Obesity and Health Risk Factors for Employees at a Major University in Rural Appalachian Ohio

A thesis presented to

the faculty of

the College of Health and Human Services of Ohio University

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of the requirements for the degree

Master of Science

Melissa L. Teeters

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This thesis titled

Obesity and Health Risk Factors for Employees at a Major University in Rural Appalachian Ohio

by

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the School of Human and Consumer Sciences

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ABSTRACT

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Obesity and Health Risk Factors for Employees at a Major University in Rural Appalachian Ohio (133 pp.)

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Obesity is a major health concern in the United States. Work environment and job status probably contribute to obesity and its comorbidities. The purpose of this cross-sectional study was to determine whether there were significant differences among employees categorized by body mass index (underweight, healthy weight, overweight, and obese) or by job classification (administrative, classified staff, and faculty) as measured using the dependent variables: clinical measures and wellness scores. Ohio University is a large university located in Athens, Ohio the rural Appalachian region of the state. Employees participated on a voluntary basis in the study. Participants completed a health screening and a survey assessing the individual’s personal wellness profile. Data of 550 Ohio University employees were assessed. Results indicated that total cholesterol, high density lipoprotein and low density lipoprotein cholesterol, triglycerides, and personal wellness scores were considered statistically significant by job classification or body mass index. The results from this study will benefit Ohio University in its attempts to foster a culture of wellness.

Approved: _____________________________________________________________

Darlene E. Berryman

Associate Professor of Human and Consumer Sciences
ACKNOWLEDGMENTS

I sincerely thank my advisor Dr. Darlene Berryman for her support and encouragement throughout my research. I would also like to thank my committee members, Dr. David Holben and Dr. Grace Brannan, for their guidance throughout the past two years. Sincere gratefulness goes towards the professional staff at WellWorks for the use of the Health Risk Appraisal project.

To my family and friends, I want to thank you, for all of your words of encouragement and support over the past two years.
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CHAPTER 1: INTRODUCTION

Overview

Obesity is a global epidemic which has increased at an alarming rate in the United States (Flegal, Carroll, Ogden, & Johnson, 2002; Ogden et al., 2006). Studies from the National Health and Nutrition Examination Survey (NHANES) note that the prevalence of obesity in the U.S. has greatly increased over the past 20 years. An estimated 65% of U.S. adults are either overweight or obese. Overweight and obesity are defined as having a body mass index (BMI), calculated as weight of the body in kilograms divided by square of height in meters (kg/m²) ≥ 25.0 kg/m², and ≥ 30 kg/m², respectively (Centers for Disease Control and Prevention [CDC], 2009b; Flegal et al., 2002). Currently, according to the 2005-2006 NHANES, 34.3% of adults in the U.S. are obese (Ogden, Carroll, McDowell, & Flegal, 2007). Evidence has also suggested that waist circumference coupled with BMI may be a better predictor of health risk (Ardern, Katzmarzyk, Janssen, & Ross, 2003; Rexrode, et al., 1998). Specifically, health risks influenced by excess adiposity include coronary heart disease, type 2 diabetes mellitus, hypertension, and hypercholesterolemia (Herva, et al., 2006; Janssen, Katzmarzyk, & Ross, 2004; Tamashiro, et al., 2007).

Obesity is a complex and multi-factorial condition that can also affect an individual’s social and psychological wellbeing. Factors, including job classification, genetics, dietary intake, emotional wellbeing, physical activity, and personal health habits, are likely to contribute to the obesity incidence. These factors cannot be singled
out, but each clearly contributes to the susceptibility of excess adiposity along with other factors such as behavioral and environmental influences (Stein & Colditz, 2004).

In addition to the numerous factors that influence excess adiposity, the workplace may also be a contributing factor to the obesity epidemic. A study by Proper and Hildebrandt (in press), which consisted of Dutch workers from a continuous, cross-sectional survey from 2000 until 2005, indicated that individuals working in trade, industrial, or transportation as well as legislators and senior managers had the highest BMI (24.9 kg/m²) compared to individuals working in the scientific and artistic areas who had the lowest BMI (23.8 kg/m²). Fortunately, each workplace has a unique opportunity to reach large numbers of individuals for health promotion and disease prevention (Atlantis, Chow, Kirby, & Fiatarone Singh, 2006).

Studies have shown that worksite interventions, including physical activity and dietary modifications, can be cost effective and may have a positive effect on the overall health of employees (Pratt, et al., 2007). For example, a retrospective cohort study from Duke University and Duke University Health System employees revealed a linear relationship between BMI, number of lost work days, and medical claims costs, with workers’ compensation claims being twice the rate for the heaviest employees (BMI ≥ 40 kg/m²) than for those with recommended weight (BMI 18.5 to 24.9 kg/m²; Ostbye, Dement, & Krause, 2007). A work, weight, and wellness program conducted at 31 hotels on the island of Oahu, Hawaii investigated BMI in relation to job classification. Job classifications included clerk, food services, housekeeping, maintenance, and management. Overall, men in management had the highest BMI (28.16 kg/m²), and
women in maintenance had the highest BMI (27.26 kg/m²; Williams, et al., 2007). Wellness programs within a university setting might decrease health risks that are influenced by excess adiposity and might improve worker productivity. However, to evaluate the potential benefit of workplace wellness programs, it is imperative to consider all factors related to obesity and health outcomes including specific occupations.

Statement of the Problem

Ohio University in Athens, Ohio is a major university located in the southeastern portion of the state, within the Appalachian region of the U.S. A review of literature revealed no studies to date that have examined the relationship of clinical measures and personal wellness scores to BMI and job classification in this region. Studies have shown that universities and workplace environments create diversity and enable researchers to reach a large number of individuals (Atlantis et al., 2006). The purpose of this cross-sectional study was to determine whether there were significant differences among employees categorized by BMI or job classification (administrative, classified staff, and faculty) as measured using dependent variables regarding clinical status and personal wellness.

Research Questions

1. Are there significant differences among employees categorized by BMI or by job classification as measured using the dependent variables: clinical measures and wellness scores?
2. Are clinical measures and anthropometric measurements comparable to the national standards?

Significance of the Study

To the researcher’s knowledge, this is the first study within the rural Appalachian region to investigate clinical measures and wellness scores by BMI and job classification within a university setting. The importance of this research study was to determine whether there were significant differences among employees categorized by BMI or job classification as measured using dependent variables regarding clinical status and personal wellness. In the future, this study is likely to benefit researchers and WellWorks at Ohio University in terms of program development and to benefit OU employees by improving the overall culture of wellness at Ohio University. WellWorks, Ohio University’s wellness program, offers many services including, but not limited to, massage therapy, fitness center, nutrition counseling, and personal trainers, all to promote a culture of wellness for the community (WellWorks, College of Health and Human Services, Ohio University).

Delimitations

1. The questionnaire for the Health Risk Appraisal was predetermined by the WellWorks professional staff.

2. The ability to ask more specific questions, such as specific types of food consumed on a daily basis or type of physical activity, would have been more
informative to examine a cause and effect relationship between obesity and health risks.

Limitations

1. The socioeconomic status of the participants was not asked in the questionnaire.

2. Ohio University employees who volunteered for the assessment might be healthier than the general population.

3. The age of those who participated in the HRA initiative was limited to the working population.

4. An accurate representation of Ohio University employees might be skewed due to a dominant gender group who participated in the HRA initiative.

5. This study used a convenience sample of the OU employee population who agreed to participate.

Definitions of Terms

Administration. A full-time contract employee of OU who spends 50% or more of his/her time in administrative duties. Administrators may be of the following types: academic administrator, professional or technical, and administrative staff (S. Madden, personal communication, October 2, 2008; OU, Office of Institutional Research, n.d.).

Body fat ranges. The Tanita Corporation (2009) defined body fat ranges for standard adults based on the National Institutes of Health, and World Health
Organization BMI guidelines, and New York Obesity Research Center. Table 1 identifies body fat ranges for age and gender.

**Table 1**

<table>
<thead>
<tr>
<th>Age and Gender</th>
<th>Under fat (%)</th>
<th>Healthy (%)</th>
<th>Over fat (%)</th>
<th>Obese (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td>0-21</td>
<td>21.1–33.0</td>
<td>33.1-39</td>
<td>≥ 39.1</td>
</tr>
<tr>
<td>40-59</td>
<td>0-23.0</td>
<td>23.1-35.0</td>
<td>35.1-40.0</td>
<td>≥ 40.1</td>
</tr>
<tr>
<td>60-79</td>
<td>0-24.0</td>
<td>24.1-36.0</td>
<td>36.1-42.0</td>
<td>≥ 42.1</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td>0-8.0</td>
<td>8.1-19.0</td>
<td>19.1-25.0</td>
<td>≥ 25.1</td>
</tr>
<tr>
<td>40-59</td>
<td>0-11.1</td>
<td>11.1-22.0</td>
<td>22.1-28.0</td>
<td>≥ 28.1</td>
</tr>
<tr>
<td>60-79</td>
<td>0-13.0</td>
<td>13.1-25.0</td>
<td>25.1-30.0</td>
<td>≥ 30.1</td>
</tr>
</tbody>
</table>


*Body mass index.* A measure of body fat that is the ratio of the weight of the body in kilograms to the square of its height in meters (U.S. National Library of Medicine, 2003). BMI classifications based on the CDC: underweight (< 18.5 kg/m²), healthy weight (18.5 to 24.9 kg/m²), overweight (25.0 to 29.9 kg/m²), and obese (≥ 30 kg/m²; CDC, 2009b)

*Classified staff.* Hourly civil service employee of OU. Full and part time non bargaining unit or bargaining unit (S. Madden, personal communication, October 2, 2008; OU, Office of Institutional Research, n.d.).

*Coronary heart disease.* Reduces the blood flow through the coronary arteries to the heart muscle (U.S. National Library of Medicine, 2003).
Epidemic. Affecting or tending to affect a large number of individuals within a population, community, or region at the same time (U.S. National Library of Medicine, 2003).

Faculty. Refers to an employee who holds a faculty contract that can be one of the following types: Group I faculty considered nine month regular full- or part-time tenure track, and 11- or 12-month full time faculty and college of medicine faculty, residents and interns included. Group II faculty included term faculty. Group IV faculty included visiting faculty and Ohio Program of Intensive English instructors (S. Madden, personal communication, October 2, 2008; OU, Office of Institutional Research, n.d.).

Hypercholesterolemia. The presence of excess cholesterol in the blood (U.S. National Library of Medicine, 2003).

Hypertension. Abnormally high arterial blood pressure (U.S. National Library of Medicine, 2003). The Joint National Committee’s seventh report (JNC VII) classified blood pressure into the following categories: normal, pre-hypertension, stage I and stage II hypertension (Chobanian, et al., 2003).

Obesity. A condition that is characterized by excessive accumulation and storage of fat in the body (U.S. National Library of Medicine, 2003).

Type 2 diabetes mellitus. Characterized by hyperglycemia resulting from impaired insulin utilization coupled with the body’s inability to compensate with increased insulin production (U.S. National Library of Medicine, 2003).
CHAPTER 2: REVIEW OF LITERATURE

Overweight and Obesity in the U.S.

Overweight and obesity continue to be a health concern in the United States (Ogden et al., 2006). According to the CDC’s NHANES, the prevalence for overweight increased by 8% between the 1976 and 1991 surveys. During the time period between 1988 and 1991, approximately 33% of U.S. adults 20 years of age or older were estimated to be overweight (CDC, 2009c; Kuczmarski, Flegal, Campbell, & Johnson, 1994). The numbers continue to increase. Between 1980 and 2002, the obesity prevalence nearly doubled in adults aged 20 years or older. According to the 2003 and 2004 NHANES, 32.2% of adults aged 20 years or older were obese and 66.3% were overweight or obese, and the prevalence of extreme obesity among adults was 4.8% (CDC, 2009c; Ogden et al., 2006). Currently, according to the 2005-2006 NHANES, 34.3% of adults in the U.S. are obese (Ogden et al., 2007). The problem is not limited to the U.S. The World Health Organization (WHO) predicted that, by the year 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese (WHO, 2006).

The WHO has attributed overweight and obesity to two primary factors. First, there has been a global shift in diet towards increased intake of energy dense foods that are high in fat and sugar. Secondly, there has been a trend towards decreased physical activity due to the increase in the sedentary nature of work, transportation, and urbanization (WHO, 2006).
The increase in obesity rates has several consequences. Obesity is associated with an increased risk of a number of chronic conditions including diabetes mellitus, cardiovascular disease, and hypertension (Flegal et al., 2002). In addition, as overweight and obesity rates have increased, health care costs have also steadily increased. Overweight and obese individuals tend to have more hospitalizations, prescription drugs, and physician visits (Raebel et al., 2004).

Appalachia and Ohio

Ohio University in Athens, Ohio is located in the midst of the rural Appalachian Region. Overall, the Appalachian Region consists of 13 states, and a total of 420 counties (Appalachian Regional Commission [ARC], n.d.). Of Ohio’s 88 counties, the Appalachian Ohio region consists of 29 counties in the southeastern portion of the state. Appalachian counties compared with other counties in Ohio, have been characterized by low socioeconomic status, including lower household incomes, higher poverty rates, less education, and lower paying occupations (ARC, n.d.; Wewers, Katz, Fickle, & Paskett, 2006). Specifically, in 2006, Athens County, Ohio, was characterized as having a distressed economic status. “Distressed” is defined as an unemployment rate of 150% or more of U.S. average, 67% or less of the U.S. average income, and 150% or more of the U.S. average poverty rate (ARC, n.d.).

According to the CDC, heart disease accounted for 27% of deaths in Ohio in 2005. In 2007, 28% of adults in Ohio reported having hypertension, and 40% reported having high blood cholesterol, which puts these Ohio residents at a greater risk for the
development of heart disease. In 2007, 8% of adults in Ohio reported being diagnosed with diabetes. Also, in 2007 64% of adults in Ohio were overweight or obese (CDC, 2008b). Others in the Appalachian region are affected by health risks associated with excess adiposity.

Body Mass Index

To help prevent the continuation of the obesity epidemic and associated high health care costs, the United States Preventive Services Task Force (USPSTF) recommended routine assessment of BMI and engagement of overweight or obese patients in weight management programs (USPSTF, 2003). BMI is a simple index of weight to height that is commonly used to classify underweight, healthy weight, overweight, and obesity in adults, and is defined as the weight in kilograms divided by the square of the height in meters (kilograms/meters\(^2\); CDC, 2008c). Individuals with BMI classifications within the overweight and obese categories have increased likelihood of certain diseases and other health problems (CDC, 2009b).

While BMI is a simple way to categorize individuals, using BMI solely can be a problem. For example, BMI values are age- and gender-independent, i.e., according to the CDC, BMI classifications are based solely on height and weight (kg/m\(^2\)) of an individual regardless of age or sex (CDC, 2008c). Therefore, BMI may not directly correspond to the same degree of fatness in different populations due to different body proportions. For example, individuals who are athletes may have a BMI that is considered overweight or obese even though they do not have excess body fat (WHO,
2008; CDC, 2009b). Also, as noted in Table 2, the BMI classifications and cutoffs for overweight and obesity are inconsistent among organizations.

Table 2

**Body Mass Index Classifications and Cutoffs**

<table>
<thead>
<tr>
<th>Organization</th>
<th>BMI</th>
<th>BMI cutoffs (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHLBI, 1998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>≤ 18.5</td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>18.5 to 24.9</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 to 29.9</td>
<td></td>
</tr>
<tr>
<td>Obesity (class 1)</td>
<td>30.0 to 34.9</td>
<td></td>
</tr>
<tr>
<td>Obesity (class 2)</td>
<td>35.0 to 39.9</td>
<td></td>
</tr>
<tr>
<td>Extreme obesity (class 3)</td>
<td>≥ 40</td>
<td></td>
</tr>
<tr>
<td>WHO, 2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe thinness</td>
<td>≤ 15.9</td>
<td></td>
</tr>
<tr>
<td>Moderate thinness</td>
<td>16.0 to 16.9</td>
<td></td>
</tr>
<tr>
<td>Mild thinness</td>
<td>17.0 to 18.49</td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>&lt; 18.5</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>18.5 to 24.9</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>≥ 25.0</td>
<td></td>
</tr>
<tr>
<td>Pre-obese</td>
<td>25.0 to 29.9</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>≥ 30.0</td>
<td></td>
</tr>
<tr>
<td>Obese class I</td>
<td>30.1 to 34.9</td>
<td></td>
</tr>
<tr>
<td>Obese class II</td>
<td>35.0 to 39.9</td>
<td></td>
</tr>
<tr>
<td>Obese class III</td>
<td>≥ 40.0</td>
<td></td>
</tr>
<tr>
<td>CDC, 2009b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>≤ 18.5</td>
<td></td>
</tr>
<tr>
<td>Healthy weight</td>
<td>18.5 to 24.9</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 to 29.9</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>≥ 30.0</td>
<td></td>
</tr>
</tbody>
</table>

Body Mass Index and Waist Circumference

Obesity, and in particular abdominal obesity, plays a major role in the pathogenesis of several metabolic and cardiovascular medical problems including type 2 diabetes mellitus, hypertension, and coronary artery disease (Calle, Thun, Petrelli, Rodriguez, & Heath, 1999). For this reason, evidence has also suggested that waist circumference coupled with BMI is a better predictor of health risks than BMI alone (Ardern et al., 2003; Janssen, Katzmarzyk, & Ross, 2002; Rexrode, et al., 1998; Zhu et al., 2002). Therefore, measuring waist circumference as part of routine screening for health risks may be a better indicator of disease related factors of overweight and obesity.

