigh same | 0.86 | 0.35 | 2.35 | 1.15 - 4.79 | | |
| Weigh more | -- | -- | 1.00 | | | |
| **Self-rated weight** | | | | | 26.02 | < 0.05 |
| Feel underweight | -- | -- | 1.00 | | | |
| Feel about right | 0.46 | 0.31 | 1.58 | 0.85 – 2.96 | | |
| Feel overweight | 1.05 | 0.32 | 2.86 | 1.51 – 5.41 | | |
| **Body mass index**[a] | | | | | 18.18 | < 0.05 |
| Underweight | -- | -- | 1.00 | | | |
| Normal weight | 1.40 | 0.44 | 4.07 | 1.67 – 9.94 | | |
| Overweight | 1.65 | 0.47 | 5.19 | 2.03 – 13.29 | | |
| Obese | 2.00 | 0.47 | 7.37 | 2.89 – 18.78 | | |
| **Sex** | | | | | 180.17 | < 0.05 |
| Male | -- | -- | 1.00 | | | |
| Female | 0.69 | 0.05 | 3.08 | 1.79 – 2.20 | | |
| **Age (years)** | | | | | 12.75 | < 0.05 |
| 20 – 39 | -- | -- | 1.00 | | | |
| 40 – 59 | -0.02 | 0.09 | 1.39 | 0.83 – 1.17 | | |
| ≥ 60 | -0.32 | 0.07 | 1.74 | 0.63 – 0.84 | | |
| **Education** | | | | | 13.25 | < 0.05 |
| Less than High school | -- | -- | 1.00 | | | |
| High school | 0.18 | 0.07 | 1.24 | 1.04 – 1.38 | | |
| More than High School | 0.46 | 0.09 | 1.81 | 1.32 – 1.90 | | |
| **Race/Ethnicity** | | | | | 3.74 | < 0.05 |
| Non Hispanic - white/Other | -- | -- | 1.00 | | | |
| Non Hispanic - black | -0.08 | 0.06 | 0.45 | 0.82 – 1.04 | | |
| Mexican-American | -0.17 | 0.07 | 0.80 | 0.74 – 0.97 | | |

[a] BMI classifications based on NHLBI BMI cut off points and measured height and weight

# CHAPTER V

# DISCUSSION

The results of this cross-sectional survey indicate that a person's self-rated weight perception was a more powerful predictor than measured BMI in determining whether he/she wanted to lose weight as well as whether he/she attempted to lose weight within the past year. The probability of someone dieting within the year was found to be more associated with wanting to weigh less than BMI level. This association of normal weighted persons wanting to weigh less could be indicative of distortive body image concerns in society.

## Study Limitations and Strengths

One of limitations for this study included the general interview questions. Studies that wish to determine body image or ideal body size use ideal body scales/body image silhouettes that have been rigorously tested. This study used general interview questions, which may have added variability through interpretation of the questions. However, bias could have been reduced because of the large number of questions, which each respondent answered. The self-rated weight question did not distinguish between overweight and obese classifications.

No clinical judgment could be made as to whether BMI was an accurate predictor of total body fatness. There are some instances where BMI is not an accurate predictor such as for extreme muscularity, sarcopenia, presence of edema, or people of short stature

Some data recording errors could have taken place during the NHANES III time period. The protocol called for calibration after each examinee. A small number of BMI measurements were calculated from self-reported for weight or height or substituted information from another MEC source. All body measurement information should have been from instrument readings and not estimated from other sources. Re-calibration ensures the reliability of the measurements and using one instrument source ensures the validity of the BMI calculation.

Recall bias of survey participant could have resulted in more variance. Most respondents answered most of the interview questions. The question with the most missing values and therefore, excluded persons were years of completed education. Although respondents were asked if they had tried to lose weight within the last year, no specifics were asked about how many attempts were made. History of diet attempts within the past year is subject to great variability among responders. The number of weight loss attempts and the method of dieting could vary from person to person. Young women are more likely to attempt extreme and deadly diet behaviors in order to lose weight. NHANES III interviewers did not collect data on weight loss methods.

One of the strengths of this study includes the measurement of BMI for a majority of the sampled persons and not self-reported BMI. Self-reported BMI has been known to correlate highly with measured BMI in some studies. However, as weight increases or height decreases, greater variations are seen among respondents. Older adults are known

to overestimate height and underestimate weight and there has been little evidence to support minority self-reported measurements.

One of the major strengths of the study was that the sample selected was representative of the United States in comparison to other studies that chose convenience sampling to deter costs (i.e. small college campuses). Convenience sampling has a greater potential for introducing bias into the point estimates.

Findings in Relation to Previous Studies

Most of past literature has emphasized body image concerns and discrepancies among young women. While researchers should not ignore the 'normative discontent' and the increased risk of eating disorders among women, scientists should also emphasize and target subpopulations that need to lose weight for health benefits.

This study's findings support Paeratakul et al, (2002) who evaluated the 1994 – 1996 Continuing Survey of Food Intakes by Individuals (CSFII) and the Diet and Health Knowledge Survey (DHKS) to develop a logistic model to predict individuals who perceived themselves as overweight. Their report found that the probability of someone perceiving themself as overweight was higher as BMI, income, and education increased, and if the respondent was female and white. This study developed a logistic regression model that predicts which persons would like to lose weight. Self-rated weight perception was included in this model and is similar to what Paeratakul et al, evaluated. This study found that self-rated weight perception was a greater predictor of a person's desire to lose weight than measured BMI. The adjusted odds ratio for feeling overweight and wanting to lose weight was OR = 1,756.17 (95% CI: 1162.91 – 2652.07). Both studies found that

women were more likely to rate themselves as overweight and that the elderly and minority women were less likely to rate themselves as overweight or wanting to weight less.

What is so alarming is that the highest prevalence of obesity was found in Non-Hispanic Black women (Figure 8). Recent articles have reported a decreased quality of life for obese as compared to normal persons. Past studies have identified reasons why Non-Hispanic black women do not face the same degree of negative social pressure to be thin. Powell and Kahn (1995) interviewed a small sample of black and white men and women and found that more black men than white men found larger than average female body sizes attractive and did not feel that they would be ridiculed if they dated a larger women.

There are perhaps many reasons to suspect a positive relationship between overweight and obesity prevalence, but there is no question as to the mounting evidence correlating excessive weight with the rise in morbidity and mortality. This study suggests that the subgroup (Non-Hispanic white females) mostly likely to attempt weight loss are less likely to need to do so while other groups who need to lose weight are less likely to express a desire or attempts to lose weight.

# APPENDIX A

```
/*********************************
Edit the line below to give destination directory for the permanent
SAS dataset.
*********************************/
LIBNAME NHANES "C:\class\NHANES_SAS";

/*********************************
The command below tells SAS where the data set ADULT is located.
*********************************/
FILENAME ADULT "C:\ADULT\ADULT.DAT" LRECL=3348;
    *** LRECL includes 2 positions for CRLF, assuming use of PC SAS;

    DATA NHANES.ADULT;
      INFILE ADULT MISSOVER;

      LENGTH
        SEQN       7
        DMPFSEQ    5
        DMPSTAT    3
        DMARETHN   3
        DMARACER   3
```

Many lines of code, which was not altered

```
        HAZMNK1R = "Average K1 BP from household and MEC"
        HAZNOK1R = "Number of BP's used for average K1"
        HAZMNK5R = "Average K5 BP from household and MEC"
        HAZNOK5R = "Number of BP's used for average K5"
      ;
        /*The original SAS code does NOT have a RUN Statement!
        There is a small box (possibly leftover from UNIX code) that
        MUST be deleted before typing the RUN statement.  */
      RUN;
```

