UNIVERSITY OF CINCINNATI

Date: November 18, 2008

I, Terri L. Rose,
hereby submit this work as part of the requirements for the degree of:
Master of Science
in:
Nutritional Sciences

It is entitled:
Influence of Diet and Diet Education on Overweight and Obese Individuals:
Outcomes Related to Job Performance

This work and its defense approved by:

Chair: Shanil Juma, PhD
       Grace Falciglia, EdD, RD
Individuals: Outcomes Related to Job Performance

By

Terri Rose

November 18, 2008

Bachelor of Art, Business Administration
University of Cincinnati

Master of Science, Nutritional Sciences
Department of Nutritional Sciences
College of Allied Health Sciences
University of Cincinnati, Ohio

Shanil Juma, PhD
Committee Chair
Abstract

Influence of Diet and Diet Education on Overweight and Obese Individuals: Outcomes Related to Job Performance

By

Terri Rose

Background: Obesity is a serious issue and continues to increase with over 300 million obese adults in the World. The rise in obesity increases the risk of numerous chronic diseases, which in turn increases medical cost to treat these diseases. These medical costs have a financial impact on many industries that absorb the higher cost. There is additional cost to industries associated with obesity including decreased productivity and an increase in absenteeism. There are studies that support the fact that a modest reduction in weight can improve risk factors of obesity.

Methods: A Nutrition Guide (NG) was developed to assist a group of workers at The Kroger Co. with a BMI of >30 to make healthier choices when grocery shopping, cooking and planning meals or snacks. The guide focuses on eliminating or reducing three key ingredients (S.S.S) saturated fat, salt and sugar. It also addresses portion control and serving sizes. A Nutrition Evaluation Assessment Tool (NEAT) was also developed to measure the impact the NG could have on changing the behavior of the employee group in making healthier choices.

Conclusion: Studies of wellness programs in work settings have shown results of improving healthy behaviors of those that participate in the program. Wellness programs offer nutrition interventions, which include a variety of education tools to improve participant nutrition knowledge so they can make healthier choices. Many companies are interested in supporting wellness programs in hopes of improving employee’s health, which in turn may reduce medical cost and absenteeism, and also improve work satisfaction.
Acknowledgements

I would like to thank my advisor Dr. Shanil Juma for his unyielding support in completing my degree while he was the Assistant Professor at the Department of Nutrition Sciences College of Allied Health Sciences, University of Cincinnati. I appreciate his continued support in helping with the completion of my thesis as he took on his new role as Assistant Professor, Department of Nutrition and Food Science, Texas Woman’s University. Most importantly, I appreciate his unyielding support during many unforeseen challenges for approval of my thesis and turning it into a reachable goal.

A would especially like to thank Dr. Grace Falciglia, Professor and Head of the Department of Nutritional Sciences for believing in my ability to succeed when I lacked a strong science background. I would also like to thank The Kroger Co. for allowing flexibility in my work schedule to attend classes during the workweek and providing a continuing education financial program, which was truly appreciated and made my dream of completing my masters program affordable.

Finally, I would like to thank my family for dealing with my stressful moods and erratic schedule during the 4 years it took to complete my degree while working full time. Especially my husband Clint who took care of our home life so I would have time to work on projects and study. I would never have made it without his love, support and understanding. I would also like to thank my stepmother, Barb, for always being there when I needed to talk during many trying times and my dad, Bob, for keeping it real and not letting me whine. And lastly, my grandmother Marian, for all the talks during my long commutes home after class. She always reminded me of what was really important and that whatever I did it would be great.
# Table of Contents

## Introduction
- Background .......................................................... 1
- Objectives ............................................................. 3

## Literature Review
- Obesity Definition, Epidemiology and Prevalence ........... 4
- Risk Factors ............................................................ 6
- Obesity Economic Affects and Work Performance .......... 9
- Measuring Obesity .................................................... 13
- Biomarkers of Obesity .............................................. 14
- Treatment Options for Obesity .................................. 16
- Pharmacotherapy ..................................................... 17
- Nutrition and Obesity .............................................. 19

## Methods
- Nutrition Guide ....................................................... 22
- Nutrition Evaluation Assessment Tool ......................... 23

## Discussion .......................................................... 26

## Limitations ......................................................... 31

## Literature Cited ................................................... 32

## Appendix
- Nutrition Guide ....................................................... 46
- Nutrition Evaluation Assessment Tool ......................... 48
Introduction

Background:

In the world today there are over 1 billion overweight adults, in which 300 million are obese. Being obese or overweight increase the risk of chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension and stroke and certain types of cancer (McCrory et al., 1995). These health consequences increase the risk of premature death, and reduce the overall quality of life. The increase of obesity during childhood is also a major concern (WHO, 2007). This rise in obesity is believed to be a result of diets with a higher percentage of fat, saturated fat and sugar. Furthermore, there is a shift toward less physically demanding work, and more passive leisure time (Riebe et al., 2003). Overweight and obese individuals are classified using body mass index (BMI), defined as their weight in kilograms divided by the square of their height in meters (kg/m$^2$). A BMI over 25 kg/m$^2$ is defined as overweight, and a BMI of over 30 kg/m$^2$ as obese. These levels provide benchmarks for clinical assessment, but the risks of disease in a population can also increase from lower BMI values (Harbin et al., 2006).

Obesity has been identified as one of the more serious health risk factors facing many individuals and society as a whole (McCrory et al., 1995). The cost that is associated with the loss of life and medical expenses is significantly greater than that of smoking, excessive drinking, and poverty. The estimated dollar increase in overall health cost for each of the following categories is obesity 36%, smoking 21%, and heavy drinking 14%. Being obese or overweight increases medical cost, plus has a direct financial effect on industry. The cost associated with decreased productivity is estimated at over $4 billion dollars. There is a direct correlation between an increase in BMI and the increase in the average number of sick days. It has been estimated that 10% of the total loss of productivity resulting from sick leave and disability in women is related to obesity or obesity-
related disease. Obese individuals have 1.5-1.9 times greater incidence of illness-related absenteeism. Studies have also shown that a higher percentage of individuals on disability pension are classified as obese (Harbin et al., 2006).