Several studies have shown that BMI alone may not be the most appropriate measurement for assessing health risk related to obesity; these studies suggest waist circumference may be a better indicator of health risks. Table 3 lists several studies that have indicated waist circumference measurements are more appropriate markers of health risk than BMI alone.
Table 3

*Waist Circumference and Body Mass Index*

<table>
<thead>
<tr>
<th>Study results</th>
<th>Researchers</th>
</tr>
</thead>
<tbody>
<tr>
<td>This study included 14,924 adult participants from the third National Health and Nutrition Examination Survey. The results indicated that BMI coupled with waist circumference does not predict an increase in obesity related health risk better than does waist circumference alone, indicating that waist circumference, and not BMI, explains obesity related health risk.</td>
<td>Janssen et al., 2004</td>
</tr>
<tr>
<td>A total of 44,702 women aged 40 to 65 years participated from the Nurses’s Health Study. Measures of excess abdominal adiposity have been associated with coronary heart disease in middle-aged women; even after controlling for BMI, the researchers noted that waist circumference was independently associated with coronary heart disease.</td>
<td>Rexrode, et al., 1998</td>
</tr>
<tr>
<td>This study included a large cohort of Swedish women from the Women’s Lifestyle and Health Cohort Study that included 49,259 women aged 30 to 50 years. The results of this study indicated that markers of central obesity, measured by waist circumference were more strongly associated with health risk than BMI.</td>
<td>Yang, Kuper, &amp; Weiderpass, 2008</td>
</tr>
</tbody>
</table>

The *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report* defined high risk waist circumference for both men and women (National Heart, Lung, and Blood Institute [NHLBI], 1998). Table 4 lists the high risk waist circumferences for men and women.
Table 4

*High Risk Waist Circumference*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Waist circumference</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>&gt; 40.0 inches</td>
<td>NHLBI, 1998</td>
</tr>
<tr>
<td>Women</td>
<td>&gt; 35.0 inches</td>
<td></td>
</tr>
</tbody>
</table>


Factors that Influence Overweight and Obesity

Obesity is a complex condition that can affect an individual’s social and psychological wellbeing. Susceptibility to weight-related problems are influenced by numerous factors including job classifications, genetics, dietary intake, emotional wellbeing, physical activity, and personal health habits. Although detailing all factors involved are beyond the scope of this literature review, an attempt will be made to provide a richer understanding of how specific factors relate to overweight and obesity.

*Job Classification*

Studies have shown that overweight and obesity can have occupational consequences according to job classification. Specifically, a study by Proper and Hildebrandt (in press) that consisted of Dutch workers from a continuous, cross-sectional survey from 2000 until 2005 indicated that individuals working in trade, industrial, or transportation as well as legislators and senior managers had the highest BMI (24.9 kg/m²) compared to individuals working in the scientific and artistic areas who had the lowest BMI (23.8 kg/m²). The relationship of morbidity with occupation position was indicated in a study by Volkers, Westert, and Schellevis (2007) that included 136,189 working adults in the Netherlands. Individuals in the lowest occupational positions were
more likely to experience depression, diabetes, ischemic heart disease, osteoarthritis, dermatitis, muscle pain, neck and back pain, and tension headaches than individuals within the highest occupational positions. Therefore, it is imperative to target at-risk occupations, and to implement disease prevention programs to improve overall health of employees.

While specific job classifications might have an effect on health risks influenced by overweight and obesity, it is imperative to take gender into consideration. Specifically, a cross-sectional, population-based study among working Australians assessed BMI and working conditions in both genders. Within the male gender, blue collar workers had the highest mean BMI (26.3 kg/m²) followed by upper white collar (26.1 kg/m²), and middle blue collar (25.7 kg/m²). Within the female group, upper white collar workers had the highest mean BMI (24.9 kg/m²), followed by middle white collar (24.4 kg/m²), and blue collar (23.6 kg/m²). Both males and females who worked > 49 hours per week had the highest mean BMI values (Ostry, Radi, Louie, & LaMontagne, 2006). McLaren and Godley (2009) analyzed data from 49,252 adults from Cycle 2.1 of the Canadian Community Health Survey conducted in 2003, and found that women within the highest income category had lower BMI (approximately 24.3 kg/m²) than those in the lowest income category with a BMI > 25.0 kg/m². The opposite pattern was found for men; those within the top income categories had the highest BMI > 26.5 kg/m², while men in the lowest income category had the lowest BMI (< 26.5 kg/m²; McLaren & Godley, 2009). A study by Galobardes, Morabia, and Bernstein (2000) included 3,035 men and women in Geneva, Switzerland. The study showed that men with low
occupations, including manual labor, and low education (classified as up to 8 years of schooling) had a higher BMI (> 27 kg/m²) than those with a high or medium occupation and high education (BMI < 25.0 kg/m²). In women, both low education and low occupation correlated with a higher BMI (> 26 kg/m²), compared to high occupation and high education (BMI < 23 kg/m²).

Even though certain occupations can negatively impact health, it is also important to consider how negative health implications affect productivity and health care costs. Ricci and Chee (2005) investigated how weight status was associated with health-related lost productive time from a sample of 6,894 respondents. Ricci and Chee found that obese workers (BMI ≥ 30 kg/m²) had significantly higher (> 0 hours) health-related lost productive time (42.3%) than either normal weight (36.4%) or overweight (34.7%) workers. Because obesity affects worker productivity, obesity can be costly to employers. Finkelstein, Fiebelkorn, and Wang (2005) used the data sets from the National Health Interview Survey and the Medical Expenditure Panel Survey to investigate the costs of obesity. The annual costs of medical expenditures and absenteeism ranged from $175 to $2,027 for men with a BMI ≥ 25 kg/m²; costs gradually increased as BMI increased. The annual costs for women ranged from $588 to $2,164; costs gradually increased as BMI increased beyond 25.0 kg/m². To decrease the number of lost productive hours and medical expenditures, these data suggest that it is imperative to implement worksite wellness programs to target specific job classifications in attempt to improve worker productivity and to decrease costs associated with less than optimal health and wellbeing.
Genetics

To what degree does the genetic profile determine the risk of overweight and obesity? There is a need for a multi-dimensional approach to address the epidemic of obesity, and it is clear that numerous environmental factors influence obesity, such as age, diet, and physical activity. Genes also influence obesity. Americans have significant variability in obesity susceptibility genes, which makes some Americans more or less prone to overweight and obesity despite living in the same environment (Bellisari, 2008).

Collectively, there is overwhelming evidence that genetics influences adiposity and obesity. Twin studies have demonstrated a strong genetic link to the development of obesity (Bellisari, 2008; Malis, et al., 2005). Understanding how genes influence susceptibility to obesity is a field of intensive research. In some cases, single genes have been shown to increase obesity. A genome-wide search has identified a fat mass and obesity gene that has an effect on BMI and weight status. The study by Frayling, et al. (2007) has shown that 16% of adults who are homozygous for the fat mass and obesity gene weighed approximately 3 kilograms more and had 1.67-fold increase odds of obesity than those who did not express the fat mass and obesity gene. A lack of the hormone known as leptin has been shown to result in obesity as a result of a combination of increased food intake and inactivity (Zhang et al., 1994). A study by Farooqi, et al. (2002) showed that obese children congenitally deficient in leptin who were injected with recombinant human leptin for up to 4 years had beneficial effects on appetite and
decreased fat mass. So, single gene defects are capable of producing modest or dramatic increases in BMI and weight status.

While single genes can cause obesity, in most cases multiple genes simultaneously play a vital role in obesity risk making the genetic contribution to obesity risk difficult to discern. In the future, genetic profiling may be important to specify a particular diet or physical activity therapy to help prevent the risk of obesity and related health conditions. Increased knowledge of the interaction between genes and the environment may lead to improved behavioral interactions including specific activity and diet therapy for the prevention of obesity (Farooqi & O’Rahilly, 2007). Genetic factors are not the only reason for the increase in adiposity, but they clearly contribute to the susceptibility of weight-related health risk along with other factors such as behavioral and environmental influences (Stein & Colditz, 2004).

Diet

Dietary intake, including food choices and amount of food consumed impacts the weight status of an individual. The importance of specific diets in the prevention and treatment of overweight and obesity has been extensively studied (Van Dam & Seidell, 2007). Individuals who live in Westernized countries typically live in a palatable food environment with readily available, abundant access to sweet, salty or fatty foods. This palatable food environment results in the consumption of unhealthy food choices and, as a result, may lead to an increased risk for overweight and obesity (Engbers, van Poppel, Paw, & van Mechelen, 2006; Macht, Gerer, & Ellgring, 2003). A previous study showed that obese individuals were likely to consume more snacks that were palatable than those
individuals of normal body weight (Berteus Forslund, Torgerson, Sjostrom, & Lindroos, 2005). Therefore, routine dietary intervention is vital to promote healthy food choices and portion management; these interventions will hopefully decrease the incidence of obesity and health related risk factors.

Where food is consumed and prepared might also influence risk of obesity. “Home” and “away” foods are defined on the basis of where foods were prepared, not where they were eaten. Home food is defined as food purchased at a retail store, and away food includes all foods prepared at restaurants or other food service establishments (Guthrie, Lin, & Frazao, 2002). Americans are seeking quick and convenient food choices that are relatively inexpensive (Bowman & Vinyard, 2004). The current trend of larger portions and consumption of away food may be due to more Americans being in the workforce; this, in turn, leaves less time for food preparation in the home. Regardless of the cause, the trend to eat away food is increasing; approximately one third of daily calories are consumed away from home (Guthrie et al., 2002). This trend has been proposed to increase adiposity due to higher fat content and larger portions.

Specifically, two studies have analyzed data from the Continuing Survey of Food Intakes by Individuals (CSFII) in regards to specific nutrients among U.S. adults who consume away from home foods. First, a study by Bowman and Vinyard (2004) analyzed data from the United States Department of Agriculture (USDA) 1994 to 1996 CSFII. This study revealed that both males and females who reported eating fast food had higher intakes of energy, total fat, saturated fat, carbohydrates, added sugars, and protein than those who did not eat fast food. Individuals who consumed fast food had
lower intakes of specific nutrients such as vitamin A, carotenes, vitamin C, calcium, and magnesium. A similar study reported that adults who consumed fast food had significantly higher intakes of total energy, fat, cholesterol, sodium, and calcium than their counterparts who did not consume fast food. Furthermore, the intake of carbohydrates, protein, dietary fiber, vitamin A, vitamin C and beta carotene was lower in the adults who reported eating fast food (Paeratakul, Ferdinand, Champagne, Ryan, & Bray, 2003).

Studies have indicated that whole grains may play a role in body weight regulation due to the effects that whole grains have on hormonal factors and satiety. Whole grains not only have a positive effect on weight status, but their consumption also show a decreased risk of developing certain diseases such as colon cancer, heart disease, diabetes, and obesity (Flight & Clifton, 2006; Koh-Banerjee & Rimm, 2003). A recent study noted that individuals with a diet rich in whole grains were more likely to have lower BMI, weight, and smaller waist circumference (Newby et al., 2007), because diets rich in whole grains are generally low in saturated fat (Liu et al., 2003). Consistent with previous studies, individuals who had greater intakes of whole grains tended to gain less weight than individuals with greater intakes of refined grains (Lui et al., 2003).

The 2005 Dietary Guidelines for Americans has recommended that persons consume three or more ounce equivalents of whole grain products per day; therefore, at least half of the grain intake should come from whole grains (USDA, 2005). According to data from the USDA’s CSFII conducted in 1994 to 1996 and 1998, Americans actually consumed 6.7 ounces of total grains per day; only 34% of this total grain intake was from
whole grains as recommended by the 2005 Dietary Guidelines for Americans (Lin & Yen, 2007). Unfortunately, surveys of food intake by the CSFII have not been repeated since 1998. Adequate whole grain consumption should be emphasized as part of a healthy lifestyle to help lessen the risk for factors influencing obesity and related-health risk. It is important to reinforce the importance of the 2005 Dietary Guidelines for Americans, which provides science-based advice to promote health and to reduce risk for major chronic diseases through diet and physical activity (USDA, 2005).

Meal patterns may also be important for weight control. For example, regular breakfast consumption has been associated with weight control. Major advantages of eating breakfast have been shown, a greater reduction in total calories and fat throughout the day due to a reduction in unplanned and impulsive snacking during the day (Schlundt, Hill, Sbrocco, Pope-Cordle, & Sharp, 1992). Similarly, women who consumed breakfast were significantly less likely to have a BMI greater than or equal to 25 kg/m² (Song, Chun, Obayashi, Cho, & Chung, 2005). A routine breakfast program should be low in fat and high in complex carbohydrates, thereby promoting a healthy weight (Schlundt et al., 1992).

Physical Activity

Physical activity is a contributing factor to the increased risk for overweight and the development of obesity along with its related health conditions such as diabetes, cardiovascular disease, cancer, and depression (Fox & Hillsdon, 2007). The CDC provides statistics for U.S. physical activity among adults; currently, more than half of the American adults are not meeting CDC physical activity recommendations (CDC,
According to the CDC, recommended physical activity is defined as moderate intensity activity that causes small increases in heart rate or breathing for at least 30 minutes per day, at least five days per week, or vigorous intensity that causes large increases in heart rate or breathing for at least 20 minutes per day, at least three days per week. The CDC defines inactivity as less than 10 minutes total per week of moderate or vigorous intensity activity (CDC, 2008a). In attempt to decrease chronic health conditions, it is imperative to engage in routine physical activity as part of a healthy lifestyle.

Sedentary behaviors may also result in obesity and related health risks by altering dietary intake. A study by Jago et al. (2005) revealed a significant difference in the percentage of energy consumed from fat by activity level. The physically inactive group consumed a larger proportion of energy from fat than the groups characterized as moderately and very active. The physically inactive group consumed fried food more than the moderately to very active groups. Similar results were noted in a study by Gillman et al. (2001) that examined the relationship between physical activity and dietary behaviors. Individuals with sedentary behavior had a higher intake of saturated fat, trans fat, and cholesterol than more active individuals. Sedentary individuals also had lower intakes of fruit, vegetables, dietary fiber, calcium, folate, and vitamins A, C, and E than more active individuals. The reviewed studies lead to the conclusion that sedentary individuals may be more prone to obesity than physically active counterparts due to increased total energy and fat intake.
Emotional Wellbeing

Stress can be attributed to either internal or external factors, which in turn may have a negative impact on health status. The Webster’s college dictionary defines stress as “a specific response by the body to a stimulus, as fear or pain that disturbs or interferes with the normal physiological equilibrium” (Costello et al., 1992). Thus, the body’s stress response may lead to factors that influence obesity and related health risk, yet not all individuals are susceptible to obesity when experiencing stress.

The relationship between stress and weight status are complex. Stress involves two pathways known as internal and external stress factors, both considered to play a vital role in weight management. Internal stress factors are mainly known as physiologic mechanisms that regulate certain factors such as appetite (Ozier et al., 2007). External stress factors are influenced by environmental factors including the availability of food, monetary sources to purchase food, and social or occupational context (Torres & Nowson, 2007).

One way in which stress appears to influence obesity is by altering dietary intake. Stress appears to cause a loss of control in food choices that individuals usually exert to prevent themselves from eating what they perceive as fattening, unhealthy foods. A study by Zellner, et al. (2006) reported that the majority of people who eat when stressed tend to consume foods that they normally avoid. These foods choices are typically high calorie foods, mostly sweets and snack-type foods. According to Laitinen, Ek, and Sovio (2002) the consumption of these high calorie foods may be considered a quick source of energy and nutrients, which in turn serve as a way to cope or to comfort oneself in
stressful times. Further, a study by Oliver, Wardle, and Gibson (2000) reported that individuals under stress selected less healthy foods, supporting the idea that stress may have a negative impact on health due to unhealthy food choices.