# APPENDIX B

```
/*This is the test to see if I can merge the Adult Interview
subset 'a'
with the Adult examination file subset 'a'*/

/*STEP 1: Sort both tables by SEQN, as advised by NCHS */

PROC SORT DATA=NHDATA.AD_SUB;
      BY SEQN;
RUN;

PROC SORT DATA=NHDATA.EX_SUB;
      BY SEQN;
RUN;

/*STEP 1: Tell SAS where the new data set is going to be located*/

DATA NHDATA.MASTER;
      MERGE NHDATA.AD_SUB NHDATA.EX_SUB;
            BY SEQN;
RUN;
```

# APPENDIX C

```
/*This specifies the name of the file to be used*/
LIBNAME Nhdata 'C:\ADULT';

/*I am trying to make a subset of data. The first step that SAS
likes is to specify WHERE the new data is going to go.
I specified Library: NHDATA, Membername: MASTER*/

/*The SET statement which 'reads' observations from a SAS
data set to form a new SAS data set
MEC Adult Questionnaire available to all examinees aged 17 years
older in the mobile examination center*/

/*The data set MASTER had n=33,199 records and 178 variables
all of these records are needed, we can't just make a subset
because SUDAAN needs to see all records.  We can't lose PSU
information or SUDAAN won't know total design*/

DATA NHdata.MASTERa;
   SET Nhdata.MASTER (KEEP= /*Adult file variables*/
            SEQN /*Unique identifier*/
            /*DM = Demographics*/
            DMPFSEQ DMPSTAT DMARETHN DMARACER DMAETHNR DMPCNTYR
        DMPFIPSR DMPMETRO DMPCREGN DMPPIR
            /*HF = Household Family questionnaire*/
            HFAGERR HFVERS HFINTVR HFLANG HFA6XCR
            HFA8R HFA12 HFE7 HFF18 HFF19R
            /*HA = Household Adult questionnaire */
            HAVERS HAINTVR HALANG HAB1 HAB2
            HAB3 HAB4 HAB5 HAB6S HAM4 HAM5S HAM6S HAM7 HAM8S
            HAM9S HAM10S HAM11 HAM12 HAM13 HAM14 HAR1 HAR3 HAR16 HAR24
            HAR27 HAS28 HAS29 HAT28 HAY6 HAY7 HAY8 HAY10
            /*HS = Household screener questionnaire*/
            HSSEX HSDOIMO HSAGEIR HSAGEU HSAITMOR HSFSIZER
            /*Survey Design Data */
            SDPPHASE SDPPSU6 SDPSTRA6 SDPPSU1 SDPSTRA1
            SDPPSU2 SDPSTRA2 WTPFQX6 WTPFEX6 WTPFHX6
            /*Sampling Weights */
            WTPFSD6 WTPFMD6
            /*MX = MEC examination (general)
              HX = Home examination (general)*/
            MXPLANG MXPSESSR MXPTIMO MXPAXTMR
            HXPSESSR HXPTIMO HXPAXTMR
            /*Exam file variables - PE = Physician's examination*/
        PEP3A PEP3A2 PEP3B1 PEP3B2 PEP13A PEP13B PEP13C PEP13E1A
            PEP13E2A PEP13E3A PEP13E4A PEP13E5A PEPLEVEL
```

```
            PEPTECH PEPPREG
            /*BM = Body measures */
            BMPTECH1 BMPWT BMPWTFLG BMPWTLBS BMPBMI BMPHT
            BMPHTFLG BMPHTIN BMPSITHT BMPWAIST BMPBUTTO
            BMPWHR BMPTHICI BMPTRI BMPSUB BMPSUP BMPTHI
            /*MA = MEC adult questionnaire (general) */
            MAPC1 MAPF2 MAPF3 MAPF4 MAPF5 MAPF6 MAPF7R
            MAPF8 MAPF9 MAPF10 MAPF12 MAPF12R MAPH1 MAPH1OS MAPH2
            MAPH3 MAPLANG
            /*CN = Central Nervous System function evaluation */
            CNPQ01 CNPQ02 CNPQ06
            /*MQ = Diagnostic Interview schedule*/
            MQPDLANG MQPDPFLG MQPHCFLG);

RUN;

PROC SORT DATA=NHDATA.MASTERa;
      BY SEQN;
RUN;
```

# APPENDIX D

```
/*SUD1.SAS is a new program to create a dataset which will be used for
future analysis.

NOTE: ALWAYS SORT THE INPUT ANALYTIC FILE BY SDPSTRA6 (STRATA)
AND SDPPSU6 BEFORE USING SUDAAN FOR ANALYSES.  USE DESGN=WR AND STRATA
AND PSU VARIABLES IN THE NEST STATEMENT.

My SUBSET for the SUDAAN program for weight*/
LIBNAME NHDATA 'C:\ADULT';

DATA NHDATA.SUD1;
      SET NHDATA.MASTERA (KEEP=SEQN /*Unique Identifier*/
            SDPSTRA6 SDPPSU6 WTPFHX6 /*Survey design and weights*/
            HAY10 HFA8R DMPPIR
            BMPBMI HSAGEIR HSSEX DMARETHN
            HAM11 HAM12 HAM13 HAB1
            MAPF12R HAS28);

/*RECODE VARIABLE DMPPIR - POVERTY INCOME RATIO*/
IF 12 <= DMPPIR THEN DMPPIR = .;

/*RECODE VARIABLE HAB1 - GENERAL HEALTH PERCEPTION*/
IF 1 = HAB1 THEN HEALTH = 1;
IF 2 = HAB1 THEN HEALTH = 2;
IF 3 = HAB1 THEN HEALTH = 3;
IF 4 = HAB1 THEN HEALTH = 4;
IF 5 = HAB1 THEN HEALTH = 5;
IF 8 = HAB1 THEN HEALTH = .;
IF 9 = HAB1 THEN HEALTH = .;

/*RECODE VARIABLE HAS28 - LANG AT HOME*/
IF 1 = HAS28 THEN LANG = 1;
IF 2 = HAS28 THEN LANG = 2;
IF 3 = HAS28 THEN LANG = 3;
IF 5 = HAS28 THEN LANG = 4;
IF 8 = HAS28 THEN LANG = .;
IF 9 = HAS28 THEN LANG = .;

/*RECODE VARIABLE HFA8R - EDUCATION LEVEL*/

IF 00 <= HFA8R <= 11 THEN EDU = 1;
IF 12 <= HFA8R <= 80 THEN EDU = 2;
IF HFA8R = 88  THEN EDU = 3;
IF HFA8R = 99  THEN EDU = 3;

/*RECODE VARIABLE HAY10 - INTERVIEW STATUS*/
IF 1 = HAY10 THEN IVW = 1;
```

```
IF 2 = HAY10 THEN IVW = 2;
IF 8 = HAY10 THEN IVW = 1;

/*RECODE VARIABLE MAPF12R - PREGNANCY CODE*/
IF 1 = MAPF12R THEN PRG = 1;
IF 8 = MAPF12R THEN PRG = 2;
IF 9 = MAPF12R THEN PRG = 2;
IF . = MAPF12R THEN PRG = 2;
IF 2 = MAPF12R THEN PRG = 2;

/*RECODE VARIABLE HSAGEIR - IF SAMPLE SIZE IS TOO SMALL*/
IF 17 <= HSAGEIR <= 19 THEN DAGE=.;
IF 20 <= HSAGEIR <= 39 THEN DAGE=1;
IF 40 <= HSAGEIR <= 59 THEN DAGE=2;
IF 60 <= HSAGEIR THEN DAGE=3;

      /*RECODE VARIABLE BMPBMI- make sure to get rid of 8888*/
IF 0 <= BMPBMI <= 18.49 THEN BMI=1;
IF 18.5 <= BMPBMI <= 24.99 THEN BMI=2;
IF 25.0 <= BMPBMI <= 29.99 THEN BMI=3;
IF 30.0 <= BMPBMI <= 34.99 THEN BMI=4;
IF 35.0 <= BMPBMI <= 39.99 THEN BMI=4;
IF 40.0 <= BMPBMI <= 80.0 THEN BMI=4;
IF 80.0 <= BMPBMI THEN BMI=.;

/*RECODE VARIABLE HAM11 - MAKE SURE TO GET RID OF 8 AND 9*/
IF 1 = HAM11 THEN WTT = 3; /*OVERWEIGHT*/
IF 2 = HAM11 THEN WTT = 1; /*UNDERWEIGHT*/
IF 3 = HAM11 THEN WTT = 2; /*ABOUT THE RIGHT WEIGHT*/
IF 8 = HAM11 THEN WTT = .;
IF 9 = HAM11 THEN WTT = .;

/*RECODE VARIABLE HAM12 - MAKE SURE TO GET RID OF 8 AND 9*/
IF 1 = HAM12 THEN WTW = 3; /*WANTS TO WEIGH MORE*/
IF 2 = HAM12 THEN WTW = 1; /*WANTS TO WEIGH LESS*/
IF 3 = HAM12 THEN WTW = 2; /*WANTS TO WEIGH SAME*/
IF 8 = HAM12 THEN WTW = .;
IF 9 = HAM12 THEN WTW = .;

/*RECODE VARIABLE HAM13 - MAKE SURE TO GET RID OF 8 AND 9*/
IF 1 = HAM13 THEN DIET = 1; /*TRIED TO LOSE WEIGHT IN PAST YR*/
IF 2 = HAM13 THEN DIET = 2; /*DID NOT TRY TO LOSE WEIGHT*/
IF 8 = HAM13 THEN DIET = .;

RUN;
PROC FORMAT;
  VALUE HEALTH
       1 = 'EXCELLENT HEALTH'
       2 = 'VERY GOOD HEALTH'
       3 = 'GOOD HEALTH'
       4 = 'FAIR HEALTH'
       5 = 'POOR HEALTH';
  VALUE LANG
       1='ENGLISH ONLY'
       2='SPAN ONLY'
       3='OTHER LANG'
       4='BOTH ENG & SPAN';
```

```
   VALUE HSSEX
        1='MALE'
        2='FEMALE';
   VALUE DMARETHN
        1= 'NH WH'
        2= 'NH BL'
        3= 'MEX-AMER'
        4= 'OTHER';
   VALUE EDU
     1= 'LESS THAN HS'
        2= 'HS EDU OR MORE';
   VALUE BMI
        1= 'UNDER WT'
        2= 'NORMAL WT'
        3= 'OVERWT'
        4= 'OBESE';
   VALUE DAGE
     1= 'AGE 20-39 YRS'
        2= 'AGE 40-59 YRS'
        3= 'AGE 60+ YRS';
   VALUE WTT
        3= 'FEEL OVERWEIGHT'
        2= 'FEEL ABOUT RT'
        1= 'FEEL UNDERWEIGHT';
   VALUE WTW
        3= 'WEIGH MORE'
        2= 'WEIGH SAME'
        1= 'WEIGH LESS';
   VALUE DIET
        1= 'TRIED TO LOSE WT W/I YR'
        2= 'DID NOT TRY TO LOSE WT W/I YR';

RUN;

/*I was told by my SAS log to sort the file by the NEST*/
PROC SORT DATA=NHDATA.SUD1;
      BY SDPSTRA6 SDPPSU6;
      RUN;
```