There is increasing evidence that supports modest reductions in weight improve obesity-related risk factors and death. A few studies have also suggested that weight loss improves the quality of life. Many diseases are associated with obesity and high BMIs > 30 kg/m$^2$ (Wee et al., 2004). Arthritis, primarily osteoarthritis, is the leading cause of disability in the United States and obesity is a risk factor for arthritis. Recent data reported that one third of U.S. adults had arthritis based on either chronic joint pain or a doctor’s diagnosis. One study showed a strong relationship between BMI and arthritis. The prevalence of arthritis was 25.9% in the normal-weight group, 32.1% in the overweight group and 43.5% in the obese group. Weight loss would be important to decrease this painful disease (Mehrotra et al., 2004).

High blood pressure is a major health concern in the U.S. affecting more than 50 million people. Blood pressure can be reduced pharmacologically in hypertensive people, but anti-hypertensive medications are not effective for everyone, and they are costly, and could result in adverse effects. Instead, weight loss is recommended for the reduction of Blood Pressure. Morbidity and Mortality are associated with Hypertension. Observational studies have shown that an increase in blood pressure from 5-6mm Hg causes an increase risk of stroke by 35-40%, and a 20-25% increased risk of ischemic heart disease. Myocardial infarction and stroke are not directly related to an increase in blood pressure but result from the structural changes in the heart and blood vessels. Studies have shown that weight loss leads to a significant reduction in blood pressure (Bacon et al., 2004).

Obesity is a major risk factor for the development of type 2 diabetes, so it is not surprising that studies show 87.6% of this group is overweight or obese. Diabetes is very
prevalent in the U.S. and is associated with high health care cost. These cost stem from treating complications of the disease. One study showed that 60% of those with diabetes have neuropathy, 97% of those taking insulin and 80% not taking insulin have retinopathy and around 14% of those 45-64 have coronary heart disease. The main risk factors for diabetic complications are poor glycemic control, hypertension, lipid disorders, and obesity. The recommended treatment and control measures for type 2 diabetes is weight loss and reduced BMI (Nothwehr & Stump, 2000).

Study Objectives:

Objective 1. To determine the effects of diet education as applied to a reduction in healthcare costs and absenteeism in the workplace before and after the treatment period.
Literature Review

Obesity

Definition, Epidemiology and Prevalence

The World Health Organization (WHO) defines obesity as ‘abnormal or excessive fat accumulation in adipose tissue, to the extent that health is impaired’ (WHO, 2000; Garrow, 1988). Since 1998 the National Institute of Health (NIH) has recommended using body mass index (BMI) to determine obesity (NIH, 1998). Obesity is defined as a BMI of greater than or equal to 30. BMI as weight in kg divided by the square of the height in meters (or weight in pounds multiplied by 703, then divided by height in inches), is an easy way to calculate body fatness and is widely used in clinical practice. (NIH, 1998). A healthy weight is defined as a BMI of 18.5 up to 24.9 kg/m², overweight as a BMI of 25 up to 29.9 kg/m², and obesity as a BMI of 30 kg/m² or greater (NIH, 2000; WHO, 1997). The interpretation of BMI in terms of body fatness and in comparison with a weight standard varies by sex, age and other factors (Baumgartner et al., 1995). In part because of lower muscle and bone mass, women are characterized by a higher percentage of body fat than men. Women tend to have a higher proportion of body fat stored in subcutaneous rather than visceral adipose tissue (Lemieux et al., 1993). Because of the differences in body composition between men and women at the same BMI women will tend to have a considerably higher percentage of body fat than men. Also, older persons will usually have a higher percentage of body fat than younger people at the same BMI because of the changes in body composition that occurs when we age. Also, only if the same body weight standards (or definition of obesity) are considered to be appropriate for both men and women does a given value of BMI have the same meaning in terms of relative weight. A given value of BMI may be numerically the same for men and women and for people of
different ages, but may not represent the same percentage of body fat, the same degree of risk, or necessarily the same degree of overweight relative to a weight standard (Ogden et al., 2007).

Approximately 65% of adults age 20 years and older in the United States are overweight and one-third of the population being classified as obese (US Dept of Human Services, 2001). A smaller percentage 4.7% is considered morbidly obese (BMI >40). Research from the U.S. Centers of Disease Control and Prevention (CDC) demonstrated that obesity in combination with poor nutrition and a sedentary lifestyle was associated with 111,909 deaths compared with normal weight people annually (Flegal et al 2005; CDC, 2004).

Research studies have correlated obesity with an increased risk of developing numerous health conditions including prediabetes, type-2 diabetes, hypertension, coronary artery disease, ischemic stroke, colon cancer, postmenopausal breast cancer, endometrial cancer, gallbladder disease, osteoarthritis, obstructive sleep apnea, and metabolic syndrome (Pinhas-Hameil et al., 1996). It is estimated that 47 million Americans have metabolic syndrome, which makes them at an increased risk of coronary heart disease (CHD), stroke, peripheral vascular disease and type-2 diabetes (Alebiosu & Odusan, 2004; Lorenzo et al., 2003; Hodgson & Cai, 2001). Components of metabolic syndrome include abdominal obesity, atherogenic dyslipidemia, elevated blood pressure, insulin resistance and prothrombotic and proinflammatory states. (NIH, 2001). The link between obesity and type-2 diabetes is particularly striking. For women, a BMI of just 25 is associated with a fivefold increase in risk of type 2 diabetes, and the risk increases to more than 40-fold for a BMI in excess of 35. The risk is especially high for women with a central pattern of fat distribution, characterized by a large waist circumference (often described as an ‘apple shape’), the risk is less for women with a similar BMI who tend to have excess fat on the hips and thighs (‘pear-shaped’) (Manson et al., 1997). Coronary heart disease (CHD) is also associated with weight gain and obesity. The Nurses’ Health Study showed a clear relationship
between CHD and elevated BMI, even when controlling for age, smoking, menopausal status and family history. The risk of CHD increased from BMI 22-23, and was doubled at 25-28.9 and more than three times higher above 29, compared with the risk at BMI less than 21.5. There has been more recognition of the increased risk of most types of cancer (with the exception of lung cancer) particularly postmenopausal breast cancer, colon and kidney cancer. Obesity is estimated to account for 20% of cancer deaths in women. Obesity, especially severe obesity, is linked to infertility and an increased risk of complications during pregnancy. Including hypertension, pre-eclampsia, gestational diabetes and an increased risk of fetal abnormalities including neural tube defects (Jebb, 2004).

In addition to increase risk of chronic disease, excess body weight has been associated with diminished psychological well being, including low self esteem, mood disturbances, and increased anxiety (Stunkard & Wadden, 1992; Wadden & Stunkard, 1985).