Studies have shown that job stress is a major health concern, not only in regard to unhealthy eating behaviors, but also linked to co-morbid conditions such as cardiovascular disease (Nishitani & Sakakibara, 2006). Furthermore, stress in the workplace may contribute to the obesity epidemic (Ozier et al., 2007). According to an interview and focus group investigation by Devine, Nelson, Chin, Dozier, and Fernandez (2007), the participants indicated that brownies and other convenience food types were eaten as stress relievers, or lunches were skipped due to a heavy workload.

Stress affects eating in a bidirectional way. That is, approximately 30% of individuals decrease food intake and lose weight during or after stress, while most individuals increase food intake during stress, resulting in weight gain (Adam & Epel, 2007; Herva, et al., 2006). A study by Zellner, et al. (2006) reported gender differences in eating behaviors when experiencing stress. Forty-six percent of the women, and only 17% of the men in the study reported overeating when stressed, compared to 37% of women and 54% of men who reported undereating when stressed.

Sleep

The duration of sleep may have an effect on the weight status of an individual. Studies have indicated that habitual sleep duration below 7.7 hours per night was associated with increased BMI or obesity (Sekine, et al., 2002; Taheri, Lin, Austin, Young, & Mignot, 2004). An investigation by Kohatsu, et al. (2006) found that
individuals with short sleep duration (less than 6 hours per night) had an average BMI of 30 kg/m²; as sleep duration increased, BMI decreased. Bjorvatn, et al. (2007) indicated less than 6.99 hours of sleep was associated with higher BMI; however, ≥ 9 hours of sleep each night was also associated with an increased BMI. Furthermore, between 6.99 and 9 hours of sleep might be associated with a decreased BMI.

Sleep duration less than 8 hours per night could be due to obstructive sleep apnea. According to the NHLBI, obstructive sleep apnea is a disease characterized by partial or complete narrowing of the pharyngeal airway during sleep, resulting in repeated episodes of airflow cessation, oxygen desaturation, and sleep interruption (NHLBI, 1998). In fact, a review by Schwartz et al. (2008) indicated that obesity has been consistently demonstrated as one of the greatest sleep apnea risk factors. Studies have shown that there may be a link between obstructive sleep apnea and insulin resistance, an important factor for the development of type 2 diabetes mellitus (Lois, Young, & Kumar, 2008; Tasali & Ip, 2008).

Hormones also play a role in the duration of sleep. Hormones such as leptin and ghrelin are altered as a result of short sleep duration. Taheri et al. (2004) suggested that reduced leptin and elevated ghrelin increase appetite, which might, in turn, increase BMI. Shorter sleep duration may also have an effect on various metabolic indices, according to Bjorvatn, et al. (2007). They reported that total cholesterol, triglycerides, and blood pressure were elevated with less than 6.99 hours of sleep (Bjorvatn, et al., 2007). Failing to achieve adequate sleep duration each night might contribute to increased health risks.
Excess Adiposity and Chronic Disease

According to *The Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*, waist circumference and BMI are interrelated, but waist circumference is an independent predictor of risk over and above that of BMI. Waist circumference measurements are particularly useful in individuals who are categorized as normal or overweight on the BMI scale. However, waist circumference has little added predictive power of disease risk with a BMI greater than or equal to 35 kg/m²; therefore, it is not necessary to measure waist circumference (NHLBI, 1998). Several studies have shown a relationship between BMI, waist and hip circumference, and related-health risks. Table 5 lists the studies that have shown a correlation between health risk factors and weight status indicators.
Table 5

*Relationships among Body Mass Index, Waist and Hip Circumference and Health Risk*

<table>
<thead>
<tr>
<th>Study</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Hoorn Study</td>
<td>Larger waist circumference was associated with a higher risk of diabetes mellitus; however, a larger hip circumference was associated with a lower risk of diabetes mellitus (Snijder, et al., 2003).</td>
</tr>
<tr>
<td>Nurses’s Health Study</td>
<td>Abdominal and overall obesity were associated with a high mortality rate; however, normal weight women with abdominal obesity were associated with a higher risk for cardiovascular disease (Zhang, Rexrode, Van Dam, Li, &amp; Hu, 2008).</td>
</tr>
<tr>
<td>NHANES</td>
<td>Waist circumference of 90 centimeters for men and of 83 centimeters for women indicated an equivalent health risk as a BMI of 25, and a waist circumference of 100 centimeters for men and 93 centimeters for women indicated an equivalent health risk as a BMI of 30 kg/m² (Zhu et al., 2002).</td>
</tr>
</tbody>
</table>

Many chronic diseases are associated with an excess of adiposity. Being either overweight or obese and sedentary are associated with increased risk for major chronic diseases, and possibly even death (Wewers et al., 2006); therefore, it is typically thought that excess adiposity precedes diabetes, high blood pressure, high cholesterol, and coronary heart disease.

*Coronary heart disease.* Obesity has been shown to promote the development and progression of coronary heart disease. As a result, excess adiposity may also include insulin resistance and lipid abnormalities, which are strong predictors of coronary heart disease (Ades, et al., 2008). Unfortunately, several studies have shown that an increase
in adiposity has been associated with an increased risk of death and recurrent cardiovascular risk after a myocardial infarction, despite pharmacologic therapies (Rana, Mukamal, Morgan, Muller, & Mittleman, 2004; Rea, et al., 2001; Wolk, Berger, Lennon, Brilakis, & Somers, 2003).

Diabetes mellitus. Obesity is a major risk factor for diabetes mellitus, especially type 2 diabetes mellitus. The incidence of new onset type 2 diabetes mellitus is associated with both overweight and obesity (Wilson, D’Agostino, Sullivan, Parise, & Kannel, 2002). Obesity has been identified as a major risk factor for the insulin resistance and hyperglycemia associated with diabetes. Obesity-induced diabetes is emerging as a global healthcare problem threatening to reach pandemic levels by 2030. The incidence is projected to more than double in a period of only 30 years from 171 million in the year 2000 to 366 million in 2030 (Wild, Roglic, Green, Sicree, & King, 2004).

Several review articles have reported that obesity-associated type 2 diabetes mellitus is evidenced by increased glucose levels in the blood, which result from elevated glucose production in the liver and decreased glucose uptake by muscle. Insulin is the principal hormone of glucose homeostasis; it stimulates glucose influx into muscle, glycogen synthesis in the liver and muscle, and fat deposition in adipocytes (Martyn, Kaneki, & Yasuhara, 2008; Saltiel & Kahn, 2001; Wellen & Hotamisligil, 2005). Several in vivo and in vitro studies have indicated that obesity, especially visceral obesity, impairs insulin sensitivity resulting in type 2 diabetes mellitus (Alberti & Zimmet, 1998).
Maintaining glycemic control within normal range is imperative for management of diabetes. The goal for hemoglobin A1c in nonpregnant adults, in general, is less than 7% (American Diabetes Association [ADA], 2008). According to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), prediabetes or impaired fasting glucose is defined as 100 to 125 mg/dL, and 126 mg/dL or above is considered diabetes (NIDDK, 2008).

*High blood pressure.* Overweight and obesity are both risk factors for high blood pressure and for the development of hypertension (Chobanian, et al., 2003; Narkiewicz, 2006). Smoking and alcohol intake have also been identified as risk factors for the development of high blood pressure (Chobanian, et al., 2003). A review by Harsha and Bray (2008) indicated that since the early 1920’s there has been a positive relationship between overweight or obesity and both blood pressure and risk for hypertension.

Several studies have shown a relationship between weight status and risk of developing hypertension. The Framingham study has shown that a BMI of 25 kg/m² or greater accounted for approximately 34% of hypertension in men and 62% of hypertension in women (Wilson et al., 2002). Studies have also shown a relationship between a higher BMI and increased risk for the development of high blood pressure in both genders (Gelber, Gaziano, Manson, Buring, & Sesso, 2007; Shuger, Sui, Church, Meriwether, & Blair, 2008). Obese women enrolled in the prospective Nurses’ Health Study were also found to have a greater prevalence of hypertension, compared to non-obese individuals (Manson, et al., 1995). NHANES III data indicated that the risk of developing
Hypertension is strongly linked to both waist circumference and waist to hip ratio (Narkiewicz, 2006).

Hypertension, a global health concern, which is defined as systolic blood pressure (SBP) in excess of 140 millimeters of mercury (mmHg) or a diastolic blood pressure (DBP) higher than 90 mmHg. Table 6 identifies Joint National Committee’s seventh report (JNC VII) classification of blood pressure for adults (Chobanian, et al., 2003).

Table 6

*Classification of Blood Pressure for Adults*

<table>
<thead>
<tr>
<th>Classification</th>
<th>SBP (mmHg)</th>
<th>DBP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 120</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Pre-hypertension</td>
<td>120 to 139</td>
<td>or 80 to 89</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140 to 159</td>
<td>or 90 to 99</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>≥ 160</td>
<td>or ≥ 100</td>
</tr>
</tbody>
</table>

*Note.* SBP: systolic blood pressure; DBP: diastolic blood pressure (Chobanian, et al., 2003).

*High blood cholesterol.* Hypercholesterolemia is known as the presence of high levels of cholesterol in the blood. Although not considered a disease, it is a metabolic condition that can be secondary to many diseases, especially cardiovascular disease (Panagiotakos, et al., 2008). Obesity, in its various manifestations, is associated with elevated cholesterol, increased triglycerides, and decreased high density lipoprotein (HDL) levels, which often precipitates to an increased risk for cardiovascular complications (Bays, Chapman, Grandy, & SHIELD Investigators’ Group, 2007;
Panagiotakos, et al., 2008). The most common cause of elevated serum cholesterol is the consumption of foods from animal origin which are typically high in saturated fats and cholesterol (NHLBI, 2002). The classification of total cholesterol, HDL, low density lipoprotein (LDL), and triglycerides are noted in Table 7 (NHLBI, 2002).

Table 7

*Adult Treatment Panel III Cholesterol Classification*

<table>
<thead>
<tr>
<th>Category</th>
<th>Classification</th>
<th>Range (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol</td>
<td>Desirable</td>
<td>&lt; 200</td>
</tr>
<tr>
<td></td>
<td>Borderline high</td>
<td>200 to 239</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>≥ 240</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>Low</td>
<td>&lt; 40</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>≥ 60</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>Optimal</td>
<td>&lt; 100</td>
</tr>
<tr>
<td></td>
<td>Near optimal</td>
<td>100 to 129</td>
</tr>
<tr>
<td></td>
<td>Borderline high</td>
<td>130 to 159</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>160 to 189</td>
</tr>
<tr>
<td></td>
<td>Very high</td>
<td>≥ 190</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>Normal</td>
<td>&lt; 150</td>
</tr>
<tr>
<td></td>
<td>Borderline high</td>
<td>150 to 199</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>200 to 499</td>
</tr>
<tr>
<td></td>
<td>Very high</td>
<td>≥ 500</td>
</tr>
</tbody>
</table>

*Note.* HDL: high density lipoprotein; LDL: low density lipoprotein (NHLBI, 2002).

Metabolic Syndrome

Overweight and obese individuals may also be at an increased risk for metabolic syndrome. However, despite an unclear definition of metabolic syndrome, the root of the condition stems from a cluster of metabolic disturbances. According to the new
International Diabetes Federation in 2006 metabolic syndrome was defined as having central obesity determined by waist circumference, plus any two of the following four factors: triglycerides $\geq 150$ mg/dL, HDL cholesterol $< 40$ mg/dL (males) and $< 50$ mg/dL (females), systolic blood pressure $\geq 130$ mmHg or diastolic blood pressure $\geq 85$ mmHg, or raised fasting plasma glucose ($\geq 100$ mg/dL; Alberti, Zimmet, & Shaw, 2006). The Adult Treatment Panel III (ATP III) within the National Cholesterol Education Program (NCEP) and the American Heart Association (AHA) identified metabolic syndrome as the presence of three or more of the following components: abdominal obesity determined by waist circumference, triglycerides $\geq 150$ mg/dL, HDL cholesterol $< 40$ mg/dL (men) and $< 50$ mg/dL (women), blood pressure $\geq 130/85$ mmHg, or fasting glucose $\geq 110$ mg/dL (AHA, 2009; NHLBI, 2002). The prevalence of metabolic syndrome is increased in the obese population, and it is estimated that metabolic syndrome affects nearly 20% to 25% of the world’s population (Grundy, 2006).

Body Composition

There are many body composition methods; however, several factors should be taken into consideration when choosing a particular method. Table 8 describes the advantages and disadvantages of several body composition methods.
Table 8

*Body Composition Methods: Advantages and Disadvantages*

<table>
<thead>
<tr>
<th>Body composition</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Energy X-Ray</td>
<td>• Simultaneously measures fat mass, lean mass, and bone</td>
<td>• Exposes a person to low amounts of radiation</td>
</tr>
<tr>
<td>Absorptiometry</td>
<td>• Known to be an accurate method</td>
<td>• Requires a trained / licensed technician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expensive</td>
</tr>
<tr>
<td>Bioelectrical Impedance</td>
<td>• Quick</td>
<td>• Results can be affected by hydration level, food intake, and skin temperature</td>
</tr>
<tr>
<td></td>
<td>• Easy to operate</td>
<td>• Not appropriate for individuals with medical implants including pacemakers and defibrillators</td>
</tr>
<tr>
<td></td>
<td>• Portable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inexpensive</td>
<td></td>
</tr>
<tr>
<td>Skinfold Calipers</td>
<td>• Inexpensive</td>
<td>• Error factor of ± 4% to 8% fat due to subcutaneous fat is being measured.</td>
</tr>
<tr>
<td></td>
<td>• Portable</td>
<td>• Reliability dependent on type of calipers and skill level of technician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Testing may be time consuming due to multiple sites need to be tested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• May not be the best test for individuals who are visible over-fat due to difficulty of pinching the proper amount of skin.</td>
</tr>
<tr>
<td>Hydrostatic weighing</td>
<td>• Determines body fat from body density</td>
<td>• Test time is lengthy</td>
</tr>
<tr>
<td></td>
<td>• Accurate method</td>
<td>• Requires a highly skilled technician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maintenance issues to maintain constant water temperature and clean water</td>
</tr>
<tr>
<td>Bod Pod</td>
<td>• Similar to hydrostatic weighing, but uses air displacement</td>
<td>• Expensive</td>
</tr>
</tbody>
</table>
Overweight and Obesity in the Workplace

Work settings may also contribute to factors that influence excess adiposity. Fortunately, worksites have the capability to reach large numbers of individuals for health promotion and disease prevention, given that most of the adult population are employed. One worksite intervention program found that combined exercise programs plus dietary education can improve anthropometric measurements, such as decreased waist circumference (Atlantis et al., 2006). Studies have also shown that worksite interventions, including physical activity and dietary modifications, can be cost effective and may have a positive effect on the overall health of the employees (Pratt et al., 2007). For example, a retrospective cohort study from Duke University and Duke University Health System employees revealed a linear relationship between BMI, number of lost work days, and medical claims cost, with the rate for the heaviest employees being twice that of recommended weight according to the BMI classifications (Ostbye et al., 2007). A work, weight, and wellness program conducted at 31 hotels on the island of Oahu, Hawaii, investigated BMI in relation to job classification. Job classifications included...
clerk, food services, housekeeping, maintenance, and management. Overall, men in management had the highest BMI (28.16 kg / m²), and women in maintenance had the highest BMI (27.26 kg/m²; Williams, et al., 2007). Thus, a wellness program may decrease health risks as influenced by excess adiposity and improve worker productivity.

Summary

Obesity is a complex condition that can affect individuals’ social and psychological wellbeing. Excess adiposity may also predispose individuals to chronic health risks including coronary heart disease, diabetes mellitus, hypertension, and high blood cholesterol. Numerous factors including genetics, dietary intake, emotional wellbeing, physical activity, personal health habits, and job classification also contribute to excess adiposity. Implementing worksite wellness could be a vital tool to help decrease the incidence of obesity and related health risk.
CHAPTER 3: METHODOLOGY

Overview

This cross-sectional study was based at Ohio University Athens, Ohio which is located in the southeastern portion of the state within the Appalachian region. According to the latest statistics from the Office of Institutional Research at OU, in 2007, the Athens campus employed a total of 3,916 full- and part-time classified staff, administrative staff, and faculty members (L. Bennett, personal communication, June 4, 2009). A review of literature revealed no studies to date that have been conducted in the Appalachian region regarding clinical measures and wellness scores, and how they differ according to BMI and job classification. The purpose of this cross-sectional study was to determine whether there were significant differences among employees categorized by BMI (underweight, healthy weight, overweight, and obese) or by job classification (administrative, classified staff, and faculty) as measured using the dependent variables: clinical measures and wellness scores. This research project was approved by the Institutional Review Board in the Office of Research Compliance at OU (see Appendix A).