# APPENDIX E

```
/*NOTE: ALWAYS SORT THE INPUT ANALYTIC FILE BY SDPSTRA6 (STRATA)
AND SDPPSU6 BEFORE USING SUDAAN FOR ANALYSES.  USE DESGN=WR AND STRATA
AND PSU VARIABLES IN THE NEST STATEMENT.
/*Code to analyze the full sample of NHANES III)

/*I was told by my SAS log to sort the file by the NEST*/
PROC SORT DATA=NHDATA.SUD1;
      BY SDPSTRA6 SDPPSU6;
RUN;
/*SUDAAN PROCEDURE STATEMENT*/

PROC CROSSTAB DATA = NHDATA.SUD1 FILETYPE=SAS DESIGN=WR DEFT2;

/*SUDAAN SAMPLE DESIGN STATEMENTS*/
NEST SDPSTRA6 SDPPSU6;
/*Nest statement analyzes 6 years of data as cross-sectional*/

WEIGHT WTPFQX6;
/*In order to analyze the complete interview,
NCHS recommends using SAMPLE WEIGHT that includes
items collected during the home interview*/
/*SUDAAN COMPUTATIONAL STATEMENT*/
SUBPOPN HSAGEIR >= 17;
/* SUBPOPN statement specifies SPs great or equal to 17 years of age*/

TABLES DMPSTAT ;
SUBGROUP DMPSTAT ;
LEVELS    3     ;
/*Creates a table looking at the sample counts per interview status*/
SETENV colwidth=9 decwidth=2 colspce=2;
TITLE "INTERVIEW STATUS, U.S. ADULTS (AGED 17+ YEARS)";
/*SUDAAN OUTPUT STATEMENT*/
PRINT
NSUM="SAMPLE SIZE"
WSUM="POPULATION SIZE"
SEWGT="STANDARD ERROR OF THE WEIGHT"
COLPER="COLUMN PERCENT"
SECOL="STANDARD ERROR OF THE COLUMN"
ROWPER="ROW PERCENT"
SEROW="STANDARD ERROR OF THE ROW"
/ NOHEAD NOTIME NDIMROW=2 NSUMFMT=F7.0 WSUMFMT = F9.0 SEWGTFMT = F8.0
STYLE=NCHS; RFORMAT DAGE DAGE.;RFORMAT HSSEX HSSEX.;
  RFORMAT DMARETHN DMARETHN.;
  RFORMAT DMPSTAT DMPSTAT.;

RUN;
```

# APPENDIX F

```
                                S U D A A N
          Software for the Statistical Analysis of Correlated Data
        Copyright      Research Triangle Institute      January 2003
                                Release 8.0.2

Number of observations read    :  31311    Weighted count :251097002
Number of observations skipped :   1888
(WEIGHT variable nonpositive)
Observations in subpopulation  :  16488    Weighted count:172775754
Denominator degrees of freedom :     49
```

| Variable<br>Race-ethnicity | SAMPLE SIZE | PERCENT | STD ERR | DESIGN EFFECT |
|---|---|---|---|---|
| WTW: WEIGH LESS | | | | |
| Total | 16488 | 61.22 | 0.57 | 2.29 |
| NH WH | 6979 | 63.61 | 0.69 | 1.45 |
| NH BL | 4538 | 52.44 | 0.74 | 1.01 |
| MEX-AMER | 4322 | 56.77 | 1.36 | 3.25 |
| OTHER | 649 | 52.75 | 3.08 | 2.46 |

The first level in the PROC DESCRIPT will look at those persons who want to weigh less. 63.6% of Non-Hispanic Whites wish to weight less. Only 52.4% of Non-Hispanic Blacks wish to weigh less.

| Variable<br>Sex | SAMPLE SIZE | PERCENT | STD ERR | DESIGN EFFECT |
|---|---|---|---|---|
| WTW: WEIGH LESS | | | | |
| Total | 16488 | 61.22 | 0.57 | 2.29 |
| MALE | 7828 | 50.75 | 0.89 | 2.49 |
| FEMALE | 8660 | 71.04 | 0.78 | 2.58 |

71.0% of women wish to weigh less compared to 50.1% of men.