Modest weight losses of 5-10% of initial body weight are shown to significantly improve co-morbid conditions and reduce the risk of diabetes (Diabetes Prevention Program Research Group, 2002; Anderson & Konz, 2001;).

**Risk Factors of Obesity**

Obesity is a consequence of a period of prolonged positive energy balance when energy intake exceeds energy needs. Food intake and physical activity are two key behaviors, which affect this energy balance (Jebb 2004). Current evidenced supports an association between obesity and a wide range of different risk factors including eating patterns, activity levels, family background and amount of sleep (Lobstein, 2004). The type of food eaten in the modern diet is likely to be a contributory factor in the rise in obesity levels. In particular, a higher proportion of energy dense foods (i.e. fatty and sugary foods and drinks) and also reduced levels of complex
carbohydrates have both been associated with obesity (Kimm, 1995). Portion sizes of food have been steadily increasing in recent years, and eating larger portions has been associated with increased weight in individuals (Rolls et al., 2002). Research shows that large portions increase the energy consumed at a single eating episode but fail to elicit increased satiety or to suppress subsequent eating (Rolls, 2003). Snacking, eating out and not eating meals, as a family have been associated with increased levels of obesity (Ma et al., 2003). Eating in response to emotional rather than hunger cues and eating when bored are both evident in overweight and obese individuals (Tuomisto et al., 1998). Depressive symptoms may also cause the onset of obesity. For each depressive symptom reported, there was more than four times the increase in risk for obesity onset (Goodman & Whitaker, 2002; Pine et al., 2001; McGuire et al., 1999).

Dieting behavior, particularly unsuccessful repeated attempts at weight loss through calorie-intake reduction have been associated with longer-term weight gain, especially in women. (French et al., 1994). The use of weight control behaviors like vomiting or laxative abuse increases the risk for obesity onset (Stice et al., 2005). These weight control behaviors may promote weight gain because they lead to increased metabolic efficiency or other alterations in homeostatic processes (Klesges et al., 1992; Blundell, 1995). These biological processes promote overeating not under eating. There is a correlation between dieting and depression, which suggest that individuals who engaged in dieting and weight control behaviors often experience increased depression. (Stice et al., 2005).

The change in activity patterns, with increasingly inactive leisure pursuits and the extensive use of cars even for short journeys has also contributed to the increasing levels of obesity in the UK (Prentice & Jebb, 1995). The number of hours spent in relatively inactive pastimes such as watching TV and playing computer games have both been associated with
obesity, particularly in children (Gortmaker et al., 1996). TV may also influence eating behavior, either indirectly, through advertisings for fast and junk food or directly by increasing snack consumption (Coon et al., 2001; Robinson, 2001). In contrast, individuals who take part in regular physical activity or exercise, particularly of moderate or greater intensity are less likely to be overweight or obese (Jebb & Moore, 1999).

The prevalence of obesity and the risk of becoming obese for active persons is one-half that of sedentary persons. Physical activity not only increases non-resting energy expenditure but also develops and maintains lean body mass that determines the size of resting energy expenditure; resting energy expenditure uses approximately 60% of the total daily energy expenditure (Popkin et al., 2006).

A low level of physical activity predicted high weight gain and decreases in physical activity over time were associated with greater weight gain (Levine et al., 2002). Physical activity can be divided into leisure-time physical activity (LTPA) and activity performed in daily living, or lifestyle physical activity (LSPA) (Levine et al., 1999). LTPA can be divided into exercise, sport, and household and other daily chores. Transportation to and from work is referred to as commuting physical activity. Video games, home computers and watching TV with remote control devices now compete for LTPA. At the same time, jobs are more comfortable and sedentary and less physical activity is required for transportation (Fogelholm et al., 1996; Hu & Young, 1995). The environment is a critical component for sedentariness. Industrialization, urbanization and improving income are each associated with car use, lifts, automatic washing machines and microwave ovens. Each reduces physical activity slightly but together they have an important impact of total energy expenditure (Levine et al., 2002).

The tendency for the obese to be less physically active than their normal weight counterparts may be influenced both by psychological factors, such as embarrassment at
appearing semi-clad or seeming unfit in public, and by physical difficulties associated with excessive weight such as joint pain or breathlessness, which restricts the ability to exercise. (Chambers & Swanson, 2006).

Perceived parental obesity also predicts the onset of obesity. Adolescents who reported parental obesity were at more than a fourfold increase for obesity onset than their peers that did not have obese parents (Stice et al., 2005). Parental obesity, particularly maternal is a key factor in predicting adult obesity in offspring, irrespective of whether they were overweight as children (Maes et al., 1997; Whitaker et al., 1997). Heavier birth-weight and early maturation have also been linked to an increased risk of obesity in later life (Whitaker & Dietz, 1998; Van Lenthe et al., 1996). Being breastfed seems to serve as a protective factor against later obesity (Von Kries et al., 1999).

Lower socioeconomic status also seems to be a risk factor for increased levels of obesity, particularly in women (Payne et al., 2004). According to one study, socio-economic inequalities in obesity and smoking could be mostly explained by differences in educational attainment rather than income or occupation (Nocon et al., 2007). Lastly, sleep has been associated with obesity levels, with obese people reportedly spending fewer hours asleep than non-obese (Hasler et al., 2004).

**Economic Affects of Obesity and Its Affect on Work Performance**

Overweight and obesity combined account for 9.1% of total U.S. medical expenditure and may be as high as $78.5 billion annually (Finkelstein et al., 2003). The CDC estimated medical costs and lost productivity attributed to these conditions in 2000 to be $117 billion, with $61 billion in direct medical costs to treat obesity-related diseases and $56 billion in lost productivity, $39.2 million lost workdays, $239 million restricted-activity days and $89.5 million
bed days (American Obesity Association, 2005; Wolf & Colditz, 1998). One study estimated the lifetime medical expenses associated with five obesity related illnesses including hypertension, type-2 diabetes, CHD, stroke, and hypercholesterolemia were $10,000 to $15,000 higher for people who were obese compared to those who had a BMI recommended for their age and gender (Thompson et al., 1999). Another study reported that costs were 50-60% higher for obese patients with acute coronary syndrome (ACS) compared to non-obese patients with ACS (Bray, 2004). Hypertension, which can cause problems that lead to stroke or cardiac failure, is another costly condition that is associated with metabolic syndrome (Snow et al., 2005). In 1998 the economic burden of hypertension was estimated to be at $108.8 billion representing 12.6% of total health care expenditures in the U.S. (Lorenzo et al., 2003). Type 2 diabetes is another health condition associated with metabolic syndrome and obesity that can cause blindness, kidney disease, hearth disease, and stroke and is the sixth leading cause of death in the U.S. Approximately $98 billion was spent in 1997 in the U.S. on health care expenses for type 2 diabetes. (Mokdad et al., 2001). Overweight and obesity cost can be broken down into three costs:

- Direct cost from health care systems for the treatment of obesity—which include the resources to treat obesity, cost of diagnosis and treatment of diseases associated with obesity.
- Individual cost in terms of illness and reduced quality of life (intangible costs)
- Society cost with lost workdays (absenteeism) and loss of productivity when at work (presenteeism) and premature disability pensions (indirect cost)

(Kouris-Blazos & Wahlqvist, 2007; Seidell, 2003).
Two methods have been used to calculate the direct cost of obesity:

- The fraction of incidence of diseases attributable to obesity multiplied by the costs of these diseases. The total direct cost is the sum of these two.
- The fraction of use of medical care attributable to obesity (e.g. excess consultations with general practitioners and medical specialists, excess hospitalization, excess medication). The total direct costs are the sum of these costs.

Most estimates are around 2-8% of total health-care costs. It has been shown that the direct cost associated with overweight which is determined by a BMI between 25-30 kg/m$^2$ are about double the cost associated with obesity with a BMI >30 (Seidell, 2003).

Indirect costs of obesity are related to loss of productivity through absenteeism, provision of disability pensions and premature death (Seidell, 2003). Obesity-related absenteeism cost U.S. employers $2.4 billion in 1998 (Thompson et al., 1998). Studies show that overweight and obese employees have significantly higher absence rates (Pelletier et al., 2004; Riedell et al., 2001; Burton et al., 1999; Tsai et al., 1997). The economic impact of lost productivity can be measured by the cost associated with absenteeism and presenteeism. Absenteeism is an individual’s total amount of time away from work. It usually consist of illness-related absences, and can have cost associated with short and long term disability and workers compensation. Presenteeism is the decreased job performance due to the presence of health problems (Burton et al., 1999). Lost productivity cost of presenteeism is often measured through the costs associated with reduced work output, errors on the job, and failure to meet company production standards. (Hemp, 2004).

Some direct and indirect costs may be partly paid by society and some by individuals; the amounts vary between countries and individuals. Other excess cost for obese individuals may include:
• Additional cost for health and life insurance

• Costs of adaptation to impaired physical functioning with a strong relationship between obesity and the ability to perform certain tasks (e.g. carrying groceries, climbing steps, bending and kneeling, walking, bathing and dressing), which results in obese individuals requiring paid, and unpaid assistance.

• Costs of adaptations to a larger body size (e.g. tailor-made clothing for larger sizes, adaptation in furniture)

• Costs of weight management/control (in the USA, $30 billion /yr is spent on weight-loss remedies). (Seidell, 2003)

A study of 341 employees at eight manufacturing companies showed that moderately and extremely obese employees have reduced productivity on the job, even compared to overweight or mildly obese workers. 23% of the workers in the study were mildly obese, 13% were moderately or extremely obese and another 43% were overweight. Health related losses in productivity averaged 4.2% for workers with moderate to severe obesity which was 1.8% higher than for all other employees. Based on an hourly wage of $21 an hour or $1,800 annual cost for presenteeism for moderate to obese worker, which is about $500 higher than for other workers. The reason for the lost productivity is likely a result of reduced mobility because of increased body weight and size or pain problems from other maladies like arthritis. This data suggest that employers can reduce cost and improve productivity by developing work place programs. The studies results indicated a weight loss of 10% could yield substantial health and economic benefits. Even modest weight loss could result in hundreds of dollars of improved productivity cost per worker each year (Gates et al., 2008).
Measuring Obesity

There isn’t a consensus on what accurately measures fatness (Freedman & Perry, 2000). Measurements include total body fat; percent body fat, which is total body fat divided by total mass; weight circumference; and waist to hip ratio. Each of these measures has its unique strengths and weaknesses. Fat causes Type-2 diabetes and cardiovascular disease by secreting resistin and leptin (Trayhurn & Bettie, 2001), which suggests that total body fat may be the most relevant measure of fatness and predicting social science outcomes affected by health because the sheer volume of fat may determine the amount of leptin and resistin released (Burkhouse & Cawley, 2007). Possibly, the percent body fat may be a better measure if additional fat-free mass can dilute the health impacts of those secretions (Burkhouse & Cawley, 2007). Findings from the medical literature also suggest that it is not just the amount of fat that matters but also the location or distribution of that fat. In particular abdominal visceral fat (i.e. that located around the internal organs) is associated with an elevated risk of morbidity (Bray et al., 1998).

The amount of abdominal visceral fat can be assessed using laboratory methods like dual-energy X-ray absorptiometry, but in practice it is frequently measured using either waist circumference or waist-to-hip ratio; comparisons have found that these two are highly correlated with abdominal fat (Snijder et al., 2002). Yusuf et al., 2005 concluded that by a variety of standards, waist-to-hip ratio and, to a lesser extent, waist circumference, better predict heart attack than does BMI. While it is generally accepted that central adiposity (abdominal fat) is associated with greater risk of morbidity and mortality, it is not clear that waist-to-hip ratio is the best way to measure it. A National Institute of Health report recommends the use of waist circumference rather than waist-to-hip ratio to measure central adiposity (NIH, 1998).
Biomarkers of Obesity