The foundation of this cross-sectional study was the Healthy Ohio initiative, known as Health Risk Appraisal (HRA) that is conducted by WellWorks, a wellness facility at OU in the College of Health and Human Services. According to WellWorks, all OU employees who were benefit eligible as determined by the OU Human Resource
Department were encouraged to participate. Benefit-eligible employees were considered legal adults who were 18 years or older.

The HRA consisted of three steps: initial health screening, Personal Wellness Profile (PWP), and education session. Table 9 provides an outline of the three-step process. The methods for the HRA steps were predetermined by the professional staff at WellWorks. The HRA was initiated during fall quarter of 2007 and continued throughout the spring 2008 quarter of the 2007-2008 academic year. Participation was completely voluntary; however, a $50 incentive was provided if all three steps of the initiative were completed. OU employees were divided and assigned into groups based on job classification. In the fall quarter, classified staff members were eligible to participate in the HRA screening, followed by administrative staff during winter quarter, and faculty members during the spring quarter. Overall, 566 employees participated in the HRA; however, 6 administrators were excluded from the study due to missing folders; 8 classified staff and 2 faculty members were excluded due to missing folders and inaccurate height entered within bioelectrical impedance scale. A total of 550 participants’ data were used for analysis.
## Table 9

*Health Risk Appraisal Process*

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: health screening</td>
<td>Waiver and release form</td>
</tr>
<tr>
<td></td>
<td>Clinical measures:</td>
</tr>
<tr>
<td></td>
<td>• Blood pressure</td>
</tr>
<tr>
<td></td>
<td>• Total cholesterol</td>
</tr>
<tr>
<td></td>
<td>• HDL cholesterol</td>
</tr>
<tr>
<td></td>
<td>• LDL cholesterol</td>
</tr>
<tr>
<td></td>
<td>• Triglycerides</td>
</tr>
<tr>
<td></td>
<td>• Blood glucose</td>
</tr>
<tr>
<td></td>
<td>Anthropometric measurements:</td>
</tr>
<tr>
<td></td>
<td>• Weight</td>
</tr>
<tr>
<td></td>
<td>• Height</td>
</tr>
<tr>
<td></td>
<td>• Percent body fat</td>
</tr>
<tr>
<td></td>
<td>• BMI</td>
</tr>
<tr>
<td></td>
<td>• Waist circumference</td>
</tr>
<tr>
<td>Step 2: PWP</td>
<td>PWP survey</td>
</tr>
<tr>
<td></td>
<td>PWP report and wellness scores</td>
</tr>
<tr>
<td>Step 3: education session</td>
<td>Education</td>
</tr>
</tbody>
</table>

*Note.* PWP: Personal Wellness Profile; Wellsource, Inc., see Appendix C.

### Step One: Initial Health Screening

All benefit-eligible OU employees, according to job classification were instructed to call WellWorks to schedule an appointment for the health screening. Participants were instructed to fast for 12 hours prior to the health screening with the exception of water intake. The health screening was held at the OU Human Resource Department. Prior to the assessment process, participants were required to sign a waiver and release form (see
Appendix B). With the exception of the venipuncture, all assessments were completed by a trained OU student affiliated with WellWorks.

**Clinical Measures**

*Blood pressure.* In a seated, resting position, a blood pressure cuff was placed around the bicep region of the right or left arm with the lower border of the cuff marked brachial artery placed approximately 1 inch above the elbow crease. A single blood pressure measurement was obtained using a Welch Allyn sphygmomanometer (part number 5098-02; Skaneateles Falls, NY) and stethoscope (part number 5079-73; Skaneateles Falls, NY), and recorded in millimeters of mercury (mmHg). The NHLBI national guidelines were used as a guide to assess health risks regarding blood pressure classification.

*Blood profile.* A phlebotomist from the Athens Medical Laboratory, Athens, Ohio, obtained a fasting blood sample by venipuncture from a vein located in either the right or left arm of the participants. The serum from the blood sample was used to assess total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, and blood glucose; however, due to cost restraints through WellWorks hemoglobin A1c was only tested if the participant had a past medical history of diabetes mellitus. The Adult Treatment Panel (ATP) III national guidelines were used to assess for health risks related to the lipid profile, while the NIDDK guidelines were used as a guide for blood glucose.
Anthropometric Measurements

Body mass index. The BMI was calculated as weight of the body in kilograms divided by square of height in meters (kg/m²). The BMI classifications and cutoffs for adults will be based on the guidelines from the CDC.

Body weight and percent body fat. The Tanita (TBF-310GS) bioelectrical impedance scale (model TBF-310GS), Tanita Standing Scale, Arlington Heights, IL was used for body weight and body fat percent determinations. For accuracy, participants were instructed to remove shoes and socks or nylons prior to assessment. Alternative body composition analysis such as the Bod Pod and skinfold caliper measurements were available at WellWorks for participants who were pregnant or had an implantable electronic device such as a pacemaker or pain pump; however, the alternative body composition analyses were not employed.

Height. The seca (model 214), stadiometer (Hanover, MD) was used for standing height measurement. Participants were instructed to remove shoes prior to measurement. Participants were instructed to stand with their back against the stadiometer, heels together, arms at the sides, legs straight, shoulders relaxed, and to look straight ahead. Height measurements were recorded to the nearest 1/8 of an inch.

Waist circumference. The Gulick II (model 67020; Gays Mills, WI) no-stretch retractable tape measure with both centimeter and inch gradients, and a 4-ounce tension indicator was employed. In a standing position, feet together, waist circumference was obtained upon location of the upper hip bone, and the top of the iliac crest. The measuring tape was placed horizontally around the abdominal region, and recorded to the
nearest 1/8 of an inch. Within this study, high waist circumference cutoff points from the NHLBI were used to determine health risks as influenced by obesity.

The blood pressure and anthropometric measurements were recorded within individual folders and a copy was provided to the participant upon completion of the health screening.

Step Two: Personal Wellness Profile

*Personal Wellness Profile*

Within 7 to 10 days following the initial health screening participants received results from the blood sample via the U.S. postal mail service. Instructions regarding step two of the HRA process was provided. Participants were instructed to complete an online Personal Wellness Profile; Wellsource, Inc., Clackamas, OR (Product # APC-328; see Appendix C), which was a survey concerning medical history and health habits; a paper survey was available to those without internet access. Within the personal wellness profile participants were instructed to self-enter personal clinical measures and anthropometric measurements. These self-entered data were subsequently verified by the researchers.

*Personal Wellness Report*

Upon completion of the PWP survey, the participants were prompted to print a PWP report (see Appendix D). The PWP report assessed individual health needs and provided a wellness rating score for individual risks, cancer risk, nutrition status, fitness status, stress and emotional health, substance use, and safety. The wellness rating scale
consisted of the following categories: 75 to 100 (excellent); 50 to 74 (good); 25 to 49 (needs to improve); and 0 to 24 (caution, high risk).

Step Three: Education Session

Participants were encouraged to participate in the final step of the HRA process, an education session held at OU Human Resource Department. The purpose of the education session was to help participants understand their PWP report. The education session also provided information regarding local resources to assist in personal health goals.

Data Analysis

The clinical measures, anthropometric measurements, wellness scores, demographics, BMI, and job classification were entered using the Statistical Package for the Social Sciences (SPSS version 16.0, 2008; Chicago, IL). Descriptive and inferential statistics were employed in this research study. A two-way ANOVA was conducted to detect the differences between two independent variable groups: BMI and job classification in a 3 x 4 design to test their effect on the dependent variables (clinical measures and personal wellness scores) and to test whether their effect was interactive.

Descriptive statistics were used to summarize the clinical measures, anthropometrics, demographics, and personal wellness scores by BMI and job classification, and were presented in terms of means, frequency or percentages. Inferential statistics were used to determine if there was a significant difference among
clinical measures and personal wellness scores in relation to BMI and job classification of OU employees. A p-value of < 0.05 was considered statistically significant. Tukey’s HSD post hoc test was performed only if there was a significant difference within the two-way ANOVA. Chi-square test of independence and Spearman rho correlation coefficient were also employed. Table 10 illustrates the details of the research questions, parameters, and statistical procedures.

Table 10

Research Questions, Parameters, Statistical Procedures

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are there significant differences among employees categorized by body mass index</td>
<td>Clinical measures: (refer to chapter 2 for standards)</td>
</tr>
<tr>
<td>or by job classification as measured using the dependent variables: clinical measures and wellness scores?</td>
<td>• Lipid profile: total, HDL and LDL cholesterol, triglycerides</td>
</tr>
<tr>
<td>2. Are clinical measures and anthropometric measurements comparable to the national standards?</td>
<td>• Blood glucose</td>
</tr>
<tr>
<td></td>
<td>• Blood pressure: systolic and diastolic</td>
</tr>
<tr>
<td></td>
<td><strong>Anthropometrics</strong></td>
</tr>
<tr>
<td></td>
<td>• Percent body fat and waist circumference</td>
</tr>
<tr>
<td></td>
<td><strong>Wellness scores</strong></td>
</tr>
<tr>
<td></td>
<td>• Overall personal wellness, coronary risk, cancer risk, nutrition status, fitness status, and stress and emotional health</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistical procedure</th>
<th>1. Descriptive statistics</th>
<th>2. Inferential statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Frequencies (job classification, gender, and age)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Percentage (job classification, gender, age, clinical measures, percent body fat, and waist circumference)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Means (clinical measures, percent body fat, waist circumference, and personal wellness scores)</td>
<td></td>
</tr>
</tbody>
</table>
• Two-way analysis of variance (ANOVA; all parameters except demographics and anthropometrics)
• Tukey’s HSD (post hoc)
• Chi-square test of independence (clinical measures and anthropometrics)

3. Prediction and association
• Spearman rho correlation coefficient (clinical measures, anthropometrics, and personal wellness scores)
CHAPTER 4: RESULTS

Participant Demographics

According to the Office of Institutional Research at OU in 2007, the Athens campus employed a total of 3,916 both full and part time classified staff (31.1%), administrative staff (36.1%), and faculty members (32.8%). Of these OU employees, approximately 50.3% were males and 49.7% were female (L. Bennett, personal communication, June 4, 2009). Table 11 summarizes OU’s statistics from 2007 regarding job classification and gender groups (L. Bennett, personal communication, June 4, 2009). The demographics within this study included age and gender. Of the 550 participants, 178 were male (32.4%) and 372 were female (67.6%). Of the OU employee population, 14.1% voluntarily participated in the Health Risk Appraisal. In Table 12, job classification and gender are presented as a frequency and percentage, and Figure 1 represents the percent of males and females per job classification. Table 13 presents age of participants as a frequency and percentage. The majority of the participants were between 41 and 60 years of age (64.9%).
Table 11

*Ohio University Characteristics 2007: Job Classification and Gender*

<table>
<thead>
<tr>
<th>Job Classification</th>
<th>Total within a job classification</th>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>1411 (36.1%)</td>
<td>Male</td>
<td>679</td>
<td>17.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>732</td>
<td>18.7</td>
</tr>
<tr>
<td>Classified Staff</td>
<td>1219 (31.1%)</td>
<td>Male</td>
<td>500</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>719</td>
<td>18.4</td>
</tr>
<tr>
<td>Faculty</td>
<td>1286 (32.8%)</td>
<td>Male</td>
<td>790</td>
<td>20.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>496</td>
<td>12.7</td>
</tr>
</tbody>
</table>

Table 12

*Participant Characteristics: Job Classification and Gender*

<table>
<thead>
<tr>
<th>Job classification</th>
<th>Total within a job classification</th>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>252 (45.8%)</td>
<td>Male</td>
<td>89</td>
<td>35.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>163</td>
<td>64.7</td>
</tr>
<tr>
<td>Classified staff</td>
<td>219 (39.8%)</td>
<td>Male</td>
<td>42</td>
<td>19.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>177</td>
<td>80.8</td>
</tr>
<tr>
<td>Faculty</td>
<td>79 (14.4%)</td>
<td>Male</td>
<td>47</td>
<td>59.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>32</td>
<td>40.5</td>
</tr>
</tbody>
</table>
Figure 1. Job classification by percent of total. Bars represent percent of total per gender.

Table 13

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>21-30</td>
<td>49</td>
<td>8.9</td>
</tr>
<tr>
<td>31-40</td>
<td>127</td>
<td>23.1</td>
</tr>
<tr>
<td>41-50</td>
<td>182</td>
<td>33.1</td>
</tr>
<tr>
<td>51-60</td>
<td>175</td>
<td>31.8</td>
</tr>
<tr>
<td>61-70</td>
<td>14</td>
<td>2.5</td>
</tr>
<tr>
<td>≥ 71</td>
<td>2</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Statistical Procedure

A two-way analysis of variance (ANOVA) was used to identify significance and interaction between job classification (administrative staff, classified staff, faculty
members) and BMI categories (underweight, healthy weight, overweight, and obese) among clinical measures and wellness scores (see Table 10). The clinical measures included blood pressure, lipid profile, and blood glucose. The anthropometric measurements included percent body fat and waist circumference. The wellness scores included overall personal wellness scores, coronary risk, nutrition status, fitness status, cancer risk, and stress and emotional health.

Clinical Measures

Table 14 indicates clinical measures and main effects from two-way ANOVA and interactions. The clinical measures included the following: systolic and diastolic blood pressure, total cholesterol, HDL and LDL cholesterol, triglycerides, and blood glucose.

Table 14

<table>
<thead>
<tr>
<th>Clinical measure</th>
<th>Job classification</th>
<th>BMI</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic blood pressure</td>
<td>$p = 0.98$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.65$</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>$p = 0.09$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.78$</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>$p = 0.03^*$</td>
<td>$p = 0.01^*$</td>
<td>$p = 0.13$</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>$p = 0.16$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.52$</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>$p = 0.12$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.19$</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>$p = 0.23$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.32$</td>
</tr>
<tr>
<td>Blood glucose</td>
<td>$p = 0.35$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.90$</td>
</tr>
</tbody>
</table>

*Note.* $^*$ indicates significance at the $p < 0.05$ level.
Systolic Blood Pressure

The interaction between BMI and job classification was not significant \((F(5, 539) = .67, p = 0.65)\). The main effect for job classification and systolic blood pressure was not significant \((F(2, 539) = .022, p = 0.98)\). A Chi-square test of independence was calculated comparing systolic blood pressure and job classifications \((\chi^2(6) = 0.186, p = 0.18)\); systolic blood pressure and job classification appear to be independent. A Spearman rho correlation coefficient was calculated for the relationship between job classification and systolic blood pressure. A weak correlation that was not significant was found \((r(548) = -0.04, p = 0.26)\). Job classification was not related to systolic blood pressure. Table 15 shows the percent for stage I and stage II hypertension for systolic blood pressure within job classification.

Table 15

<table>
<thead>
<tr>
<th>Job classification</th>
<th>Stage I</th>
<th>Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>7.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Classified staff</td>
<td>6.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Faculty</td>
<td>2.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

A significant main effect for BMI was found for systolic blood pressure \((F(3, 539) = 20.35, p = 0.00)\). Tukey’s HSD post hoc test indicated that systolic blood pressure was significantly higher in obese participants \((m = 125.78, sd = 11.84)\) than underweight
(\(m = 107.00, sd = 4.80\)), healthy weight (\(m = 114.49, sd = 10.96\)), and overweight (\(m = 121.98, sd = 12.00\)) participants. No significant difference was found between underweight and healthy weight participants. A Chi-square test of independence was calculated comparing BMI to systolic blood pressure. A significant interaction was found (\(\chi^2(9) = 71.13, p = 0.00\)). Obese (9.1%) and overweight (8.6%) were more likely to have stage I HTN than healthy weight (2.9%) and underweight (0.0%). Obese (1.4%) were more likely to have stage II HTN than overweight (0.5%), healthy weight (0.0%), and underweight (0.0%).

A Spearman rho correlation coefficient was calculated for the relationship between participants BMI and systolic blood pressure. A positive, but weak correlation was found (\(r(548) = 0.39, p = 0.01\)), indicating a significant relationship between the two variables. Obese participants had a higher mean systolic blood pressure than overweight, healthy weight or underweight participants.