| Variable<br>BMI | SAMPLE SIZE | PERCENT | STD ERR | DESIGN EFFECT |
|---|---|---|---|---|
| WTW: WEIGH LESS | | | | |
| Total | 16488 | 61.22 | 0.57 | 2.29 |
| UNDER WT | 377 | 3.63 | 1.67 | 2.98 |
| NORMAL WT | 6179 | 37.86 | 0.90 | 2.12 |
| OVERWT | 5755 | 73.80 | 0.94 | 2.65 |
| OBESE | 4177 | 93.75 | 0.58 | 2.37 |

An increased BMI level category displays an inverse relationship with wanting to weigh less.

| Variable DAGE | SAMPLE SIZE | PERCENT | STD ERR | DESIGN EFFECT |
|---|---|---|---|---|
| WTW: WEIGH LESS | | | | |
| Total | 16488 | 61.22 | 0.57 | 2.29 |
| AGE 20-39 YRS | 6496 | 58.97 | 1.00 | 2.71 |
| AGE 40-59 YRS | 4398 | 70.08 | 0.94 | 1.85 |
| AGE 60+ YRS | 5594 | 53.45 | 0.98 | 2.15 |

The desire to weigh less does not have a relationship with age. However, 70% of people ages 40-59 years wish to weigh less.

| Variable EDU | SAMPLE SIZE | PERCENT | STD ERR | DESIGN EFFECT |
|---|---|---|---|---|
| WTW: WEIGH LESS | | | | |
| Total | 16488 | 61.22 | 0.57 | 2.29 |
| LESS THAN HS | 6809 | 52.70 | 1.08 | 3.16 |
| HS EDU | 4991 | 64.63 | 0.73 | 1.15 |
| MORE THAN HS | 4688 | 63.63 | 1.02 | 2.12 |

People with less than a high school wish to weigh less (52.7%) compared to the other education groups.

| Variable WTT | SAMPLE SIZE | PERCENT | STD ERR | DESIGN EFFECT |
|---|---|---|---|---|
| WTW: WEIGH LESS | | | | |
| Total | 16488 | 61.22 | 0.57 | 2.29 |
| FEEL UNDR | 1054 | 3.00 | 0.75 | 2.05 |
| FEEL ABT RT | 7230 | 23.41 | 0.94 | 3.54 |
| FEEL OVWT | 8204 | 96.33 | 0.23 | 1.24 |

People who felt that they were overweight were more likely to want to lose weight (96.3%) compared to other groups. Note that as people felt heavier they wished to weigh less.

# APPENDIX G

## MULTINOMIAL LOGISTIC REGRESSION ANALYSIS

```
/*NOTE: ALWAYS SORT THE INPUT ANALYTIC FILE BY SDPSTRA6 (STRATA)
AND SDPPSU6 BEFORE USING SUDAAN FOR ANALYSES.  USE DESGN=WR AND STRATA
AND PSU VARIABLES IN THE NEST STATEMENT.

/*I was told by my SAS log to sort the file by the NEST*/
PROC SORT DATA=NHDATA.SUD1;
      BY SDPSTRA6 SDPPSU6;
RUN;
/*SUDAAN PROCEDURE STATEMENT*/

PROC MULTILOG DATA = NHDATA.SUD1 FILETYPE=SAS DESIGN=WR DEFT2
SEMETHOD=ZEGER R=INDEPENDENT;
/*The regression model is fitted via the GEE model-fitting technique
, with the assumption of independent working correlations
(R=correlations) and using a robust variance estimator*/

/*SUDAAN SAMPLE DESIGN STATEMENTS*/
      NEST SDPSTRA6 SDPPSU6;
      WEIGHT WTPFHX6;

/*SUDAAN COMPUTATIONAL STATEMENT*/
/*First specifying the subpopulation of interest*/
      SUBPOPN HSAGEIR > 19 & PRG >1 & IVW=1 & HFA8R<20 & BMPBMI<=80
            & HAM11 <=3 & HAM13 <3 & HAM12 <4 & DMARETHN <4/
   NAME="NON-PREGNANT ADULTS AGED 20+ YEARS WITH RELIABLE INTERVIEWS";

      SUBGROUP WTW WTT BMI HSSEX DAGE EDU DMARETHN ;
      LEVELS    3   3  4    2     3   3     3    ;
      REFLEVEL HSSEX=1 BMI=1 DAGE=3 DMARETHN=1 EDU=1 WTT=1;

      MODEL WTW = WTT BMI HSSEX DAGE EDU DMARETHN /CUMLOGIT;
/*SUDAAN implements the proportional odds model with cumulative logit
link for ordinal responses. WTW is an ordinal response with 3 levels.
CUMLOGIT handles continuous as well as categorical response variables*/

/*SUDAAN OUTPUT STATEMENT*/
      SETENV LABWIDTH=22 COLSPCE=1 COLWIDTH=8 DECWIDTH=2 LINESIZE=78
                  PAGESIZE=60;
PRINT
BETA ="BETA" SEBETA ="S.E.BETA" DEFT="DESGIN EFFECT"
T_BETA="T:BETA=0" P_BETA="P-VALUE"
```

```
OR = "ODDS RATIO" LOWOR UPOR DF = "DF" SATADJDF="ADJ DF"
WALDCHI= "CHI-SQ (WALD)" SATADCHI= "CHI-SQ (SAT)"
ADJWALDF="ADJ-WALD" WALDCHP= "P-VALUE (WALD)"
SATADCHP= "P-VALUE (SAT)" ADJWALDP="P-VALUE ADJ"
/RISK=ALL TESTS=DEFAULT T_BETAFMT=F8.2 DEFTFMT=F6.2
SEBETAFMT=F8.2 DFFMT=F7.0 WALDCHIFMT=F8.2
ORFMT=F8.2 LOWORFMT=F8.2 UPORFMT=F8.2;
      RTITLE "PREDICTING DESIRED WEIGHT";
      RTITLE "1988-1994, NHANES III";
      RFORMAT HSSEX HSSEX.;
      RFORMAT DMARETHN DMARETHN.;
      RFORMAT BMI BMI.;
      RFORMAT DAGE DAGE.;
      RFORMAT EDU EDU.;
      RFORMAT WTT WTT.;
      RFORMAT WTW WTW.;
      RFORMAT LANG LANG.;
      RFORMAT DIET DIET.;
RUN;
```

# APPENDIX H

## MULTINOMIAL LOGISTIC REGRESSION OUTPUT

```
                              S U D A A N
          Software for the Statistical Analysis of Correlated Data
        Copyright      Research Triangle Institute      January 2003
                              Release 8.0.2


Independence parameters have converged in 8 iterations

Number of observations read       :  31311    Weighted count:251097002
Number of observations skipped    :   1888
(WEIGHT variable nonpositive)
Observations in subpopulation     :  16488    Weighted count:172775754
Observations used in the analysis :  16488    Weighted count:172775754
Denominator degrees of freedom    :     49

Maximum number of estimable parameters for the model is 14

File NHDATA.SUD1 contains   98 Clusters
  98 clusters were used to fit the model
Maximum cluster size is 260 records
Minimum cluster size is  64 records

Sample and Population Counts for Response Variable WTW
  WEIGH LESS:  Sample Count     9116    Population Count 105773411
  WEIGH SAME:  Sample Count     6075    Population Count  54126285
  WEIGH MORE:  Sample Count     1297    Population Count  12876058

-2 * Normalized Log-Likelihood with Intercepts Only : 28277.80
-2 * Normalized Log-Likelihood Full Model           : 13509.82
Approximate Chi-Square (-2 * Log-L Ratio)           : 14767.98
Degrees of Freedom                                  :       12
WTW (cum-logit),
  Independent
  Variables and                          DESGIN
  Effects                 BETA S.E.BETA EFFECT T:BETA=0  P-VALUE
-------------------------------------------------------------------
WTW (cum-logit)
  Intercept 1: WEIGH
  LESS                   -7.76     0.26   1.91   -29.65     0.00
  Intercept 2: WEIGH
  SAME                   -3.68     0.22   1.66   -17.06     0.00
WTT
  FEEL UNDR               0.00     0.00    .       .         .
  FEEL ABT RT             3.69     0.15   1.94    24.52     0.00
  FEEL OVWT               7.48     0.20   2.42    37.09     0.00
```