The adipose tissue was once perceived as a passive storage and release depot of lipid but is now considered a genuine endocrine tissue (Ahima, 2006; Ronti et al., 2006). As an endocrine tissue, it secretes various substances into blood circulation to influence the physiology of the other tissues or organs at a distant site. The substances include fatty acids, tumor necrosis factor-alpha (TNF-a), interleukin-6 (IL-6), leptin, adiponectin, resistin, and others. Many of these secreted factors are proteins, which are called “adipocytokine” or “adipokine” (Berg et al., 2002; Matsuzawa et al., 1999). The first and most studied adipokine is leptin (Campfield et al., 1995; Halaas et al., 1995; Pelleymounter et al., 1995). Leptin is a satiety hormone functioning as a long-term regulator of appetite and energy balance of our body (Ahima, 2005). Its made and secreted in the adipose tissue. When we get fat, the plasma level of leptin increases. Upon acting on the leptin receptor at hypothalamus, the post-receptor Stat3 signaling is triggered (Bates & Meyer, 2003). Subsequently, pro-opiomelanocortin (POMC) pathway is activated, and neuropeptide-Y (NP-Y) pathway is suppressed. The activation of POMC pathway increases satiety and energy expenditure (Oswal & Yeo, 2007). While the NP-Y pathway decreases appetite and energy conservation (Wilding, 2002). Elevated leptin levels specifically signal a negative energy balance, whereas low concentrations result in a positive balance. Leptin concentration has been documented to positively correlate with percent body fat in both adults and children (Venner, et al., 2006). Mice that were studied and lacking in leptin or leptin receptor were very obese (Campfield, et al., 1995; Halaas et al., 1995; Pelleymounter et al., 1995). There are rare human cases with leptin or leptin receptor gene mutations that were also morbidly obese (Farooqi & O’Rahilly, 2006). Congenital leptin deficiency deleterious effects can be restored with the administration of exogenous recombinant human leptin (Licinio et al., 2004; Farooqi et al., 2002). By contrast, initial trials in obese patients with no leptin deficiency showed no
significant benefits in terms of weight reduction unless substantially higher doses were given (Heymsfield et al., 1999). In addition to leptins role in appetite regulation and long-term body weight control, leptin was also implicated in several other important physiological functions, including immunity, puberty and ageing processes. (Lam & Lu, 2007; Cervero et al., 2006; Koochmeshgi, 2004; Shimokawa & Higami, 2001; Cunningham et al., 1999; Barzilai & Gupta, 1999). So leptin is generally accepted to be the “master” hormone for long-term weight control (Jin-Ying, 2008).

Adiponectin is also an adipose tissue-derived glycoprotein, almost exclusively secreted by the adipose tissues (Kadowaki & Yamauchi, 2005; Matsuzawa et al., 1999). Adiponectin synthesis and release are controlled by different mechanisms. It has been demonstrated that insulin stimulates adiponectin gene expression and its release by cultured adipocytes (Scherer et al., 1995), and both insulin and insulin-like growth factor-1 increases the adiponectin production in adipocytes isolated by visceral adipose tissue (Halleux et al., 2001). Adiponectin plays an important role in the regulation of insulin function and energetic homeostasis (Berg et al., 2002; Havel, 2002). Circulating levels and adipose tissue gene expression are lower in the obese and in type 2 diabetes subjects compared to healthy controls (Weyer et al., 2001; Hotta et al., 2000; Arita et al., 1999) and negatively correlate with the BMI, the plasma levels of glucose, insulin, triglycerides and the insulin-resistance (Hotta et al., 2000).

Although there has been a great deal of attention given to the recent discovery of leptin and other molecular genetic factors that underlie energy regulation, these cannot explain the current obesity epidemic. The rise in obesity rates has occurred too rapidly for it to be a consequence of changes in the genetic make-up of populations. This suggests that changes in the environment-physical, socio-cultural, economic and political- are the primary drivers of the epidemic of obesity (Caterson, 2002).
Treatment Options for Obesity

Due to long term difficulty by obese individuals in keeping to a energy restricted diet and programmed exercise routine less emphasis should be placed on weight loss instead it should be focused on the management of co-morbid conditions, weight maintenance and reduction of waist circumference. More attention should be given to lifestyle approaches (like increasing incidental activity, walking, reducing portion sizes) to maintain weight or prevent further weight gain in the obese and the never-obese, and weight regain after weight loss (Hills & Byrne, 2006; Weinsier et al., 2002).

The spectrum of weight management

• Prevention of weight gain (should receive the most attention)
• Weight maintenance
• Management of obesity co-morbidities
• Weight loss (Gill, 1997)

People with co-morbidities (such as type-2 diabetes, obstructive sleep apnea or dyslipidaemia) who are more likely to improve with weight loss, are at a greater risk of complications and thus treatment options should be more aggressive. As little as 5-10% weight loss will achieve significant health benefits such as improvements in insulin sensitivity and lowering of blood pressure and blood lipids (Caterson & Finer, 2006). People who have lost weight have better biochemical profiles (lower lipids and insulin levels and glucose control) and quality of life profiles than those who have similar BMIs without having lost weight. These people may still technically be overweight or obese by BMI definition after weight loss (Knowler et al., 2002). Body fat distribution should also be taken into account. Intra-abdominal adipose tissue is now
known to be an active endocrine organ that secretes biologically active substances (adipokines). Secretions of pro-inflammatory, pro-atherogenic adipokines like interleukin-6, and C-reactive proteins among others, all increase with increased abdominal obesity, whereas secretion of adiponectin a supposedly cardioprotective adipokine, is reduced in abdominally obese individuals (Caterson & Finer, 2006). The main clinical goal in obesity management and reduction is reducing risk of disease so abdominal obesity should be targeted. Waist circumference has been identified as the most useful measure of abdominal obesity (Caterson & Finer, 2006).

**Pharmacotherapy**

About 25-30% of obese people may require some form of adjunctive therapy to supplement diet and lifestyle changes. Medicine is usually reserved for those whose health is impaired and who have been unsuccessful at losing weight in other ways (Caterson & Finer, 2006). Pharmacotherapy should be considered for people with a BMI of >30 together with other risk factors or have failed to lose weight through diet, exercise and behavioral therapy. Pharmacotherapy should not be viewed as the easy options, which can replace weight, loss through diet and exercise. Studies have shown successful weight loss with pharmacotherapy with an energy-restricted diet. If less than 5% of body weight is lost during the first 6 months then discontinuation of pharmacotherapy should be considered (Caterson & Finer, 2006).

A number of available weight loss pharmaceuticals are shown as being very effective. Sibutramine, orlistat and phentermine achieve mean weight losses of 4.5kg-2.9kg and 3.6kg respectively when compared to placebo (Li et al., 2005). Unfortunately weight loss medications only work while being taken and their long-term safety and efficacy are yet to be established.
Ideally, weight loss medications should be combined with lifestyle changes for maximum results (Kouris-Blazos & Wahlqvist, 2007).