**Diastolic Blood Pressure**

The interaction between BMI and job classification was not significant (\(F(5, 539) = .49, p = 0.78\)). The main effect for job classification and diastolic blood pressure was not significant (\(F(2, 539) = 2.42, p = 0.09\)). Figure 2 indicates systolic and diastolic blood pressure by mean values and standard deviation by job classification. Table 16 shows the percent of diastolic blood pressure within job classification. A Chi-square test of independence was calculated comparing job classifications and diastolic blood pressure. No significant relationship was found (\(\chi^2(6) = 11.85, p = 0.06\)). Job classification and diastolic blood pressure seem to be independent. A Spearman rho
A weak positive correlation that was not significant was found between job classification and diastolic blood pressure (\( r (548) = 0.04, p = 0.28 \)). Job classification was not related to diastolic blood pressure.

**Figure 2.** Systolic and diastolic blood pressure by mean values. Bars represent systolic and diastolic blood pressure by a job classification. Data are mean ± standard deviation. Bars sharing the same letter within a variable are not statistically significant at \( p < 0.05 \).
Table 16

*Stage I and Stage II Hypertension: Percent within Job Classification Categories for Diastolic Blood Pressure*

<table>
<thead>
<tr>
<th>Job classification</th>
<th>Stage I</th>
<th>Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>6.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Classified staff</td>
<td>10.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Faculty</td>
<td>2.5</td>
<td>1.3</td>
</tr>
</tbody>
</table>

A significant main effect for BMI was found for diastolic blood pressure \((F (3, 539) = 12.37, p = 0.00)\). Figure 3 indicates systolic and diastolic blood pressure by mean values and standard deviation by BMI. Tukey’s HSD post hoc test indicated that diastolic blood pressure was significantly higher in obese participants \((m = 79.61, sd = 8.14)\) and overweight \((m = 78.06, sd = 8.11)\) than underweight \((m = 70.40, sd = 4.34)\) participants; however, no significant difference were noted among healthy weight \((m = 73.26, sd = 8.67)\), overweight or obese participants. A Chi-square test of independence was calculated comparing BMI and diastolic blood pressure. A significant interaction was found \(\chi^2(9) = 62.46, p = 0.00\). Obese \((14.7\%)\) and overweight \((8.6\%)\) were more likely to have stage I diastolic hypertension than healthy weight \((1.5\%)\) and underweight \((0.0\%)\). Overweight \((1.0\%)\) and healthy weight \((1.0\%)\) were more likely to have stage II diastolic hypertension than obese \((0.0\%)\) and underweight \((0.0\%)\) participants.
Figure 3. Systolic and diastolic blood pressure by mean values. Bars represent systolic and diastolic blood pressure body mass index. Data are mean ± standard deviation. Bars sharing the same letter within a variable are not statistically significant at \( p < 0.05 \).

A Spearman \( \rho \) correlation coefficient was calculated for the relationship between BMI and diastolic blood pressure. A weak, but positive correlation was found (\( r(548) = 0.33, p = 0.01 \)), indicating a significant relationship between BMI and diastolic blood pressure. Obese participants tended to have a higher mean diastolic blood pressure than overweight, healthy weight, and underweight participants.

Figures 4 and 5 indicate total cholesterol, HDL and LDL cholesterol, and triglycerides by mean values and standard deviations by job classification and BMI respectively.
Figure 4. Lipid profile by mean values. Bars represent total cholesterol, high density lipoprotein and low density lipoprotein cholesterol, and triglycerides by job classification. Data are mean ± standard deviation. Bars sharing the same letter within a variable are not statistically significant at $p < 0.05$. 
Figure 5. Lipid profile by mean values. Bars represent total cholesterol, high density lipoprotein and low density lipoprotein cholesterol, and triglycerides by body mass index. Data are mean ± standard deviation. Bars sharing the same letter within a variable are not statistically significant at \( p < 0.05 \).

**Total Cholesterol**

The interaction between BMI and job classification was not significant \( (F(5, 537) = 1.72, p = 0.13) \). A significant main effect for job classification was found for total cholesterol \( (F(2, 537) = 3.65, p = 0.03) \). Tukey’s HSD post hoc test indicated total cholesterol was significantly higher within classified staff \( (m = 196.37, sd = 30.97) \) than faculty members \( (m = 183.24, sd = 34.37) \) and administrative staff \( (m = 187.76, sd = 32.33) \). No significant difference was found between administrative staff and faculty members. Figure 6 shows percent of total cholesterol within a job classification. A Chi-
square test of independence was calculated comparing job classifications and total cholesterol. A significant interaction was found ($\chi^2(4) = 9.97, p = 0.04$). Classified staff were more likely to have high total cholesterol (10.5%) than administrative staff (6.0%) and faculty members (3.8%).

A Spearman rho correlation coefficient was calculated for the relationship between job classifications and total cholesterol. A weak, but positive correlation that was not significant was found ($r(546) = 0.03, p = 0.41$). Total cholesterol was not related to job classification.

Figure 6. Job classification by percent of total. Bars represent percent of total cholesterol within a job classification.
A significant main effect for BMI was found \( F(3, 357) = 3.69, p = 0.01 \). Tukey’s HSD post hoc test indicated total cholesterol was significantly higher for obese \((m = 195.97, sd = 33.54)\) and overweight \((m = 194.14, sd = 30.16)\) than healthy weight \((m = 183.34, sd = 32.26)\) participants. No significant differences were noted among underweight \((m = 186.80, sd = 48.59)\), overweight or obese participants. A Chi-square test of independence was calculated comparing the results of job classification and total cholesterol. No significant relationship was found \( \chi^2(6) = 9.01, p = 0.17 \). BMI and total cholesterol were independent.

A Spearman rho correlation coefficient was calculated for the relationship between BMI and total cholesterol. A weak positive correlation was found \( r(546) = 0.17, p = 0.01 \), indicating a significant relationship between the two variables. Obese and overweight participants tended to have higher mean total cholesterol than healthy weight participants.

*High Density Lipoprotein*

The interaction between BMI and job classification was not significant \( F(5, 536) = .85, p = 0.52 \). The main effect for job classification and HDL cholesterol was not significant \( F(2, 536) = 1.87, p = 0.16 \). Figure 7 indicates HDL cholesterol by percent of total within a job classification. A Chi-square test of independence was calculated comparing job classification and HDL cholesterol. A significant interaction was found \( \chi^2(4) = 11.36, p = 0.02 \). Faculty members \( (44.3\%) \) and administrative staff \( (38.2\%) \) were more likely to have high HDL cholesterol levels than classified staff \( (26.9\%) \). A Spearman rho correlation coefficient was calculated for the relationship between job
classification and HDL cholesterol. A weak negative correlation that was not significant was found ($r(545) = -0.06, p = 0.19$). Job classification was not related to HDL cholesterol.

Figure 7. Job classification by percent of total. Bars represent percent of high density lipoprotein cholesterol within a job classification.

A significant main effect for BMI was found for HDL cholesterol ($F(3, 536) = 13.66, p = 0.00$). Tukey’s HSD post hoc test indicated HDL cholesterol was significantly higher for underweight ($m = 64.60, sd = 18.35$), healthy weight ($m = 60.49, sd = 14.90$), and overweight ($m = 53.94, sd = 14.84$) than obese ($m = 47.50, sd = 11.90$) participants. Underweight participants were not statistically different than healthy weight or overweight. No significant differences were found between underweight and healthy weight, and no significant differences were found between overweight and underweight
participants. A Chi-square test of independence was calculated comparing BMI and HDL cholesterol. A significant interaction was found ($\chi^2(6) = 65.35, p = 0.00$). Healthy weight (52.0%) and underweight (40.0%) were more likely to have higher HDL cholesterol values than overweight (29.9%) or obese (16.1%) participants.

A Spearman rho correlation coefficient was calculated for the relationship between BMI and HDL cholesterol. A weak negative correlation was found ($r (545) = -0.36, p = 0.01$), indicating a significant relationship between the two variables. Underweight and healthy weight participants had higher mean HDL cholesterol values than overweight and obese participants.

*Low Density Lipoprotein*

The interaction between BMI and job classification was not significant ($F (5, 534) = 1.50, p = 0.19$). The main effect for job classification and LDL cholesterol was not significant ($F (2, 534) = 2.11, p = 0.12$). Figure 8 indicates LDL cholesterol by percent within job classification. A Chi-square test of independence was calculated comparing the results of job classifications and LDL cholesterol. No significant relationship was found ($\chi^2(8) = 14.66, p = 0.06$). Job classification and LDL cholesterol appear to be independent. A Spearman rho correlation coefficient was calculated for the relationship between job classification and LDL cholesterol. A weak positive correlation that was not significant was found ($r (543) = 0.06, p = 0.15$). Job classification was not related to LDL cholesterol.
Figure 8. Job classification by percent of total. Bars represent percent of low density lipoprotein cholesterol within a job classification.

A significant main effect for BMI was found for LDL cholesterol \( F(3, 534) = 5.72, p = 0.00 \). Tukey’s HSD post hoc test indicated healthy weight \( (m = 105.22, sd = 28.18) \) participants had a significantly lower LDL cholesterol than obese \( (m = 118.52, sd = 28.19) \) and overweight \( (m = 115.65, sd = 27.98) \) participants. Underweight \( (m = 106.80, sd = 28.35) \) participants were not significantly different than healthy weight, overweight or obese participants; overweight participants were not significantly different than underweight or obese participants. A Chi-square test of independence was calculated comparing BMI and LDL cholesterol. A significant interaction was found \( \chi^2(12) = 24.69, p = 0.01 \). Obese \( (9.2\%) \) were within high or very high LDL cholesterol compared to overweight \( (7.1\%) \), healthy weight \( (3.0\%) \), and underweight \( (0.0\%) \).
A Spearman rho correlation coefficient was calculated for the relationship between BMI and LDL cholesterol. A weak positive correlation was found ($r(543) = 0.19, p = 0.01$), indicating a weak, but significant relationship between the two variables. Overweight and overweight participants mean LDL cholesterol values were higher than healthy weight and underweight participants.

*Triglycerides*

The interaction between BMI and job classification was not significant ($F(5, 536) = 1.19, p = 0.32$). The main effect for job classification and triglycerides was not significant ($F(2, 536) = 1.48, p = 0.23$). Figure 9 indicates percent of triglyceride values within a job classification. A Chi-square test of independence was calculated comparing job classification and triglycerides. A significant interaction was found ($\chi^2(6) = 12.80, p = 0.04$). Classified staff (12.8%) was more likely to have either high or very high triglyceride values than administrative staff (9.2%) and faculty members (1.3%).

A Spearman rho correlation coefficient was calculated for the relationship between job classification and LDL cholesterol. A weak positive correlation that was not significant was found ($r(545) = 0.06, p = 0.10$). Job classification was not related to triglyceride values.
A significant main effect for BMI was found for triglycerides ($F (3, 536) = 10.80, p = 0.00$). Tukey’s HSD post hoc test indicated that triglycerides were significantly higher for obese ($m = 148.73, sd = 82.33$) and overweight ($m = 126.72, sd = 84.52$) than healthy weight ($m = 88.21, sd = 37.59$) participants. Underweight ($m = 77.60, sd = 15.32$) participants were not statistically different than healthy weight, overweight or obese participants. A Chi-square test of independence was calculated comparing BMI and triglycerides. A significant interaction was found ($\chi^2(9) = 46.94, p = 0.00$). Obese (16.9%) and overweight (13.2%) were more likely to have high or very high triglyceride values than healthy weight (1.0%) and underweight (0.0%).

A Spearman rho correlation coefficient was calculated for the relationship between BMI and triglycerides. A positive correlation was found ($r (545) = 0.42, p = 0.01$), indicating a significant relationship between the two variables. Obese and

\[ \text{Figure 9. Job classification by percent of total. Bars represent percent of triglyceride values within a job classification.} \]
overweight participants tended to have higher triglycerides values than healthy weight and underweight participants.

**Blood Glucose**

The interaction between BMI and job classification was not significant \((F(5, 537) = .32, p = 0.90)\). The main effect for job classification and blood glucose was not significant \((F(2, 537) = 1.05, p = 0.35)\). A Chi-square test of independence was calculated comparing job classification and blood glucose. A significant interaction was found \((\chi^2(4) = 12.68, p = 0.01)\). Classified staff had a higher percentage (16.4%) for either pre-diabetes or diabetes compared to administrative staff (7.6%) and faculty members (6.3%).

A Spearman \(\rho\) correlation coefficient was calculated for the relationship between job classification and blood glucose. A weak positive correlation that was not significant was found \(r(546) = 0.07, p = 0.07\). Blood glucose was not related to job classification.

A significant main effect for BMI was found for blood glucose \((F(3, 537) = 4.69, p = 0.00)\). Tukey’s HSD post hoc test indicated that obese \((m = 96.38, sd = 29.15)\) and overweight \((m = 88.80, sd = 13.48)\) participants had a significantly higher blood glucose than healthy weight \((m = 84.11, sd = 7.77)\) participants. Underweight \((m = 83.20, sd = 3.11)\) participants were not statistically different than healthy weight, overweight, or obese participants. Figure 10 shows mean blood glucose values by BMI classifications. A Chi-square test of independence was calculated comparing BMI and blood glucose. A significant interaction was found \((\chi^2(6) = 33.99, p = 0.00)\). A combined total of 22.4%
obese participants either had diabetes or considered pre-diabetic, followed by 11.1% overweight, 3.0% healthy weight, and 0.0% underweight participants.

Figure 10. Blood glucose by body mass index classifications. Bars represent mean blood glucose values by body mass index classifications. Bars sharing the same letter within a variable are not statistically significant at $p < 0.05$.

A Spearman rho correlation coefficient was calculated for the relationship between BMI and blood glucose. A weak positive correlation was found ($r (546) = 0.31$, $p = 0.01$), indicating a weak, but significant relationship between the two variables. Obese and overweight participants had higher mean blood glucose levels than healthy weight and underweight participants.
Anthropometric Measurements

**Waist Circumference**

A Chi-square test of independence was calculated comparing job classification and waist circumference. A significant interaction was found ($\chi^2(2) = 51.32, p = 0.00$). Classified staff (59.4%) was more likely to have an “at risk” waist circumference than administrative staff (34.9%) and faculty members (17.7%).

A Spearman $\rho$ correlation coefficient was calculated for the relationship between job classification and waist circumference. A weak positive correlation that was not significant was found ($r(548) = 0.04, p = 0.31$). Waist circumference was not related to job classification.

*Figure 11.* Job classification by percent of total. Bars represent percent of “no risk” and “at risk” waist circumference within job classification categories.
A Chi-square test of independence was calculated comparing BMI and waist circumference. A significant interaction was found ($\chi^2(3) = 2.89, p = 0.00$). Obese were more likely to have an “at risk” waist circumference (93.7%) than overweight (46.5%), healthy weight (2.9%), and underweight (0.0%).

A Spearman rho correlation coefficient was calculated for the relationship between BMI and waist circumference. A strong positive correlation was found ($r(548) = 0.82, p = 0.01$), indicating a significant relationship between the two variables. Obese participants tended to have a higher waist circumference than overweight, healthy weight, and underweight participants.

According to NHLBI, (1998) the standards for waist circumference measurements are different for males (> 40 inches) and females (> 35 inches). A Chi-square test of independence was calculated comparing waist circumference according the standards in regards to males and females. A significant interaction was found ($\chi^2(1) = 4.18, p = 0.04$). Females were more likely to have an “at risk” waist circumference (45.2%) than males (36.0%). Figure 12 shows waist circumference by gender. A Spearman rho correlation coefficient was calculated for the relationship between waist circumference and gender. A weak positive correlation was found ($r(548) = 0.08, p = 0.04$), indicating a weak relationship between the two variables. Females tended to have a smaller waist circumference than males; however, waist circumferences > 35 inches for females are considered high risk.
Gender by percent waist circumference. Bars represent percent of “no risk” and “at risk” waist circumference within gender groups.

Figure 12. Gender by percent waist circumference. Bars represent percent of “no risk” and “at risk” waist circumference within gender groups.

Body Fat Percent

A Chi-square test of independence was calculated comparing job classification and body fat percent. A significant interaction was found ($\chi^2(6) = 47.81, p = 0.00$). Classified staff was more likely to be either over fat or obese (68.1%) than administrative staff (46.9%) and faculty members (29.1%). A Spearman rho correlation coefficient was calculated for the relationship between job classification and body fat percent. A weak positive correlation that was not significant was found ($r (548) = 0.01, p = 0.65$). Waist circumference was not related to job classification.
Figure 13. Job classification by body mass index classifications. Bars represent mean values for body fat percent within a job classification. Bars sharing the same letter within a variable are not statistically significant at $p < 0.05$.