| WTW (cum-logit), Independent Variables and Effects | BETA | S.E.BETA | DESGIN EFFECT | T:BETA=0 | P-VALUE |
|---|---|---|---|---|---|
| BMI | | | | | |
| UNDER WT | 0.00 | 0.00 | . | . | . |
| NORMAL WT | 1.48 | 0.21 | 2.44 | 7.03 | 0.00 |
| OVERWT | 2.52 | 0.23 | 2.44 | 11.08 | 0.00 |
| OBESE | 3.26 | 0.23 | 1.72 | 14.35 | 0.00 |
| Sex | | | | | |
| MALE | 0.00 | 0.00 | . | . | . |
| FEMALE | 1.12 | 0.08 | 2.44 | 14.48 | 0.00 |
| DAGE | | | | | |
| AGE 20-39 YRS | 0.33 | 0.06 | 0.97 | 5.61 | 0.00 |
| AGE 40-59 YRS | 0.55 | 0.08 | 1.71 | 6.65 | 0.00 |
| AGE 60+ YRS | 0.00 | 0.00 | . | . | . |
| EDU | | | | | |
| LESS THAN HS | 0.00 | 0.00 | . | . | . |
| HS EDU | 0.22 | 0.10 | 2.47 | 2.24 | 0.03 |
| MORE THAN HS | 0.59 | 0.07 | 1.50 | 7.93 | 0.00 |
| Race-ethnicity | | | | | |
| NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| NH BL | -0.80 | 0.06 | 0.63 | -13.91 | 0.00 |
| MEX-AMER | -0.23 | 0.07 | 0.53 | -3.03 | 0.00 |

| Contrast | DF | ADJ DF | CHI-SQ (WALD) | CHI-SQ (SAT) | ADJ-WALD | P-VALUE (WALD) | P-VALUE (SAT) | P-VALUE ADJ |
|---|---|---|---|---|---|---|---|---|
| OVERALL MODEL | 14 | 9.00 | 5133.11 | 2226.62 | 269.38 | 0.00 | 0.00 | 0.00 |
| MODEL MINUS INTERCEPT | 12 | 7.89 | 4137.76 | 1842.18 | 267.41 | 0.00 | 0.00 | 0.00 |
| WTT | 2 | 1.90 | 1658.12 | 1925.80 | 812.14 | 0.00 | 0.00 | 0.00 |
| BMI | 3 | 2.74 | 369.18 | 225.57 | 118.04 | 0.00 | 0.00 | 0.00 |
| HSSEX | 1 | 1.00 | 209.77 | 209.77 | 209.77 | 0.00 | 0.00 | 0.00 |
| DAGE | 2 | 1.61 | 61.14 | 33.91 | 29.95 | 0.00 | 0.00 | 0.00 |
| EDU | 2 | 1.78 | 64.57 | 39.51 | 31.63 | 0.00 | 0.00 | 0.00 |
| DMARETHN | 2 | 1.93 | 194.99 | 208.41 | 95.51 | 0.00 | 0.00 | 0.00 |

| Contrast | P-value Wald F | Wald F |
|---|---|---|
| OVERALL MODEL | 366.65 | 0.00 |
| MODEL MINUS INTERCEPT | 344.81 | 0.00 |
| WTT | 829.06 | 0.00 |
| BMI | 123.06 | 0.00 |
| HSSEX | 209.77 | 0.00 |
| DAGE | 30.57 | 0.00 |
| EDU | 32.28 | 0.00 |
| DMARETHN | 97.50 | 0.00 |

| WTW (cum-logit), Independent Variables and Effects | ODDS RATIO | Lower 95% Limit OR | Upper 95% Limit OR |
|---|---|---|---|
| WTW (cum-logit) | | | |
| Intercept 1: WEIGH | | | |
| LESS | 0.00 | 0.00 | 0.00 |
| Intercept 2: WEIGH | | | |
| SAME | 0.03 | 0.02 | 0.04 |
| WTT | | | |
| FEEL UNDR | 1.00 | 1.00 | 1.00 |
| FEEL ABT RT | 40.16 | 29.67 | 54.35 |
| FEEL OVWT | 1775.27 | 1183.65 | 2662.59 |
| BMI | | | |
| UNDER WT | 1.00 | 1.00 | 1.00 |
| NORMAL WT | 4.39 | 2.88 | 6.71 |
| OVERWT | 12.48 | 7.89 | 19.71 |
| OBESE | 25.99 | 16.47 | 41.01 |
| Sex | | | |
| MALE | 1.00 | 1.00 | 1.00 |
| FEMALE | 3.08 | 2.63 | 3.60 |
| DAGE | | | |
| AGE 20-39 YRS | 1.39 | 1.24 | 1.56 |
| AGE 40-59 YRS | 1.74 | 1.47 | 2.05 |
| AGE 60+ YRS | 1.00 | 1.00 | 1.00 |
| EDU | | | |
| LESS THAN HS | 1.00 | 1.00 | 1.00 |
| HS EDU | 1.24 | 1.02 | 1.51 |
| MORE THAN HS | 1.81 | 1.56 | 2.10 |
| Race-ethnicity | | | |
| NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| NH BL | 0.45 | 0.40 | 0.50 |
| MEX-AMER | 0.80 | 0.69 | 0.93 |

# APPENDIX I

## MULTINOMIAL LOGISTIC REGRESSION ANALYSIS WITH INTERACTIONS

```
/*NOTE: ALWAYS SORT THE INPUT ANALYTIC FILE BY SDPSTRA6 (STRATA)
AND SDPPSU6 BEFORE USING SUDAAN FOR ANALYSES.  USE DESGN=WR AND STRATA
AND PSU VARIABLES IN THE NEST STATEMENT.

/*I was told by my SAS log to sort the file by the NEST*/
PROC SORT DATA=NHDATA.SUD1;
      BY SDPSTRA6 SDPPSU6;
RUN;
/*SUDAAN PROCEDURE STATEMENT*/

PROC MULTILOG DATA = NHDATA.SUD1 FILETYPE=SAS DESIGN=WR DEFT2;
/*The regression model is fitted via the GEE model-fitting technique
, with the assumption of independent working correlations
(R=correlations) and using a robust variance estimator*/

/*SUDAAN SAMPLE DESIGN STATEMENTS*/
      NEST SDPSTRA6 SDPPSU6;
      WEIGHT WTPFHX6;

/*SUDAAN COMPUTATIONAL STATEMENT*/
/*First specifying the subpopulation of interest*/
      SUBPOPN HSAGEIR > 19 & PRG >1 & IVW=1 & HFA8R<20 & BMPBMI<=80
            & HAM11 <=3 & HAM13 <3 & HAM12 <4 & DMARETHN <4/
   NAME="NON-PREGNANT ADULTS AGED 20+ YEARS WITH RELIABLE INTERVIEWS";

      SUBGROUP WTW WTT BMI HSSEX DAGE EDU DMARETHN ;
      LEVELS    3   3  4    2     3   3     3    ;
      REFLEVEL HSSEX=1 BMI=1 DAGE=3 DMARETHN=1 EDU=1 WTT=1;

      MODEL WTW = WTT BMI HSSEX DAGE EDU DMARETHN HSSEX*DMARETHN
                  BMI*DMARETHN/CUMLOGIT;
      EFFECTS HSSEX*DMARETHN BMI*DMARETHN / NAME = "Chunk
interactions";
/*SUDAAN implements the proportional odds model with cumulitive logit
link for ordinal responses. WTW is an ordinal response with 3 levels.
CUMLOGIT handles continuous as well as categorical response variables*/

/*SUDAAN OUTPUT STATEMENT*/
      SETENV LABWIDTH=22 COLSPCE=1 COLWIDTH=8 DECWIDTH=2 LINESIZE=78
                  PAGESIZE=60;
```

```
PRINT
BETA ="BETA" SEBETA ="S.E.BETA" DEFT="DESGIN EFFECT"
T_BETA="T:BETA=0" P_BETA="P-VALUE"
OR = "ODDS RATIO" LOWOR UPOR DF = "DF" SATADJDF="ADJ DF"
WALDCHI= "CHI-SQ (WALD)" SATADCHI= "CHI-SQ (SAT)"
ADJWALDF="ADJ-WALD" WALDCHP= "P-VALUE (WALD)"
SATADCHP= "P-VALUE (SAT)" ADJWALDP="P-VALUE ADJ"
/RISK=ALL TESTS=DEFAULT T_BETAFMT=F8.2 DEFTFMT=F6.2
SEBETAFMT=F8.2 DFFMT=F7.0 WALDCHIFMT=F8.2
ORFMT=F8.2 LOWORFMT=F8.2 UPORFMT=F8.2;
      RTITLE "PREDICTING DESIRED WEIGHT";
      RTITLE "1988-1994, NHANES III";
      RFORMAT HSSEX HSSEX.;
      RFORMAT DMARETHN DMARETHN.;
      RFORMAT BMI BMI.;
      RFORMAT DAGE DAGE.;
      RFORMAT EDU EDU.;
      RFORMAT WTT WTT.;
      RFORMAT WTW WTW.;
      RFORMAT LANG LANG.;
      RFORMAT DIET DIET.;
RUN;
```