The workplace is a great location for health programs that address health risks like those associated with metabolic syndrome, because people spend approximately one-third of their weekday at work, and information can be communicated efficiently in a work setting. Plus, employers are usually paying for medical costs, which can be greatly impacted by adverse health behaviors. In April of 2005 the American College of Physicians (ACP) released guidelines for the management of obesity with 5 recommendations (Snow et al., 2005).

- Obese patients with a BMI>30 should receive lifestyle and behavioral modification consultation (e.g. diet modification and exercise). Goals related to weight loss and associated benefits should be determined individually.
- After a doctor-patient discussion of pharmaceutical therapy, weight-loss drugs can be included as part to the program for those individuals unable to achieve weight loss through lifestyle modification.
- A variety of drug options can be utilized dependent on each individual choice based on possible side effects.
- Obese individuals can be considered for surgical treatment if they maintain a BMI of 40 or greater, are unsuccessful at losing weight through lifestyle modifications, and have obesity-related comorbidities like hypertension, hyperlipidemia, impaired glucose tolerance or diabetes.
- Patients considered for surgery should be referred to surgeons highly experienced (Snow et al., 2005).

Research suggests that insurance companies and employers should help individuals become more accountable for their own health by providing incentives for healthy behavior and penalties
for unhealthy behavior (Walters, 2002). Lifestyle changes remain the primary method of weight reduction. Dietary modification along with regular exercise program is necessary for long-term weight reduction with an initial goal of 7% to 10% reduction in body weight over 6 to 12 months. Consistent caloric reduction of 500-1000 calories per day has been proven to be most efficient for producing long-term weight reduction (Andersen et al., 1996).

Portion-controlled servings and meal replacements were shown to improve weight loss and weight maintenance (Wadden et al., 2004; Heymsfield et al., 2003). Obese individuals underestimate their caloric intake (Lichtman et al., 1992) therefore providing a portion-controlled meal may improve adherence to a low-caloric diet and improve weight loss and maintenance (Mattes, 2002).

**Nutrition and Obesity**

Medical Nutrition Therapy (MNT) is the cornerstone of weight loss and weight maintenance therapy. A negative caloric balance is essential to promote weight loss. Weight loss is generally achieved by a low-calorie diet (LCD) that provides 800-1500 kcal/d. A caloric deficit of 500-1000 kcal/d will promote a desired weight loss of 1-2lb/wk (Plodkowsky & St Jeor, 2003). Low calorie diets (LCD) providing around 1200-1500 kcal coupled with lifestyle modifications and designed to reduce body weight by 5-7% were successful in preventing development of diabetes. One approach to this plan is meal replacements, which provide fixed amounts of food with the known calorie content. They also simplify food choices, requiring little preparation, and allow dieters to avoid contact with problem foods. This may increase patients’ adherence to the targeted calorie goal (Dixon & Dixon, 2006).

Moderate fat diets have been widely used for weight loss and weight maintenance (Wing & Hill, 2001). A diet providing 30% calories from fat, 10-20% from protein, and 40-55% as
carbohydrates, as recommended by the National Cholesterol Education Program III, is also appropriate for weight loss. Saturated fat should comprise less than 7% of total calories, polyunsaturated fats (PUFA) less than 10%, and monounsaturated fats (MUFA) less than 20% of total calories. Moderated and low-fat diets decrease energy intake and therefore promote weight loss. Low and very-low fat diets (<20% of daily caloric intake from fat) are less palatable diets and therefore have less long-term adherence (McManus et al., 2001). Fat is the most energy-dense macronutrient, providing 9 kcal/g and is the least satiating nutrient. Low-fat foods can be used to substitute for full-fat equivalents and will assist in weight loss only as part of an overall energy restricted diet. In many cases, simple carbohydrates have replaced fat (Jebb, 2004).

Complex carbohydrates from fruits and vegetables and whole grains should be the main source of carbohydrates, providing a daily intake of 20-30g of fiber (Klein et al., 2004). Emerging evidence suggests that consumption of fruits and vegetables provides a positive effect on satiety, overall caloric intake and weight regulation. Fruits and vegetables are low in energy density (low number of calories per gram because they are high in water and fiber) therefore consuming a diet high in fruits and vegetables results in a larger volume or amount of food that can be consumed at a give calorie level (Rolls et al., 2004).

Many studies have shown and inverse relationship between the intake of fiber and weight-gain (Howorth, 2001). It may be due to the incomplete digestion and absorption of energy from this type of carbohydrate. Also, the bulkiness of high fiber foods, with an increased need to chew more and subsequent gastric distention, may increase fullness and decrease energy intake. Fullness may also result from the delayed gastric emptying and the attenuation of postprandial glucose and insulin responses. It may also impact other gut hormones that regulate appetite like cholecystokinin (Jebb, 2007). The intake of whole grains promotes satiety and slows starch digestion or absorption. This then leads to relatively lower insulin and glucose
responses that favor the oxidation and lipolysis of fat, rather than its storage (Liu et al., 2003). Refined grains have higher starch content and lower fiber content (i.e. greater energy density) than whole grains. Concentrations of vitamins, minerals, essential fatty acids and phytochemicals that are important in carbohydrate metabolism are also lower in refined grains so they should be limited in the diet (Liu et al., 2003). Bread, pasta and potatoes should provide the bulk of each meal as they help provide a sense of fullness. These foods have low energy density and are a good source of important nutrients (Jebb, 2004).

Lean sources of protein such as poultry (skin removed), and low-fat dairy products should be included on a lower-energy diet. Protein is very satiating compared to carbohydrate and fat and emerging evidence suggests modest increases in protein intake in the context of a low-fat diet may enhance appetite control. Leading to enhanced weight loss and weight loss maintenance (Jebb, 2004). Studies showed that sweetened beverage intake was associated with weight gain so these should not be consumed (Bray et al., 2004; Schulze et al., 2004; Raben et al., 2002; Ludwig, 2001).
Methods

**Nutrition Guide**

The Nutrition Guide (NG) was developed to assist Kroger employees that have a BMI > 30 in the selection of healthier meal and snack choices at home, work and in restaurants. It’s a quick guide to help the user make healthier choices by planning meals for work and home. It addresses grocery shopping with helpful hints on healthy choices in different sections and aisles of the grocery store. It provides a nutrition label that explains how to read a nutrition label and what to look for when choosing healthier options. It also includes a portion control plate for meal planning, which is broken out into cooking and item selection in each nutrition group including, protein, carbohydrates and fats. It includes a serving size guide that will assist the user on what is considered a proper serving for different nutrients. It also includes helpful hints for restaurant eating and snacking at work and home.