A Chi-square test of independence was calculated comparing BMI and body fat percent. A significant interaction was found ($\chi^2(9) = 6.54, p = 0.00$). Obese participants were more likely to be either over fat or obese (98.6%) than overweight (72.3%), healthy weight (2.9%), and underweight (0.0%) participants.

A Spearman $\rho$ correlation coefficient was calculated for the relationship between BMI and body fat percent. A strong positive correlation was found ($r (548) = 0.70, p = 0.01$), indicating a significant relationship between the two variables. Obese participants tended to have a higher mean body fat percent than overweight, healthy weight, and underweight participants.
Body fat percent standards are different between males and females. A Chi-square test of independence was calculated comparing the standards for body fat percent in regards to males and females. No significant relationship was found ($\chi^2(3) = 4.39, p = 0.22$). Body fat percent differences between males and females appear to be independent of each other. Figure 14 shows body fat percent between gender. A Spearman $\rho$ correlation coefficient was calculated for the relationship between body fat percent and gender. A weak positive correlation that was not significant was found ($r (548) = 0.06, p = 0.11$). Body fat percentages were not related to gender.

Figure 14. Body fat percent and gender. Bars represent body fat percent between gender.
Body Mass Index

A Chi-square test of independence was calculated comparing job classification and BMI. A significant interaction was found ($\chi^2(6) = 42.34, p = 0.00$). Classified staff were more likely to be either overweight or obese (75.3%), followed by administrative staff (56.7%), and faculty members (41.7%). A Spearman rho correlation coefficient was calculated for the relationship between job classification and BMI. A weak positive correlation that was not significant was found ($r (548) = 0.02, p = 0.62$). BMI was not related to job classification.

Personal Wellness Scores

Figure 15 and 16 indicate personal wellness scores by mean values and standard deviation within a job classification and BMI, respectively. The personal wellness scores include the following: overall wellness, coronary risk, cancer risk, nutrition status, fitness status, and stress and emotional health. The wellness rating scale consisted of the following categories: 75 to 100 (excellent); 50 to 74 (good); 25 to 49 (needs to improve); and 0 to 24 (caution, high risk). Table 18 indicates wellness scores by main effects and interactions, while Table 19 indicates wellness ratings by job classification.
Figure 15. Personal wellness scores by mean scores. Bars represent mean personal wellness scores per job classification. Data are mean ± standard deviation. Bars sharing the same letter within a variable are not statistically significant at $p < 0.05$. 
Figure 16. Personal wellness scores by mean scores. Bars represent mean personal wellness scores per body mass index classification. Data are mean ± standard deviation. Bars sharing the same letter within a variable are not statistically significant at $p < 0.05$. 
Table 17

*Wellness Scores by Main Effects and Interactions from Two-way ANOVA*

<table>
<thead>
<tr>
<th>Wellness scores</th>
<th>Job classification</th>
<th>BMI</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall wellness</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.03^*$</td>
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<tr>
<td>Coronary risk</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.93$</td>
</tr>
<tr>
<td>Cancer risk</td>
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<td>$p = 0.00^*$</td>
<td>$p = 0.00^*$</td>
</tr>
<tr>
<td>Nutrition status</td>
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<td>$p = 0.00^*$</td>
<td>$p = 0.02^*$</td>
</tr>
<tr>
<td>Fitness status</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.00^*$</td>
<td>$p = 0.18$</td>
</tr>
<tr>
<td>Stress and emotional health</td>
<td>$p = 0.44$</td>
<td>$p = 0.04^*$</td>
<td>$p = 0.16$</td>
</tr>
</tbody>
</table>

*Note.* * indicates significance at $p < 0.05$.

Table 18

*Wellness Ratings per Job Classification*

<table>
<thead>
<tr>
<th>Wellness</th>
<th>Administrative</th>
<th>Classified staff</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall wellness</td>
<td>Needs to improve</td>
<td>Needs to improve</td>
<td>Good</td>
</tr>
<tr>
<td>Coronary risk</td>
<td>Good</td>
<td>Needs to improve</td>
<td>Good</td>
</tr>
<tr>
<td>Cancer risk</td>
<td>Good</td>
<td>Needs to improve</td>
<td>Good</td>
</tr>
<tr>
<td>Nutrition status</td>
<td>Good</td>
<td>Needs to improve</td>
<td>Good</td>
</tr>
<tr>
<td>Fitness status</td>
<td>Needs to improve</td>
<td>Needs to improve</td>
<td>Good</td>
</tr>
<tr>
<td>Stress and emotional health</td>
<td>Excellent</td>
<td>Good</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

*Overall Personal Wellness Score*

The interaction between BMI and job classification was significant ($F(5, 539) = 2.55, p = 0.03$). A significant main effect for job classification was found for overall personal wellness scores ($F(2, 539) = 18.36, p = 0.00$). Tukey’s HSD post hoc test indicated a significant difference within all job classifications: faculty members ($m =$
62.38, sd = 19.05), administrative staff (m = 48.94, sd = 18.68), and classified staff (m = 39.40, sd = 16.04). A Spearman rho correlation coefficient was calculated for the relationship between job classifications and overall personal wellness scores. A weak positive correlation that was not significant was found (r (548) = 0.02, p = 0.60). Overall personal wellness scores were not related to job classification.

A significant main effect for BMI and overall personal wellness scores was found (F (3, 539) = 29.93, p = 0.00). Tukey’s HSD post hoc test indicated underweight (m = 66.00, sd = 10.42) participants scored significantly higher than overweight (m = 43.48, sd = 17.36) and obese (m = 37.12, sd = 13.22) participants. Healthy weight (m = 57.07, sd = 19.94) participants scored significantly higher than overweight and obese participants. No significant interaction was noted between underweight and healthy weight participants. A Spearman rho correlation coefficient was calculated for the relationship between BMI and overall personal wellness scores. A negative correlation was found (r (548) = -0.41, p = 0.01), indicating a significant relationship between the two variables. Healthy weight and underweight participants tended to have higher mean overall personal wellness scores than overweight and obese participants.

Coronary Risk

The interaction between BMI and job classification was not significant (F (5, 531) = .27, p = 0.93). A significant main effect for job classification was found for coronary risk (F (2, 531) = 6.77, p = 0.00). Tukey’s HSD post hoc test indicated a significant difference within all job classifications: faculty members (m = 62.03, sd = 23.28), administrative staff (m = 54.04, sd = 24.61), and classified staff (m = 42.50, sd = 23.82).
A Spearman rho correlation coefficient was calculated for the relationship between job classifications and coronary risks. A weak negative correlation that was not significant was found \((r (540) = -0.03, p = 0.44)\). Coronary risks were not related to job classification.

A significant main effect for BMI was found for coronary risk \((F (3, 531) = 25.15, p = 0.00)\). Tukey’s HSD post hoc test indicated a significant difference within the following BMI classifications: healthy weight \((m = 63.48, sd = 21.38)\), overweight \((m = 47.80, sd = 23.12)\), and obese \((m = 35.63, sd = 23.10)\) participants. No significant difference was found between healthy weight and underweight \((m = 78.80, sd = 6.57)\) participants. A Spearman rho correlation coefficient was calculated for the relationship between coronary risks and BMI. A negative correlation was found \((r (540) = -0.47, p = 0.01)\), indicating a significant relationship between the two variables. Healthy weight and underweight participants tended to have higher mean coronary risk scores than overweight and obese participants.

**Cancer Risk**

The interaction between BMI and job classification was significant \((F (5, 539) = 3.79, p = 0.00)\). A significant main effect for job classification was found for cancer risk \((F (2, 539) = 30.13, p = 0.00)\). Tukey’s HSD post hoc test indicated a significant difference among all job classifications: faculty members \((m = 59.01, sd = 16.47)\), administrative staff \((m = 51.71, sd = 14.01)\), and classified staff \((m = 42.37, sd = 12.92)\). A Spearman rho correlation coefficient was calculated for the relationship between job
classification and cancer risks. A weak negative correlation that was not significant was found ($r (548) = -0.05, p = 0.24$). Cancer risks were not related to job classification.

A significant main effect for BMI was found for cancer risk ($F (3, 539) = 8.85, p = 0.00$). Tukey’s HSD post hoc test indicated that underweight ($m = 64.20, sd = 15.90$) participants scored significantly higher than overweight ($m = 47.30, sd = 13.41$) and obese ($m = 43.80, sd = 12.36$) participants. No significant interaction was found between underweight and healthy weight ($m = 54.02, sd = 16.80$) or overweight and obese participants. A Spearman rho correlation coefficient was calculated for the relationship between cancer risks and BMI. A weak negative correlation was found ($r (548) = -0.29, p = 0.01$), indicating a significant relationship between the two variables. Underweight and healthy weight participants tended to have higher mean cancer risk scores than overweight and obese participants.

**Nutrition Status**

The interaction between BMI and job classification was significant ($F (5, 539) = 2.78, p = 0.02$). A significant main effect for job classification was found for nutrition status ($F (2, 539) = 9.76, p = 0.00$). Tukey’s HSD post hoc test indicated significant differences among job classifications: faculty members ($m = 66.08, sd = 19.47$), administrative staff ($m = 54.40, sd = 21.49$), and classified staff ($m = 47.29, sd = 22.29$). A Spearman rho correlation coefficient was calculated for the relationship between job classification and nutrition status. A weak positive correlation that was not significant was found ($r (548) = 0.05, p = 0.23$). Nutrition status scores were not related to job classification.
A significant main effect for BMI was found for nutrition status \((F (3, 539) = 6.03, p = 0.00)\). Tukey’s HSD post hoc test indicated healthy weight \((m = 59.07, sd = 21.70)\) participants had a significantly higher nutrition score than overweight \((m = 52.12, sd = 22.49)\) and obese \((m = 46.14, sd = 20.94)\) participants. Underweight \((m = 63.60, sd = 24.43)\) participants were not statistically different than healthy weight, overweight, or obese participants. A Spearman rho correlation coefficient was calculated for BMI and nutrition status. A weak negative correlation was found \((r (548) = -0.23, p = 0.01)\), indicating a significant relationship between the two variables. Underweight and healthy weight participants tended to have higher mean nutrition status scores than overweight and obese participants.

**Fitness Status**

The interaction between BMI and job classification was not significant for fitness status \((F (5, 539) = 1.52, p = 0.18)\). A significant main effect for job classification was found for fitness status \((F (2, 539) = 6.47, p = 0.00)\). Tukey’s HSD post hoc test indicated a significant difference among all job classifications: faculty members \((m = 52.96, sd = 22.20)\), administrative staff \((m = 42.84, sd = 22.32)\), and classified staff \((m = 38.18, sd = 20.81)\). A Spearman rho correlation coefficient was calculated for the relationship between job classifications and fitness status. A weak positive correlation that was not significant was found \((r (548) = 0.05, p = 0.17)\). Fitness status scores were not related to job classification.

A significant main effect for BMI was found for fitness status \((F (3, 539) = 4.12, p = 0.00)\). Tukey’s HSD post hoc test indicated healthy weight \((m = 48.00, sd = 21.85)\)
participants had a significantly higher fitness status score than overweight \((m = 40.87, sd = 22.25)\) and obese \((m = 36.22, sd = 20.54)\) participants. No significant difference were found between underweight \((m = 55.80, sd = 28.14)\) and healthy weight participants. A Spearman \(rho\) correlation coefficient was calculated for the relationship between BMI and fitness status. A weak negative correlation was found \(r (548) = -0.24, p = 0.01\), indicating a significant relationship between the two variables. Underweight and healthy weight participants tended to have higher fitness status scores than overweight and obese participants.

**Stress and Emotional Health**

The interaction between BMI and job classification was not significant \(F (5, 539) = 1.60, p = 0.16\). A significant main effect for job classification was not found for stress and emotional health \(F (2, 539) = .82, p = 0.44\). A Spearman \(rho\) correlation coefficient was calculated for the relationship between job classification and stress and emotional health. A weak negative correlation that was not significant was found \(r (548) = -0.02, p = 0.54\). Stress and emotion health scores were not related to job classification.

A significant main effect for BMI was found for stress and emotional health \(F (3, 539) = 2.89, p = 0.04\). Tukey’s HSD post hoc test indicated no significant differences among BMI classifications: underweight \((m = 63.20, sd = 19.63)\), healthy weight \((m = 75.73, sd = 14.05)\), overweight \((m = 76.27, sd = 12.69)\), and obese \((m = 72.80, sd = 16.48)\) participants. A Spearman \(rho\) correlation coefficient was calculated for the relationship between BMI and stress and emotional health. A weak negative correlation
that was not significant was found ($r (548) = -0.04, p = 0.31$). Stress and emotional health scores were not related to BMI.
CHAPTER 5: DISCUSSION

Discussion, Conclusions, and Recommendations

The purpose of this cross-sectional study was to determine whether there were significant differences among employees categorized by BMI and job classification as measured using the dependent variables: clinical measures and wellness scores. This chapter provides a discussion of the data, conclusions, and recommendations to improve employee wellness at OU, a major university located in the Appalachian portion of Ohio. In this study, the major significant differences were found within total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, and personal wellness scores.

Discussion and Conclusions

Lipid Profile

In this study, the results showed that the fasting lipid profile, including total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides, were the most significant clinical measures by job classification or BMI. Significant \( p \)-values for the lipid profile were indicated: total cholesterol was significant within job classification \( (p = .03) \) and BMI \( (p = .01) \); LDL cholesterol was significant within BMI classification \( (p = .00) \); HDL cholesterol was significant within BMI classification \( (p = .00) \); and triglycerides were also significant within BMI classification \( (p = .00) \).

The ATP III stratifications were used as a guide regarding the lipid profile classifications. Elevated total cholesterol, increased triglycerides and decreased HDL
levels often predisposes an increased risk for cardiovascular complications (Bays et al., 2007; Panagiotakos, et al., 2008). The most common cause of elevated serum cholesterol is the consumption of foods from animal origin, which are typically high in saturated fat and cholesterol (NHLBI, 2002). For this study, it is imperative to note that OU is located in the Appalachian region, which is characterized by lower income, lower levels of education, and lower standard of living than the rest of the United States (ARC, n.d.).

**Total Cholesterol**

According to the ATP III guidelines (NHLBI, 2002), all job classifications had a mean total cholesterol value within the desirable range of < 200 mg/dL. Within all participants, 64.6% were desirable, followed by 27.9% borderline high, and 7.5% with high cholesterol. Interestingly, OU is comparable to data from the 1999-2004 NHANES study which followed a similar pattern, 53.5% were desirable, followed by 31.9% borderline high, and 14.6% with high total cholesterol for the non-institutionalized civilian U.S. population (Hyre, Muntner, Menke, Raggi, & He, 2007). NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the U.S. (CDC, 2007).

Similar to OU, which revealed classified staff to have the highest percent within high and borderline high total cholesterol, a study by Niknian, Linnan, Lasater, and Carleton (1991) showed that blue collar workers had a significantly higher percentage within high (23.5%) and borderline high (28.7%) total cholesterol when compared to white collar workers, 22.8% and 29.2% respectively. Similar results were also found in a study by Poppius, Tenkanen, Kalimo, and Heinsalmi (1999), blue collar workers had
significantly higher total cholesterol values than white collar workers. Interestingly, according to Carroll, et al., (2005), high total cholesterol (≥ 240 mg/dL) decreased from 20% during NHANES III 1988-1994 to 17% during NHANES 1999-2002, which revealed a positive trend towards the prevention of heart disease and related chronic diseases.

Low Density Lipoprotein

Low density lipoprotein (LDL) cholesterol revealed a significant difference within BMI classifications. Overall, 32.8% of OU participants were within optimal range, 41.8% near optimal, 19.3% borderline high, 5.0% high and 1.1% very high.

Overall, approximately 25.0% of the OU participants had a LDL cholesterol level higher than 130 mg/dL. Similar to OU, a study conducted at the University of Wisconsin–Eau Claire (UW–Eau Claire) also revealed that approximately 31% of the faculty and staff had a LDL level higher than 130 mg/dL (Lila, Reller, Smecko, & Wallenta, 2008). The results were also consistent with the NHANES 1999-2004 data; approximately 35% of the population had a LDL level higher than 130 mg/dL (Hyre et al., 2007). Therefore, over 60% of the subjects were within the optimal or near optimal classification.

High Density Lipoprotein

According to the ATP III stratifications both underweight and healthy weight participants had mean values within the “high” classification (≥ 60 mg/dL), while obese and overweight participants had a mean HDL cholesterol values < 60 mg/dL. HDL cholesterol values gradually decreased as BMI increased beyond healthy weight; overall
within the BMI classification, underweight (40.0%), healthy weight (52.0%), overweight (29.9%), and obese (16.1%) participants were within the “high” HDL classification. Low HDL cholesterol followed the opposite pattern as high LDL cholesterol, with the highest percentage found within obese (29.4%), and followed by overweight (16.8%), healthy weight (6.4%), and underweight (0.0%) participants.