# APPENDIX J

## MULTINOMIAL LOGISTIC REGRESSION ANALYSIS WITH INTERACTIONS OUTPUT

```
                                S U D A A N
                  Software for the Statistical Analysis of Correlated Data
                Copyright      Research Triangle Institute      January 2003
                                      Release 8.0.2


Independence parameters have converged in 8 iterations

Number of observations read       :  31311    Weighted count:251097002
Number of observations skipped    :   1888
(WEIGHT variable nonpositive)
Observations in subpopulation     :  16488    Weighted count:172775754
Observations used in the analysis :  16488    Weighted count:172775754
Denominator degrees of freedom    :     49

Maximum number of estimable parameters for the model is 21

File NHDATA.SUD1 contains   98 Clusters
  98 clusters were used to fit the model
Maximum cluster size is 260 records
Minimum cluster size is  64 records
Sample and Population Counts for Response Variable WTW
  WEIGH LESS:  Sample Count     9116    Population Count 105773411
  WEIGH SAME:  Sample Count     6075    Population Count  54126285
  WEIGH MORE:  Sample Count     1297    Population Count  12876058

-2 * Normalized Log-Likelihood with Intercepts Only : 28277.80
-2 * Normalized Log-Likelihood Full Model           : 13493.03
Approximate Chi-Square (-2 * Log-L Ratio)           : 14784.77
Degrees of Freedom                                  :       20

Note: The approximate Chi-Square is not adjusted for clustering.
      Refer to hypothesis test table for adjusted test.
WTW (cum-logit),
  Independent
  Variables and                          DESGIN
  Effects                 BETA S.E.BETA EFFECT T:BETA=0  P-VALUE
-------------------------------------------------------------------
WTW (cum-logit)
  Intercept 1: WEIGH
  LESS                   -7.87     0.28   2.05   -28.14     0.00
  Intercept 2: WEIGH
  SAME                   -3.79     0.23   1.83   -16.13     0.00
```

| WTW (cum-logit), Independent Variables and Effects | BETA | S.E.BETA | DESGIN EFFECT | T:BETA=0 | P-VALUE |
|---|---|---|---|---|---|
| WTT | | | | | |
| FEEL UNDR | 0.00 | 0.00 | . | . | . |
| FEEL ABT RT | 3.68 | 0.15 | 2.05 | 23.85 | 0.00 |
| FEEL OVWT | 7.47 | 0.21 | 2.51 | 36.42 | 0.00 |
| BMI | | | | | |
| UNDER WT | 0.00 | 0.00 | . | . | . |
| NORMAL WT | 1.53 | 0.23 | 2.72 | 6.57 | 0.00 |
| OVERWT | 2.64 | 0.26 | 2.87 | 10.05 | 0.00 |
| OBESE | 3.34 | 0.28 | 2.12 | 11.87 | 0.00 |
| Sex | | | | | |
| MALE | 0.00 | 0.00 | . | . | . |
| FEMALE | 1.21 | 0.09 | 2.49 | 13.81 | 0.00 |
| DAGE | | | | | |
| AGE 20-39 YRS | 0.34 | 0.06 | 0.95 | 5.80 | 0.00 |
| AGE 40-59 YRS | 0.56 | 0.08 | 1.69 | 6.78 | 0.00 |
| AGE 60+ YRS | 0.00 | 0.00 | . | . | . |
| EDU | | | | | |
| LESS THAN HS | 0.00 | 0.00 | . | . | . |
| HS EDU | 0.21 | 0.10 | 2.49 | 2.19 | 0.03 |
| MORE THAN HS | 0.60 | 0.07 | 1.50 | 7.97 | 0.00 |
| Race-ethnicity | | | | | |
| NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| NH BL | -0.16 | 0.36 | 0.53 | -0.44 | 0.66 |
| MEX-AMER | 0.43 | 0.37 | 0.27 | 1.18 | 0.25 |
| BMI, Race-ethnicity | | | | | |
| UNDER WT, NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| UNDER WT, NH BL | 0.00 | 0.00 | . | . | . |
| UNDER WT, MEX-AMER | 0.00 | 0.00 | . | . | . |
| NORMAL WT, NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| NORMAL WT, NH BL | -0.39 | 0.37 | 0.55 | -1.06 | 0.29 |
| NORMAL WT, MEX-AMER | -0.30 | 0.36 | 0.25 | -0.85 | 0.40 |
| OVERWT, NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| OVERWT, NH BL | -0.56 | 0.39 | 0.60 | -1.43 | 0.16 |
| OVERWT, MEX-AMER | -0.69 | 0.38 | 0.28 | -1.82 | 0.07 |
| OBESE, NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| OBESE, NH BL | -0.42 | 0.42 | 0.63 | -1.00 | 0.32 |
| OBESE, MEX-AMER | -0.44 | 0.47 | 0.36 | -0.93 | 0.35 |
| Sex, Race-ethnicity | | | | | |
| MALE, NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| MALE, NH BL | 0.00 | 0.00 | . | . | . |
| MALE, MEX-AMER | 0.00 | 0.00 | . | . | . |
| FEMALE, NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| FEMALE, NH BL | -0.46 | 0.11 | 0.61 | -4.13 | 0.00 |
| FEMALE, MEX-AMER | -0.51 | 0.13 | 0.39 | -4.02 | 0.00 |