The Nutrition Guide addresses tips on avoiding or limiting three key ingredients: S.S.S

- Saturated fat
- Sugar
- Salt

Based on the information provided, these three items should be limited if they follow the nutrition guide when they are shopping for and planning meals and snacks at home and work.

The Kroger employees with BMIs >30 that are looking to improve their health will be asked to fill out a Nutrition Evaluation Assessment Tool (NEAT) prior to receiving the Nutrition Guide to determine if it is a useful guide to assist these participants in making healthier choices.
**Nutrition Evaluation Assessment Tool**

The Nutrition Evaluation Assessment Tool (NEAT) provides 90 easy to understand questions, which takes no more than 15 minutes to complete. Using the NEAT tool will provide a baseline of health habits of the participants prior to receiving the Nutrition Guide (NG) to measure any impact from the use of the NG.

The tool includes check boxes for the responses; organized into subheadings for the different categories addressed. The questions range from usually/often or rarely/never, which can be scored as a 1 or 3 respectively. There is also a not applicable (NA) category for questions that do not apply to the participant and should not be scored.

The questions are focused on basic eating habits, meals eaten at home, work and restaurants. Included are questions concerning the intake of protein, whole grains, fruit & vegetables, dairy, snacks, desserts and beverages with portion examples to help us understand the daily nutrition consumption of the participant. These questions provide insight into the intake of salt, sugar, saturated fat and cholesterol plus fiber and calcium. It also addresses if the participants are focused on health when they are grocery shopping and eating at restaurants plus how the participants prepare food at home.

**Subcategories**

- **Meals**—Covers basic habits including eating at home or eating out plus number of meals eaten and when.
- **Protein**—Includes questions on types of protein purchased and how it’s prepared along with selections made at restaurants.
- **Whole Grains**— Determines how many servings of whole grains are consumed.
- Fruit & Vegetables - Are fruits and vegetables included in the diet and how often.
- Dairy - Intake of dairy items and if they are low in fat and sugar.
- Snacks and Desserts - What types are consumed, and how often.
- Beverages - What types of beverages consumed and how often.

The questions in the NEAT tool that address the S.S.S. ingredients are marked with the following symbols. Salt questions are marked with a (^) symbol, sugar will be marked with a (*) symbol and saturated fat questions are marked with a (~) symbol. There are 5 questions that address salt, 21 that address sugar and 30 that address saturated fat.

To implement this program at the Kroger General Office, the possible participants would need to be informed of the study to test the NG. First, an email would be sent out to all employees about a Research Study being conducted on a Nutrition Guide that would be available to those interested in losing 20% of their weight and making healthier food choices to improve their health. The email would instruct interested parties to contact the Human Resource Department by phone to be screened for eligibility in the study. The employees that contacted the HR department would be screened to determine their present BMI. Those with a BMI of 30 or more would be included in the study. They would not need to supply their name only their height, weight, and age. After 40 participants were approved and confirmed for participation in the study, they would be directed to a WEB site to fill out the NEAT survey that they would send in once completed. Each participants completed NEAT survey would be given a number that would be assigned to them as identification so that they would remain anonymous throughout the study. Each NEAT survey would be scored based on the responses prior to receiving the NG and three months after receiving the NG to determine any affect on healthier behavior. The participants would then be sent to a Web location to print off the Nutrition Guide. They would be instructed to call the 1-888 number on the guide to speak to a dietician if they had any
questions about the contents of the guide. Instructions would be included with the guide informing the participants to use the guide when they were grocery shopping to guide them on making healthier choices for meals. They would also be asked to use the guide when preparing the meals at home and to try to follow the serving size suggestions along with the portion plate guide. It would be suggested that they follow the restaurant guide when eating out and to try to plan their work meals and snacks ahead of time so they would be more likely to stick with a healthy diet throughout each day. After the three months, the participants would be instructed to return to the WEB site and complete another NEAT survey which they would submit with the identification number provided at the beginning of the study. The new NEAT survey would be scored and compared to the first NEAT survey to determine if the participant food behavior improved using the Nutrition Guide.
Discussion

There are many environments where health promotion and wellness programs can be effective including workplaces, communities, and schools. Workplaces are a great place to have a wellness program because men and women spend more time at work than at any other activity except sleeping. Voluntary participation in worksite programs is often much higher than in one-time community events. Workplace wellness programs bring both tangible and intangible benefits to employees and the employers (WELCOA, 1995). The work setting has been demonstrated as a beneficial channel for promoting healthy behaviors among the general population via worksite wellness programs (Campbell et al., 2002). Wellness program components can vary from program to program but usually they have the common goal of raising awareness, reinforcing positive behaviors and helping participants develop tools for behavior change (Serxner et al., 2003).

Many employees see the benefits of shifting emphasis from treatment-oriented health care to less costly, prevention-oriented wellness programs. In 1995, 81% of worksites with 50 or more employees reported offering health promotion activities (DHHS, 2000). Benefits to the company with healthier employees include reduced medical and disability cost, (Pelletier, 1991; Anderson & Anderson, 1991) increased employee productivity, (Pelletier, 1991), decreased employee absenteeism, (O’Donnell & Harris, 1994), improved employee morale and job satisfaction, (O’Donnell & Harris, 1994), and improved corporate image (O’Donnell & Harris, 1994).

Worksite nutrition education benefits not only the employees and the company, but also the nutrition educator:

- Most employees eat at least one meal a day at the workplace, providing the educator with an excellent opportunity to focus attention on food choices.
The worksite is a convenient place to reach large numbers of people.

People at work share information. Nutrition information can be taught and learned through these informal channels (ADA, 1997; DHHS, 1993).

Coworkers can provide support and motivation for one another as they learn, try out, and adopt new healthful behaviors (DHHS, 1991).

Employers can contribute resources for program activities.

Nutrition and health information can reach family members through the employee.

Wellness programs may improve the health of employees, and absenteeism costs (Bly et al., 1986). It has been estimated that absenteeism costs organizations more than 26 million dollars each year (Altchiler & Motta, 1994) and accounts for 10.4 million workdays lost each year (Ho, 1997). The cost associated with absenteeism is a main reason that organizations have traditionally resorted to the implementation of wellness programs (Altchiler & Motta, 1994). A meta-analysis study indicated that those that participated in a wellness program tended to have lower absenteeism rates than those who did not participate. The results support the general assumption that employees who participate in wellness programs are healthier and thus less likely to incur sickness-related absences (Parks & Steelman, 2008).