Comparable to OU, the study at UW–Eau Claire showed that 17% of the participants reported a low HDL level, and 48% exhibited a high HDL (Lila et al., 2008). The study by Niknian et al. revealed that blue collar workers (48.1%) had a significantly lower HDL cholesterol value than white collar workers (51.1%). Results from the NHANES 1999-2004 data indicated 19.5% of the population had low HDL cholesterol, 53.0% were within optimal range, and 27.6% had high HDL cholesterol values. Overall, all studies revealed that approximately 50% of the participants were within the optimal or high HDL cholesterol range, which is important since high HDL may help to protect individuals from developing heart disease (Schober, Carroll, Lacher, & Hirsch, 2007).

*Triglycerides*

According to the ATP III stratifications, underweight, healthy weight, overweight, and obese participants all had a mean triglyceride value within the normal range. However, total percent of “normal” triglyceride values within BMI classifications gradually decreased beyond healthy weight. Overall, within BMI classification, 100% underweight, 91.6% healthy weight, 71.6% overweight, and 65.5% obese participants were within the normal triglyceride range. Similar results were found at the UW–Eau Claire, in which all participants were within the normal range (Lila et al., 2008).
According to NHANES 1999-2004 data, over 60% of the population were also within normal range (Hyre et al., 2007). The positive trend of normal triglyceride values may lead to a decrease in the incidence of heart disease.

**Personal Wellness Scores**

Overall wellness scores revealed that 21.1% of the participants were classified as “good,” 58.2% “needs to improve,” and 13.6% “caution, high risk;” however, it is important to note a score of “excellent” was not received for overall wellness. Faculty scored significantly higher than both administrative and classified staff in terms of overall personal wellness, coronary risk, cancer risk, nutrition status, and fitness status; however, no significant difference was found within job classification for stress and emotional health.

According to the personal wellness report, faculty had mean scores within the “good” category for all variables; except for stress and emotional health a mean score of excellent was received. The personal wellness report also revealed that administration had a mean score of “excellent” for stress and emotional health. Administration was within the “good” category for coronary risk, cancer risk, and nutrition status; however, they scored within the “needs to improve” category for fitness status and overall wellness. Finally, classified staff received a mean score of “good” within stress and emotional health, and “needs to improve” for the remainder of the variables. Overall, fitness status received the lowest mean scores within job classification and BMI categories.
Similar to OU’s HRA, a study by Walton and Timms (1999) also used the Personal Wellness Profile (PWP), developed by Wellsource, Inc. to assess individual health risk and current behaviors for the South Carolina Department of Transportation employees. This study indicated 19% of the participants received a “good” or “excellent” rating, 56% received a “fair” rating, and 36% received a “poor” rating within overall wellness scores. Overall, within job classification at OU: 41.8% faculty, 24.6% administrative, and 9.6% of the classified staff were within the “good” classification; 32.9% faculty, 59.5% administrative, and 65.8% of the classified staff were within the “needs to improve” classification; and, 2.5% faculty, 9.5% administrative, and 22.4% of the classified staff were within the “caution, high risk” classification. The Walton and Timms study suggested that early detection of employee health problems may have a positive impact on overall employee health and reduce medical claims. The personal wellness report (see Appendix D) describes the differences among the overall wellness scores categorized as: excellent, good, needs to improve, and caution, high risk.

In comparison to Walton and Timms and OU’s study, several other studies have also quantified health status of employees. A study by Niknian et al. revealed that blue collar workers identified as workers in labor, manufacturing, industry, farming, forestry, mechanics, and transportation had a significantly lower HDL cholesterol and significantly higher BMI when compared to white collar colleagues. The white collar employees included management, scientists, teachers, health practitioners, writers, and sales. Comparable, the Helsinki Heart Study by Poppius et al. (1999) revealed that total cholesterol, BMI and systolic blood pressure were significantly higher for blue collar
workers than white collar workers. Furthermore, it is imperative to assess the needs and health concerns within each job classification to provide the appropriate interventions.

*Wellness Programs*

Specific wellness programs geared toward improvement of overall wellness scores and the lipid profile may be beneficial for OU administrative, classified staff, and faculty. Several studies have shown beneficial effects of implementing wellness programs within the college or university setting. For example, at the UW-Eau Claire, similar findings to OU were found through an initial health screening which consisted of resting blood pressure, fasting blood lipids and glucose, and anthropometric measurements. Furthermore, the findings through the health assessment of UW-Eau Claire faculty and staff suggest a workplace wellness intervention would be beneficial (Lila et al., 2008). Comparable results were shown in a study by Haines et al. (2007) which revealed a positive interaction between college faculty and staff in regards to a 12-week worksite walking intervention. A reduction in mean BMI, blood pressure, blood glucose, and total cholesterol levels were evident in the post-walking intervention follow-up. Furthermore, improvement was also reported in regards to fitness level, health awareness, nutrition habits, and overall health status. Also, a university-based wellness program in Morgantown, West Virginia, revealed positive improvements from pre- and post-program in terms of physiologic measures of weight, blood pressure, total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, and blood glucose (Reger, Williams, Kolar, Smith and Douglas, 2002). Thus, wellness programs within a university
setting may decrease health risks as influenced by excess adiposity and may improve worker productivity.

Overall, workplace wellness programs might promote a decreased prevalence of chronic diseases such as cardiovascular disease, certain types of cancer, and hypertension, which in turn might reduce health care expenses (Abood, Black, & Feral, 2003). It is clear from the reviewed studies and results from the OU Health Risk Appraisal that OU might benefit from specific employee wellness programs geared toward the improvement of overall wellness scores and lipid profiles. Furthermore, wellness programs to target specific job classifications in attempt to improve worker productivity and to decrease costs associated with less than optimal health and wellbeing (Finkelstein et al., 2005).

**Recommendations**

1. To avoid errors within the data, WellWorks staff should consider entering all clinical and anthropometric measurements for each participant. This would be an effective way to ensure accuracy of data instead of relying on self-reported information. Based on personal experience with folder reviews, there were numerous cases of inaccurate data entry for both anthropometric and clinical measures, which were all self-entered by each participant. This recommendation is made for the following reasons: prior to folder reviews, a total of 566 OU employees actually completed all three steps of the HRA initiative; however, upon completion of the folder reviews, 16 participants were excluded from the
data analysis. Exclusion criteria were based on the following: (a) missing folders from the initial assessment; (b) inaccurate height entered by staff member into the bioelectrical impedance scale. Furthermore, it is imperative for WellWorks staff to enter both anthropometric data and clinical measures to save time and to ensure reliability of collected data.

2. The bioelectrical impedance scale is easy to use, and can quickly acquire information on both lean and fat tissue at a relatively low cost for a large number of participants. However, the bioelectrical impedance scale may not be the best method for determining both lean and fat tissue due to it primarily measures total body water, hence, hydration status may affect accuracy. It has been observed that the bioelectrical impedance scale has a tendency to underestimate the fat content in males and overestimate fat content for females (Kamimura et al., 2003). Furthermore, considering an alternative method such as skin fold measurements may be a more reliable method to assess body fat.

3. To encourage participation for all three steps of the Health Risk Appraisal initiative, WellWorks and OU should consider providing a monetary incentive or reduction in health insurance after each step of the health assessment. For example, after each completed step, the participant would receive $40 off monthly health insurance, so ultimately the participant could have a $120 total reduction in health insurance each month. The long term goal of this proposed incentive program is to improve the culture of wellness at OU by implementing educational programs geared towards the OU employee population.
4. Specific educational programs designed for each job classification to promote improvement in overall wellness scores, and specifically lipid profile. Educational programs may include psychological classes for stress management; exercise programs such as designed walking groups to promote physical activity; and a nutrition program may include cooking, shopping, meal preparation, healthier food choices. However, before an educational program can take place all angles must be considered. For example, the program should be available for all working shifts to meet the needs of all employees.
REFERENCES


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http://www.arc.gov/index.do?nodeId=56#Query1


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APPENDIX A: INSTITUTIONAL REVIEW BOARD

The following research study has been approved by the Institutional Review Board at Ohio University for the period listed below. This review was conducted through an expedited review procedure as defined in the federal regulations as Category(ies):

Project Title: Obesity and Health Risk Factors for Employees at a Major University in Rural Appalachian Ohio

Researcher(s): Melissa Teeters

Faculty Advisor (if applicable): Darlene Berryman

Department: Health and Human Services

Approval Date: 11/14/08
Expiration Date: 11/13/09

This approval is valid until expiration date listed above. If you wish to continue beyond expiration date, you must submit a periodic review application and obtain approval prior to continuation.

Adverse events must be reported to the IRB promptly, within 5 working days of the occurrence.

The approval remains in effect provided the study is conducted exactly as described in your application for review. Any additions or modifications to the project must be approved by the IRB (as an amendment) prior to implementation.
APPENDIX B: WAIVER AND RELEASE

WAIVER AND RELEASE

I desire to voluntarily participate in Ohio University’s WellWorks Health Risk Appraisal program. I understand that this screening and appraisal do not substitute for the care of a physician. In consideration of my participation in this program, I, my heirs, executor, administrators, and assigns do hereby release and discharge Ohio University, its officers, agents, sponsors, or employees from any responsibility or liability for activities that I may engage in as a result of participating in this program. I understand that any abnormal results will be sent to the following named physician, ________________________, for appropriate follow-up. I attest that I have full knowledge of any and all risk involved in participating in the WellWorks program. I further give permission for Ohio University to use data collected for program development and research purposes as appropriate. I understand these data will only be reported in a confidential and anonymous manner.

Signature: ________________________ Date: ________________________
APPENDIX C: PERSONAL WELLNESS PROFILE

![Image of the Personal Wellness Profile form]

**Proper Mark**
- ![Proper Mark Image]

**Improper Mark**
- ![Improper Mark Image]

### Last Name - Space - First Name

4. **Personal health history** Has a doctor informed you that you currently have any of the following health problems? If yes, mark either yes, but not taking medication or yes, and taking medication, otherwise leave blank.

   **1 - yes, but not taking medication**
   **2 - yes, and taking medication**

1. ✅ ✅ asthma
2. ✅ ✅ bowel polyp or inflammatory bowel disease
3. ✅ ✅ cancer, other than skin cancer
4. ✅ ✅ chronic bronchitis or emphysema (COPD)
5. ✅ ✅ coronary heart disease, congestive heart failure, angina, heart attack, or heart surgery
6. ✅ ✅ diabetes (high blood sugar)
7. ✅ ✅ high blood pressure (140/90 or higher)
8. ✅ ✅ high blood cholesterol (240 or higher)
9. ✅ ✅ sciatica or chronic back problem
10. ✅ ✅ stroke or restricted blood flow to head or legs

5. **Current symptoms** Mark any of the following symptoms you have experienced within the last four weeks.

1. ✅ chest pain or discomfort, frequent palpitations or fluttering in the heart
2. ✅ unusual shortness of breath
3. ✅ unexplained dizziness or fainting
4. ✅ temporary sensation of numbness or tingling, paralysis, vision problem, or lightheadedness
5. ✅ frequent urination and unusual thirst
6. ✅ frequent back pain
7. ✅ have trouble sleeping lately
8. ✅ I've recently thought about ending my life

6. **Bodily pain** How much bodily pain have you had during the past four weeks?

   - none
   - very mild
   - mild
   - moderate
   - severe
   - very severe

7. **Health limitations** During the past four weeks, how much difficulty did you have doing your work or other regular daily activities as a result of your physical health?

   - none
   - a little bit
   - some
   - quite a bit
   - could not do daily work

8. **Emotional problems** During the past four weeks, to what extent have you accomplished less than you would like in your work or other daily activities as a result of emotional problems, such as feeling depressed or anxious?

   - none at all
   - slightly
   - moderately
   - quite a bit
   - extremely

9. **Social activity** During the past four weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

   - none at all
   - slightly
   - moderately
   - quite a bit
   - extremely

10. **Daily activities** The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so how much?

   **1 - yes, limited a lot**
   **2 - yes, limited a little**
   **3 - no, not limited at all**

1. ✅ ✅ lifting or carrying groceries
2. ✅ ✅ climbing several flights of stairs
3. ✅ ✅ walking several blocks

11. **Exercise** How many days per week do you engage in aerobic exercise of at least 20 to 30 minutes duration (fitness walking, cycling, jogging, swimming, aerobic dance, active sports)?

   - none
   - three days
   - six days
   - one day
   - four days
   - seven days
   - two days
   - five days

12. **Strength exercises** How many times per week do you do strength building exercises such as sit-ups, push-ups, or use weight training equipment?

   - none
   - twice a week
   - once a week
   - three or more

13. **Stretching exercises** How many times per week do you do stretching exercises to improve flexibility of your back, neck, shoulders, and legs?

   - none
   - twice a week
   - once a week
   - three or more

14. **Breakfast** How often do you eat breakfast, more than just a roll and a cup of coffee?

   - eat breakfast every day
   - eat breakfast most mornings
   - eat breakfast two to three times per week
   - seldom or never eat breakfast

15. **Snacks** How often do you eat snack foods between meals (chips, pastries, soft drinks, candy, ice cream, cookies)?

   - three or more times per day
   - once or twice per day
   - few times per week
   - seldom or never eat typical snacks

16. **Salt** How often do you add salt to your food or eat salty foods (chips, pickles, soy sauce)?

   - seldom or never
   - most meals
   - some meals
   - nearly every meal
17. **Fat intake** Indicate the kinds of foods you usually eat.
   **High fat examples:** hamburgers, hot dogs, bologna, steaks, sour cream, cheese, whole milk, eggs, butter, cake, pastry, ice cream, chocolate, fried foods, and many fast foods.
   **Low fat examples:** lean meats, skinless poultry, fish, skim milk, low fat dairy products, fruit, vegetables, pasta, legumes (peas and beans).
   - nearly always eat the high fat foods
   - eat mostly the high fat foods, some low fat
   - eat about the same
   - eat mostly low fat foods, some high fat
   - eat only low fat foods

18. **Breads and grains** Indicate the kinds of breads and grains you usually eat.
   **Refined grain examples:** white bread, rolls, regular pancakes and waffles, white rice, typical breakfast cereals, typical baked goods.
   **Whole grain examples:** whole grain breads, brown rice, oatmeal, whole grain or high fiber cereals.
   - nearly always eat refined grain products
   - eat mostly refined grain products
   - eat about the same
   - eat primarily whole grain products
   - eat only whole grain products

19. **Fruits and vegetables** How many servings of fruits and vegetables do you eat daily?
   **A serving is:** 1 cup fresh, 1/2 cup cooked, 1 medium size fruit, or 3/4 cup juice
   - 1 or less
   - three daily
   - five or more
   - two daily
   - four daily

20. **Number of drinks** How many alcoholic drinks do you usually have per week?
   **One drinks is:** a 12 oz. beer, 5 oz. wine, or 1.5 oz. liquor
   - seldom or never
   - one to seven
   - fifteen to twenty
   - twenty-one or more
   - eight to fourteen

21. **Medications** How often do you use drugs or medicines (include prescription and nonprescription) that affect your mood, help you relax, or help you sleep?
   - frequently
   - sometimes
   - rarely
   - never

22. **Smoking status** Mark the appropriate response.
   - have never smoked
   - quit smoking two or more years ago
   - quit smoking less than two years ago
   - smoke pipe or cigar only
   - currently smoke less than ten cigarettes daily
   - currently smoke ten or more cigarettes daily

23. **Chewing tobacco** Do you use chewing tobacco?
   - yes
   - no

24. **Coping status** How well do you feel you are coping with your current stress load?
   - coping very well
   - coping fairly well
   - have trouble coping at times
   - often have trouble coping
   - feel unable to cope any more

25. **Stress signals** Mark any item below that applies to you.
   1. Minor problems throw me for a loop.
   2. I find it difficult to get along with people I used to enjoy.
   3. Nothing seems to give me pleasure anymore.
   4. I am unable to stop thinking about my problems.
   5. I feel frustrated, impatient, or angry much of the time.
   6. I feel tense or anxious much of the time.

26. **Feelings** The next questions are about how you feel things have been with you during the past four weeks. For each question, please give the one answer that comes the closest to the way you have been feeling. How much of the time during the past four weeks...