| Contrast | DF | ADJ DF | CHI-SQ (WALD) | CHI-SQ (SAT) | ADJ-WALD | P-VALUE (WALD) | P-VALUE (SAT) | P-VALUE ADJ |
|---|---|---|---|---|---|---|---|---|
| OVERALL MODEL | 22 | 10.23 | 8954.71 | 2204.69 | 232.59 | 0.00 | 0.00 | 0.00 |
| MODEL MINUS INTERCEPT | 20 | 9.16 | 6235.18 | 1813.03 | 190.87 | 0.00 | 0.00 | 0.00 |
| WTT | 2 | 1.91 | 1610.16 | 1856.75 | 788.65 | 0.00 | 0.00 | 0.00 |
| BMI | . | . | . | . | . | . | . | . |
| HSSEX | . | . | . | . | . | . | . | . |
| DAGE | 2 | 1.59 | 65.09 | 34.68 | 31.88 | 0.00 | 0.00 | 0.00 |
| EDU | 2 | 1.79 | 65.80 | 40.34 | 32.23 | 0.00 | 0.00 | 0.00 |
| DMARETHN | . | . | . | . | . | . | . | . |
| BMI * DMARETHN | 6 | 4.13 | 6.86 | 6.41 | 1.03 | 0.33 | 0.18 | 0.42 |
| HSSEX * DMARETHN | 2 | 1.89 | 28.10 | 29.03 | 13.76 | 0.00 | 0.00 | 0.00 |
| Chunk interactions | 8 | 5.24 | 41.93 | 21.11 | 4.49 | 0.00 | 0.00 | 0.00 |

| Contrast | P-value Wald F | P-value Wald F |
|---|---|---|
| OVERALL MODEL | 407.03 | 0.00 |
| MODEL MINUS INTERCEPT | 311.76 | 0.00 |
| WTT | 805.08 | 0.00 |
| BMI | . | . |
| HSSEX | . | . |
| DAGE | 32.54 | 0.00 |
| EDU | 32.90 | 0.00 |
| DMARETHN | . | . |
| BMI * DMARETHN | 1.14 | 0.35 |
| HSSEX * DMARETHN | 14.05 | 0.00 |
| Chunk interactions | 5.24 | 0.00 |

| WTW (cum-logit), Independent Variables and Effects | ODDS RATIO | Lower 95% Limit OR | Upper 95% Limit OR |
|---|---|---|---|
| WTW (cum-logit) | | | |
| Intercept 1: WEIGH LESS | 0.00 | 0.00 | 0.00 |
| Intercept 2: WEIGH SAME | 0.02 | 0.01 | 0.04 |
| WTT | | | |
| FEEL UNDR | 1.00 | 1.00 | 1.00 |
| FEEL ABT RT | 39.52 | 28.99 | 53.88 |
| FEEL OVWT | 1756.17 | 1162.91 | 2652.07 |
| BMI | | | |
| UNDER WT | 1.00 | 1.00 | 1.00 |
| NORMAL WT | 4.63 | 2.90 | 7.40 |
| OVERWT | 14.01 | 8.26 | 23.74 |
| OBESE | 28.29 | 16.07 | 49.83 |
| Sex | | | |
| MALE | 1.00 | 1.00 | 1.00 |
| FEMALE | 3.37 | 2.82 | 4.02 |
| DAGE | | | |
| AGE 20-39 YRS | 1.40 | 1.25 | 1.57 |
| AGE 40-59 YRS | 1.75 | 1.48 | 2.07 |
| AGE 60+ YRS | 1.00 | 1.00 | 1.00 |

| WTW (cum-logit), Independent Variables and Effects | ODDS RATIO | Lower 95% Limit OR | Upper 95% Limit OR |
|---|---|---|---|
| EDU | | | |
| LESS THAN HS | 1.00 | 1.00 | 1.00 |
| HS EDU | 1.24 | 1.02 | 1.51 |
| MORE THAN HS | 1.81 | 1.56 | 2.11 |
| Race-ethnicity | | | |
| NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| NH BL | 0.85 | 0.41 | 1.77 |
| MEX-AMER | 1.54 | 0.74 | 3.22 |
| BMI, Race-ethnicity | | | |
| UNDER WT, NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| UNDER WT, NH BL | 1.00 | 1.00 | 1.00 |
| UNDER WT, MEX-AMER | 1.00 | 1.00 | 1.00 |
| NORMAL WT, NHWH/OTHR | 1.00 | 1.00 | 1.00 |
| NORMAL WT, NH BL | 0.67 | 0.32 | 1.42 |
| NORMAL WT, MEX-AMER | 0.74 | 0.36 | 1.51 |
| OVERWT, NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| OVERWT, NH BL | 0.57 | 0.26 | 1.25 |
| OVERWT, MEX-AMER | 0.50 | 0.23 | 1.07 |
| OBESE, NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| OBESE, NH BL | 0.66 | 0.28 | 1.53 |
| OBESE, MEX-AMER | 0.64 | 0.25 | 1.66 |
| Sex, Race-ethnicity | | | |
| MALE, NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| MALE, NH BL | 1.00 | 1.00 | 1.00 |
| MALE, MEX-AMER | 1.00 | 1.00 | 1.00 |
| FEMALE, NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| FEMALE, NH BL | 0.63 | 0.50 | 0.79 |
| FEMALE, MEX-AMER | 0.60 | 0.46 | 0.77 |

# APPENDIX K

## LOGISTIC REGRESSION ANALYSIS

```
/*NOTE: ALWAYS SORT THE INPUT ANALYTIC FILE BY SDPSTRA6 (STRATA)
AND SDPPSU6 BEFORE USING SUDAAN FOR ANALYSES.  USE DESGN=WR AND STRATA
AND PSU VARIABLES IN THE NEST STATEMENT.

PROC SORT DATA=NHDATA.SUD1;
      BY SDPSTRA6 SDPPSU6;
RUN;
/*SUDAAN PROCEDURE STATEMENT*/

PROC RLOGIST DATA = NHDATA.SUD1 FILETYPE=SAS DESIGN=WR DEFT2;

/*SUDAAN SAMPLE DESIGN STATEMENTS*/
      NEST SDPSTRA6 SDPPSU6;
      WEIGHT WTPFHX6;
RECODE DIET = 2;/*CHANGES DIET FROM A 1,2 TO 0,1) */

/*SUDAAN COMPUTATIONAL STATEMENT*/
      SUBPOPN HSAGEIR > 19 & PRG >1 & IVW=1 & HFA8R<20 & BMPBMI<=80
            & HAM11 <=3 & HAM13 <3 & HAM12 <4 & DMARETHN <5/
   NAME="NON-PREGNANT ADULTS AGED 20+ YEARS WITH RELIABLE INTERVIEWS";

      SUBGROUP HSSEX DMARETHN BMI DAGE PRG  HAY10 WTW EDU WTT WTW;
      LEVELS    2       3     4    3    2    2    3    3    3   3;
      REFLEVEL HSSEX=1 BMI=1 DAGE=1 DMARETHN=1 EDU=1 WTT=1 WTW=3;

      MODEL DIET=WTW BMI HSSEX WTT DAGE EDU DMARETHN;

/*SUDAAN OUTPUT STATEMENT*/
      SETENV LABWIDTH=22 COLSPCE=1 COLWIDTH=8 DECWIDTH=2 LINESIZE=78;
      PRINT

BETA ="BETA" SEBETA ="S.E.BETA" DEFT="DESGIN EFFECT"
T_BETA="T:BETA=0" P_BETA="P-VALUE"  OR = "ODDS RATIO"
LOWOR UPOR DF = "DF" SATADJDF="ADJ DF" WALDCHI= "CHI-SQ (WALD)"
SATADCHI= "CHI-SQ (SAT)" ADJWALDF="ADJ-WALD" WALDCHP= "P-VALUE (WALD)"
SATADCHP= "P-VALUE (SAT)" ADJWALDP="P-VALUE ADJ"
/T_BETAFMT=F8.2 DEFTFMT=F6.2 SEBETAFMT=F8.2
DFFMT=F7.0 WALDCHIFMT=F8.2 ORFMT=F8.2 LOWORFMT=F8.2
UPORFMT=F8.2;
      RTITLE "PREDICTING WEIGHT PERCEPTION";
      RTITLE "1988-1994, NHANES III";
```

```
        RFORMAT HSSEX HSSEX.;
        RFORMAT DMARETHN DMARETHN.;
        RFORMAT BMI BMI.;
        RFORMAT DAGE DAGE.;
        RFORMAT EDU EDU.;
        RFORMAT WTT WTT.;
        RFORMAT WTW WTW.;
        RFORMAT LANG LANG.;
        RFORMAT DIET DIET.;
RUN;
```