   **1 - all the time**
   **2 - most of the time**
   **3 - a good bit of the time**
   **4 - some of the time**
   **5 - a little of the time**
   **6 - none of the time**

   1. Have you felt calm and peaceful?
   2. Did you have a lot of energy?
   3. Have you felt downhearted/blue?
   4. Have you been a happy person?
   5. Have you felt worthless, inadequate, or unimportant?
   6. Did you take the time to relax and have fun daily?

27. **Sleep** How often do you get 7 to 8 hours of sleep?
   - always
   - most of the time
   - seldom or never

28. **Job satisfaction** Indicate level of satisfaction.
   - very satisfied
   - mostly satisfied
   - dissatisfied
   - not applicable

29. **Social support** Do you have friends/family with whom you can share problems/get help if needed?
   - yes
   - no

30. **Seat belts** How often do you wear a seat belt?
   - always
   - most of the time
   - seldom or never

31. **Sun protection** Do you use sun screen, wear protective clothing, avoid sun bathing, etc.?
   - yes
   - no
32. **Lifting** When lifting heavy objects, how often do you lift with your legs not with your back?
- always
- most of the time
- seldom or don't know

33. **Drinking and driving** Do you sometimes drive when perhaps you've had too much to drink, or ride with such a person?
- yes
- no

34. **Physical exam** When was your last physical examination? Within the last:
- year
- three years
- five or more years
- two years
- four years

35. **Women's health issues** Mark all that apply. Men skip to next question.
- Currently pregnant.
- Had PAP smear, within last 1-3 years.
- Had mammogram within last 1-2 years.
- Gave birth before reaching age 30.
- Passed or reached menopause.
- Taking estrogen, female hormones.
- Practice monthly breast self-exam.

36. **Sick days** How many days did you miss from work (or from school if a student) due to illness or injury during the last 12 months?
- 0
- 1-2
- 3-4
- 5-6
- 7-8
- 9-10
- 10+

37. **Preventive exams** Mark the preventive exams you have had during the time frame listed:
- bowel exam, or flexible sigmoidoscopy within last 3-10 yrs.
- dental exam, within last year
- flu shot, within last year

38. **Readiness to change** Indicate how ready you are to make the changes or improvements in your health in the following areas:
- no present interest in making a change
- plan a change in the next 6 months
- plan to change this month
- recently started doing this
- already do this regularly (6 mos. +)

39. **Health interests** Mark any of the following health improvement opportunities that you would like to be personally notified about if available.
- Cutting smoking
- Weight management
- Aerobics to music
- A walking group
- Jogging group
- Fitness evaluation
- Nutrition improvement
- Cholesterol reduction
- Blood pressure control
- Reducing coronary risk
- Cancer risk reduction

**CLINICAL DATA** Staff Use Only
- mmoles use decimals, otherwise ignore decimals

- Systolic
- Diastolic
- Cholesterol
- Glucose
- Triglycerides

- Waist
- Hip
- Body Composition
- Sum of skinfolds
- Known % fat
- HbA1c

**PLEASE DO NOT WRITE IN THIS AREA**

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Optional Questions

Please fill in the answers below in the “Optional” section on your paper Personal Wellness Profile.

1. Please look at your health screening laboratory results. If there is a value for HbA1c, please answer below. If not, please advance to the next question.
   1.) $\leq 5.9$
   2.) 6.0 - 6.9
   3.) 7.0 - 7.9
   4.) 8.0 - 8.9
   5.) $\geq 9.0$

2. Do you think Ohio University promotes a culture of wellness for their employees?
   1.) Yes
   2.) No

3. Do you think that employees at Ohio University are encouraged to balance their work and personal life?
   1.) Yes
   2.) No

4. Do you think that employees who do not smoke and/or use tobacco should receive a discount on their health insurance?
   1.) Yes
   2.) No

5. Do you have a family physician?
   1.) Yes
   2.) No

6. Do you and your family:
   1.) mostly see your doctor for regular physicals and preventative testing?
   2.) mostly see your doctor only when ill?
   3.) mostly see the doctor at the emergency/walk-in clinic when needed?

7. What is your top health concern with your family’s health?
   1.) eating habits
   2.) smoking
   3.) exercise habits
   4.) chronic conditions
   5.) stress
8. How many different prescription medications do you personally take?
   1.) One or less
   2.) Two daily
   3.) Three daily
   4.) Four daily
   5.) Five or more daily

9. Have you suffered a personal loss or misfortune in the past year? (For example: job loss, disability, divorce, separation, jail term, or the death of someone close to you)
   1.) Yes, two or more serious losses
   2.) Yes, one serious loss
   3.) No

10. During the past year, how much effect has stress had on your health?
   1.) None
   2.) A little bit
   3.) Some
   4.) Quite a bit
   5.) Could not do daily work

11. How often do you eat fast food meals such as hamburgers, tacos, fried chicken, hot dogs, French fries, milkshakes, etc.?
   1.) Eat fast food every day
   2.) Eat fast food most days
   3.) Eat fast food 2-3 times per week
   4.) Seldom or never eat fast food

12. What is your job classification?
   1.) Administrative
   2.) Classified (Bargaining Unit)
   3.) Classified (Non-Bargaining Unit)
   4.) Faculty
   5.) FOP

If you have any questions, please contact Heidi Anderson at 3-9458 or andersh2@ohio.edu.

Thank you!
Personal Wellness Profile

Report for: 10/1/2008

Please Note: Because one or more questions were left blank, answers were furnished (default answers) by the computer to provide you with a complete report. The default answers are generally considered average or assume the healthiest lifestyle habits. As a result, the recommendations are based on your responses and those entered by the computer.

Assessing Health Needs Assessing your health is an important first step in taking responsibility for your own health and well-being. This health assessment will help you identify health risks. It will also suggest what preventive actions you can take to achieve and maintain optimum health.

Wellness Scores
Overall Wellness Score: 72 out of 100 points
Rating: Good

The overall wellness score is a calculated value that represents your health based on the survey results.

> Scores range from 0 to 100 with high scores being more favorable.
> The wellness rating for the range of scores is shown in the chart below.

Wellness Rating Scale

75 to 100 Excellent
50 to 74 Good
25 to 49 Needs to Improve
0 to 24 Caution, High Risk

Your scores for each of the 7 major areas of wellness are shown in the full report below. Items numbered in red indicate a need for improvement.

Individual Risks

In each major area of wellness, a list of health behaviors or risks are shown. It is these individual risks and health habits that make up your score for that area of wellness. Review the list to see how you are doing.

Personal risks and areas of concern are flagged with a "*".

For further information and insights on reducing risk and enhancing health, click on the undefined links.

1 Coronary Risk

You have 2 risk factors for coronary heart disease (*). This puts you at low risk. Take preventive action now to reduce your risks and prevent a future heart problem!

Factors Increasing Coronary Risk:

Personal Wellness Profile Report

Rating: Good

- Elevated cholesterol - 200 mg/dl (5.20 mmol/L) or greater.
  Your cholesterol = 158 mg/dl (4.11 mmol/L). Cholesterol is evaluated using HDL Cholesterol values when available (High HDL may reduce risk of Total Cholesterol).
- Low HDL cholesterol - 45 mg/dl (1.17 mmol/L) or less. Your HDL cholesterol = 50 mg/dl (1.30 mmol/L).
- High LDL cholesterol - 130 mg/dl (3.38 mmol/L) or more.
  Your LDL cholesterol = 78 mg/dl (2.03 mmol/L).
- Elevated blood pressure - 140/90 and above is high. Desired is less than 120/80 and 120/80 to 139/89 is prehypertension. Your blood pressure is 110/68.
- Smoking
- Age (55+) and gender (men are at a higher risk than women)
- Sedentary lifestyle
- Family or personal history of early heart disease or diabetes
- Overweight - percent fat >25.0%. Your body fat = 26.0% 
- Diabetes - fasting glucose of 100 mg/dl (5.60 mmol/L) or greater. Your fasting blood glucose = 78 mg/dl (4.37 mmol/L). 
- High blood fats (called triglycerides) - 150 mg/dl (1.65 mmol/L) or above are an increased health risk. Your triglyceride level is 150 mg/dl (1.65 mmol/L) and needs to be lowered.

Preventive Actions:
- Heart Health
- Improve HDL Cholesterol Levels
- Lower LDL Cholesterol
- Lower Blood Pressure
- Insulin Resistance
- Smoking and the Heart
- Maintain a Healthy Weight

2. Cancer Risk

Cancer Risk Score
49 out of 100 points
Rating: Needs to improve

Cancer is the second leading cause of death in the US. Most cancer is caused by lifestyle practices (smoking, eating habits, drinking, exposure to multiple sexual partners, etc.) and may be preventable. Many cancers can be detected early through regular cancer checkups and can be successfully treated. Review your risk factors (✓) below:

Factors Increasing Cancer Risk:
- Family/personal history of cancer
- Smoking or using chewing tobacco
- Eating fewer than 5 servings of fruits and vegetables
- High fat diet
- Low fiber diet
- High alcohol intake
- Overweight - percent fat >25.0%. Your body fat = 26.0%
- High sun exposure
- Exposure to multiple sex partners

Preventive Actions:
- Cancer Prevention
- Smoking
- Cholesterol in Foods
- Alcohol Use
- Body Weight
- Avoiding Skin Cancer

3 Nutrition Status

Nutrition Score
76 out of 100 points
Rating: Excellent

The food we eat provides the nutrients required for every cell of our body to function properly. Good eating habits can reduce our risk of: overweight, high blood pressure, stroke, heart disease, cancer, and can enhance our resistance to disease. Review your nutrition status and how you might eat better. Pay special attention to the marked (*) items.

Components of Good Nutrition:
- Eat breakfast daily
- Regular meals, avoid frequent eating of snack foods
- Low fat intake
- Whole-grain breads and cereals
- Salt in moderation
- Eat 5 or more servings of fruits and vegetables daily

Nutrition Guidelines
"Choose a diet with most of the calories from grain products, vegetables, fruits, lowfat milk products, lean meats, fish, poultry, and dry beans. Choose very few calories from fats and sweets." Dietary Guidelines for Americans

Preventive Actions:
- Nutrition Guidelines
- Eat Your Breakfast
- Fight Food Cravings
- Choose Healthy Fats
- Benefits of Whole Grains
- Salt or Sodium
- Fruits and Vegetables

4 Fitness Status

Fitness Score
64 out of 100 points
Rating: Good

Every body needs regular exercise. Without it your muscles, bones, and cardiovascular system all weaken. Exercise helps prevent excess weight, high blood pressure, diabetes, heart disease and certain cancers. It also relieves stress and tension.

Components of a Good Fitness Routine Include:
- Muscle strength training - twice per week recommended
- Flexibility, stretching exercises - 2-3 times/week recommended
- Aerobic or cardiovascular fitness - 3-5+ days/wk recommended
- Body composition - percent fat <25.0%. Your body fat = 26.0%

Exercise Guidelines
"Every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week." Centers for Disease Control.

Preventive Actions:
- Remove Barriers to Exercise
- Develop Your Strength Training Program
- Develop a Personal Fitness Program
- Fitness - Mind and Body
- Be Successful at Exercise
- Maintain a Healthy Weight

5 Stress/Emotional Health

Mental Wellness Score
74 out of 100 points

Rating:
Good

Excessive stress, depression, anxiety and strong feelings, all have a profound effect on mental health, physical health, productivity, and enjoyment of life. Maintaining good stress management and emotional well-being are important parts of any wellness program.

Indicators of Mental Wellness Include:
- Coping status - You report “coping well”
- Stress signals - You marked no stress signals. This indicates you are coping well with life.
- Happiness - This is a general indicator of how your life is going.
- Energy level - Low energy is often linked to emotional problems.
- Sleep is essential for good mental/emotional health. 7-8 hours per day is recommended for optimum physical and mental health.

Preventive Actions:
- Mental Well-being
- Coping with Stress
- Dealing with Depression
- Depression Self Test
- Diet and Stress
- What Determines Happiness?

6 Substance Use

Substance Use Score
100 out of 100 points

Rating:
Excellent

Substance abuse is the single largest cause of premature death in the US. Do not let chemical dependencies control your life. Get help, if needed.

Substance Use Issues:
- Congratulations for not smoking.
- You are commended for not chewing tobacco.
- Drinking is not recommended but if you choose to drink, limit intake to no more than 1-2 drinks in any one day.

Some people should not drink alcohol:
- Pregnant Women
- People operating machinery
- Children
- Those unable to control their drinking
- Mood altering drugs - Limit to prescribed medications
- If you take more than one prescribed medication, tell your doctor and druggist so you can avoid any dangerous drug interaction.

Preventive Actions:
- Addiction and Disease
- Alcohol Use
- Smoking
- Caffeine and Health
7 Safety

Safety Score
85 out of 100 points

Rating:
Excellent

Accidents are the leading cause of death for persons under 35 and the 3rd leading cause of death overall. Most accidents could be prevented by being safety-minded and taking precautions.

Safety Issues:
2. Smoke detector - Every home needs a smoke detector in the area where people sleep. Check it regularly to make sure it works.
3. Lifting - Use good lifting techniques to prevent back injury.
4. Never drink and drive. If you drink, allow 1-2 hours/drink to clear the mind of the effects of alcohol before driving.
5. Helmets - If you ride a bike, in-line skate, or ride a motor bike, helmets can prevent serious head injuries.

Preventive Actions:
- Make Safe Choices
- Staying Safe Behind the Wheel
- Get in Shape without Getting Injured
- Your Kitchen Could Make You Sick
- Seniors and Food Safety
- Responsible Sexual Behavior

8 Health Age

Your choice of health practices, to a large degree, determines how fast you will age. In a study of some 6,900 people followed for 15 years they found 7 health practices to be good predictors of longevity. Your health practices are compared to this study population to determine your “Health Age.”

Current Age
28 years
(based on your number of birthdays)

Health Age
26.6 years
(based on your health practices)

Potential Health Age
23.2 years
(This is your potential if you were following all 7 of the good health practices.)

Years of added life
3.4 years
(This is how many years you can add to your life expectancy by following all 7 of the good health practices. More importantly, you can add life to your years.)

Health Practices Related to Longevity
- Regular exercise
- Eat breakfast daily
- Maintain a healthy weight
- Not smoking
- Not drinking alcohol or light to moderate intake

9 Medical Follow-up

Discuss the following health problems marked on your lifestyle questionnaire with your primary care physician (PCP):

10 Preventive Exams

The following preventive exams are recommended:

- Physical exam, every 1-3 years.
- Cholesterol check, every 2-5 years.
- Blood pressure check, every 1-2 years.
- Bowel exam, after 50, yearly check for blood in stool or flexible sigmoidoscopy every 5 years, and colonoscopy every 10 years.
- Dental exam, yearly.
- Vision, every 2-4 years, every 2 years after age 60.
- Health and lifestyle assessment, every 1-2 years, yearly if high risk.
- Immunizations, tetanus every 10 years, pneumonia once at age 65+ and flu yearly at age 50+.
- Women only:
  - If pregnant, get prenatal care early (within the first trimester).
  - PAP smear, every 1-3 years.
  - Mammogram with breast exam, every 1-2 after age 40.
  - Breast self-exam, monthly.

Recommendations based on:

- Put Prevention into Practice, US Dept. of Health and Human Services.

11 Leading Causes of Death, Persons 25-64

If you know your leading health hazards, take steps to minimize your risk.

1. Cancer
2. Heart disease
3. Motor vehicle and other accidents
4. Human immunodeficiency virus (HIV) infection (AIDS)
5. Suicide and homicide

Preventive Actions:

- Cancer Prevention
- Heart Health
- Safety/Accident Prevention
- Mental Well-being

12 Summary of Recommended Health Actions

Personal Recommendations:

Recommendations are personal, based on your risks and listed in priority of need. Up to 5 are listed.

1. Reduce cancer risk
13 The Next Step

WellAssured Guides To Better Health® are available from Wellsource for many areas of health concern. Don't wait until a serious health problem develops to take an active interest in your health. Take preventive action today. Review the list of personal health recommendations above. Give serious consideration to which area(s) of health you would like to improve.

Choose a topic you are most interested in pursuing and start your personal health improvement program today.

- Improving Fitness
- Managing Stress
- Blood Pressure Management
- Lowering Cholesterol Levels
- Improving Nutrition
- Senior Health
- Healthy Pregnancy

14 Other Health Resources

Community programs and organizations

- Your local hospital health promotion department
- Local heart association
- Local lung association
- County health department

Books

Amer. Heart Assoc. and Amer. Cancer Society, Living Well,
Staying Well, Times Books, Random House
Amer. College of Sports Medicine, ACSM Fitness Book, Leisure
Press
Sorja Conner, MS RD and William Connor, MD, The New
American Diet, Simon and Schuster Inc.