# APPENDIX L

## LOGISTIC REGRESSION

```
                              S U D A A N
                Software for the Statistical Analysis of Correlated Data
              Copyright      Research Triangle Institute      January 2003
                                    Release 8.0.2


Number of zero responses     : 10519
Number of non-zero responses :  5969

Independence parameters have converged in 8 iterations

Number of observations read       :  31311    Weighted count:251097002
Number of observations skipped    :   1888
(WEIGHT variable nonpositive)
Observations in subpopulation     :  16488    Weighted count:172775754
Observations used in the analysis :  16488    Weighted count:172775754
Denominator degrees of freedom    :     49

Maximum number of estimable parameters for the model is 15

File NHDATA.SUD1 contains   98 Clusters
  98 clusters were used to fit the model
Maximum cluster size is 260 records
Minimum cluster size is  64 records

Sample and Population Counts for Response Variable DIET
  0:  Sample Count    10519    Population Count 102537747
  1:  Sample Count     5969    Population Count  70238007

R-Square for dependent variable DIET (Cox & Snell, 1989): 0.281846

-2 * Normalized Log-Likelihood with Intercepts Only : 22277.58
-2 * Normalized Log-Likelihood Full Model           : 16818.87
Approximate Chi-Square (-2 * Log-L Ratio)           :  5458.71
Degrees of Freedom                                  :       14

Note: The approximate Chi-Square is not adjusted for clustering.
      Refer to hypothesis test table for adjusted test.
```

| Independent Variables and Effects | BETA | S.E.BETA | DESGIN EFFECT | T:BETA=0 | P-VALUE |
|---|---|---|---|---|---|
| Intercept | -5.33 | 0.48 | 2.40 | -11.21 | 0.00 |
| WTW | | | | | |
| WEIGH LESS | 2.53 | 0.37 | 3.04 | 6.93 | 0.00 |
| WEIGH SAME | 0.86 | 0.35 | 2.93 | 2.41 | 0.02 |
| WEIGH MORE | 0.00 | 0.00 | . | . | . |
| BMI | | | | | |
| UNDER WT | 0.00 | 0.00 | . | . | . |
| NORMAL WT | 1.40 | 0.44 | 2.34 | 3.16 | 0.00 |
| OVERWT | 1.65 | 0.47 | 2.52 | 3.52 | 0.00 |
| OBESE | 2.00 | 0.47 | 2.48 | 4.29 | 0.00 |
| Sex | | | | | |
| MALE | 0.00 | 0.00 | . | . | . |
| FEMALE | 0.69 | 0.05 | 1.60 | 13.42 | 0.00 |
| WTT | | | | | |
| FEEL UNDR | 0.00 | 0.00 | . | . | . |
| FEEL ABT RT | 0.46 | 0.31 | 2.00 | 1.48 | 0.15 |
| FEEL OVWT | 1.05 | 0.32 | 2.02 | 3.30 | 0.00 |
| DAGE | | | | | |
| AGE 20-39 YRS | 0.00 | 0.00 | . | . | . |
| AGE 40-59 YRS | -0.02 | 0.09 | 3.92 | -0.20 | 0.85 |
| AGE 60+ YRS | -0.32 | 0.07 | 1.87 | -4.41 | 0.00 |
| EDU | | | | | |
| LESS THAN HS | 0.00 | 0.00 | . | . | . |
| HS EDU | 0.18 | 0.07 | 1.88 | 2.53 | 0.01 |
| MORE THAN HS | 0.46 | 0.09 | 3.04 | 5.12 | 0.00 |
| Race-ethnicity | | | | | |
| NH WH/OTHR | 0.00 | 0.00 | . | . | . |
| NH BL | -0.08 | 0.06 | 0.85 | -1.36 | 0.18 |
| MEX-AMER | -0.17 | 0.07 | 0.53 | -2.52 | 0.01 |

| Contrast | DF | ADJ DF | CHI-SQ (WALD) | CHI-SQ (SAT) | ADJ-WALD | P-VALUE (WALD) | P-VALUE (SAT) | P-VALUE ADJ |
|---|---|---|---|---|---|---|---|---|
| OVERALL MODEL | 15 | 9.29 | 2801.85 | 987.85 | 133.42 | 0.00 | 0.00 | 0.00 |
| MODEL MINUS INTERCEPT | 14 | 9.39 | 2516.65 | 1133.41 | 132.07 | 0.00 | 0.00 | 0.00 |
| INTERCEPT | . | . | . | . | . | . | . | . |
| WTW | 2 | 1.96 | 309.46 | 277.60 | 151.57 | 0.00 | 0.00 | 0.00 |
| BMI | 3 | 2.69 | 56.86 | 59.52 | 18.18 | 0.00 | 0.00 | 0.00 |
| HSSEX | 1 | 1.00 | 180.17 | 180.17 | 180.17 | 0.00 | 0.00 | 0.00 |
| WTT | 2 | 1.99 | 53.13 | 55.82 | 26.02 | 0.00 | 0.00 | 0.00 |
| DAGE | 2 | 1.69 | 26.02 | 12.60 | 12.75 | 0.00 | 0.00 | 0.00 |
| EDU | 2 | 1.83 | 27.05 | 32.03 | 13.25 | 0.00 | 0.00 | 0.00 |
| DMARETHN | 2 | 1.90 | 7.64 | 6.24 | 3.74 | 0.02 | 0.04 | 0.03 |

| Independent Variables and Effects | ODDS RATIO | Lower 95% Limit OR | Upper 95% Limit OR |
|---|---|---|---|
| Intercept | 0.00 | 0.00 | 0.01 |
| WTW | | | |
| WEIGH LESS | 12.55 | 6.02 | 26.13 |
| WEIGH SAME | 2.35 | 1.15 | 4.79 |
| WEIGH MORE | 1.00 | 1.00 | 1.00 |
| BMI | | | |
| UNDER WT | 1.00 | 1.00 | 1.00 |
| NORMAL WT | 4.07 | 1.67 | 9.94 |
| OVERWT | 5.19 | 2.03 | 13.29 |
| OBESE | 7.37 | 2.89 | 18.78 |
| Sex | | | |
| MALE | 1.00 | 1.00 | 1.00 |
| FEMALE | 1.99 | 1.79 | 2.20 |
| WTT | | | |
| FEEL UNDR | 1.00 | 1.00 | 1.00 |
| FEEL ABT RT | 1.58 | 0.85 | 2.96 |
| FEEL OVWT | 2.86 | 1.51 | 5.41 |
| DAGE | | | |
| AGE 20-39 YRS | 1.00 | 1.00 | 1.00 |
| AGE 40-59 YRS | 0.98 | 0.83 | 1.17 |
| AGE 60+ YRS | 0.73 | 0.63 | 0.84 |
| EDU | | | |
| LESS THAN HS | 1.00 | 1.00 | 1.00 |
| HS EDU | 1.20 | 1.04 | 1.38 |
| MORE THAN HS | 1.59 | 1.32 | 1.90 |
| Race-ethnicity | | | |
| NH WH/OTHR | 1.00 | 1.00 | 1.00 |
| NH BL | 0.92 | 0.82 | 1.04 |
| MEX-AMER | 0.84 | 0.74 | 0.97 |

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National Center for Health Statistics. (1994) Anthropometric Reference Data, United States, 1988 – 1994. Table 12. Height in inches for females 20 years and over - number of examined persons, mean, standard error of the mean and selected percentiles by race-ethnicity and age: United States, 1988-1994

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# VITA

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