Another reason to implement a wellness program is job satisfaction. Job satisfaction is usually defined as an employee’s level of positive affect toward his or her job (Locke, 1976; Spector, 1997) and is often thought to develop in response to the characteristics of the employees’ jobs or by the characteristics of the organizations in which they work (Hackman & Oldham, 1980). It has been suggested that providing a worksite wellness program will create a positive attitude, making employees happier with the organization and therefore more satisfied with their jobs (Gronningsaeter et al., 1992). One explanation is an organizational wellness program makes employees feel better physically. Physical well-being has been shown to affect,
general happiness and job satisfaction (Kirkcaldy et al., 1994). A meta-analysis study showed participation in wellness programs was associated with higher job satisfaction. Three lines of reasoning support the findings. First, the existence of a wellness program may indicate to employees that their employer values them and cares about them (Rhoades & Eisenberger, 2002). Second is the assumption that wellness programs are attractive to employees and thus useful as recruiting and retention tools. In particular, employees who value physical fitness may be more likely to be happy with an organization that provides wellness opportunities and thus more satisfied with their job and less likely to leave the organization (Falkenberg, 1987). Third, exercise and physical fitness have been shown to be related to reduce stress levels (Iwasaki et al., 2001), which in turn impact personal well-being and job satisfaction (Wood et al., 1989).

Nutrition information that can be used in wellness programs can be found in nutrition food guides. Since the early 1900s, the United States Department of Agriculture (USDA) has been issuing food guides designed to help consumers choose diets that meet recommendations based on scientific literature (Welsh, 1994). Graphics and illustrations that show the information in these food guides have played an important role in conveying dietary advice to consumers. One of the most well know graphic is the Food Guide Pyramid, issued in 1992 by the USDA and the US department of Health and Human Services (DHHS). The Pyramid was designed after extensive market research and testing, in which it was found to be the graphic best suited to convey three key concepts with regard to diet: variety, proportionality, and moderation (Welsh et al., 1992; Davis et al., 2001). The key concepts conveyed by the Pyramid-variety, proportionality, and moderation are important principles on which Americans should base their diets, and nutrition interventions based on overall dietary patterns are advocated (ADA, 2002). Studies have found that nutrition interventions based on overall dietary patterns are effective in improving healthy related outcomes, including body mass index (Kennedy et al., 2001; Gambera
et al., 1995), blood pressure (Appel et al., 1997), and blood lipid levels (Gambera et al., 1995; NCEP, 2001; Ornish et al., 1990).

Another important nutrition guide is the nutrition label. In the United States, the Nutrition Labeling and Education Act (NLEA) was enacted in 1990. The NLEA regulates nutrition labeling, health claims and nutrient content claims for most foods sold in the United States. The US Food and Drug Administration (FDA) issued final regulations to implement the NLEA in January 1993, and these regulations took effect in May 1994. The cornerstone of labeling regulations promulgated by the FDA under the NLEA’s mandate is the ‘Nutrition Facts’ panel (NFP), which almost all packaged foods are required to carry. The panel provides information on serving size and servings per package or container, along with the per serving amounts and the percentage of daily value on nutrients such as calories, total and saturated fats, cholesterol, and sodium (Variyam, 2007). Nutrition labels are important policy tools that have the potential to improve nutrient intake in every nation. Because they are on virtually every package of food sold in the US, nutrition labels are the most pervasive and readily accessible source of nutrition information for US residents (Byrd-Bredbenner et al., 2000). The Byrd-Bredbenner et al., 2000 study indicated that nutrition labels appear to have an important influence on women’s food purchasing decisions. Three out of four participants reported that labels always or sometimes affected their purchasing decisions. The rate at which labels affect participants’ purchasing decisions was somewhat higher than reported earlier (ADA, 1997).

The Nutrition Guide developed for this study was created with information provided by the Food Pyramid and the Nutrition Label. The Nutrition Guide would provide nutrition knowledge that could change food behavior. A study by Wardle et al. used a postal survey to determine that nutrition knowledge was significantly associated with ‘healthy eating’ (e.g., fruit and vegetable intakes) knowledgeable individuals were 25 times more likely to consume
adequate amounts of fruit and vegetables daily. In another population study a national US sample of adults, showed that fat, fiber, fruit and vegetable intakes were closer to dietary recommendations among respondents who had more cancer-prevention knowledge after social economic and nutritional confounders were taken into consideration (Harnack et al., 1997). Another study found that among 97 middle aged women knowledge of fat nutrition and social norms about fat were positively related to the consumption of low fat diets (Kristal et al., 1990). In a random sample study of 475 elderly Americans, it was found that high nutrition knowledge was strongly associated with the reading of nutrition information panels on food products (Elbon et al., 1996). A wellness program that would utilize the Nutrition Guide would be an inexpensive way to encourage healthy food behavior and possibly improve job satisfaction and reduce absenteeism. If participants use the Nutrition Guide and followed the recommendations on the guide for a three-month time period, they may have a reduction in weight and an improvement in health. Even modest weight loss can result in important reductions in risk profile including blood pressure, blood lipids, and blood glucose (Goldstein, 1991; Sargent et al., 1995). There is also substantial evidence that reducing dietary fat and increasing fruit and vegetable intake offers a wide range of health benefits (Gillman et al., 1995).
Limitations

The main limitation is that a research study has not been done on the Nutrition Guide to determine if this guide would be an effective nutrition intervention tool to use in a corporate wellness program to impact healthy food behavior. There are many assumptions being made that enough employees would be interested in participating in a program to receive the Nutrition Guide and that they would follow the suggested information to try to improve their food behavior, which could impact their health. It would not show if it changed behavior over a long time period based on the Survey being performed after the 3-month study but not at a future date. Would they use the tool after the completion of the study? Would they understand the tool and find it easy to follow and a useful guide in making healthier food selections when shopping? Would it improve their cooking behavior and control their portion sizes? Would they be motivated to use the guide without an incentive? Also requesting participants that have a BMI of > 30 would eliminate other potential participants that may have been motivated too and would have liked to use the tool to improve their health behavior. The participants would be from a corporate setting, which may not correctly represent the average population of obese people. What other factors would affect the outcomes? Calls to the dietician would not be measured, and may have a huge impact on the results. There isn’t a control group in place to measure this other aspect of the study. A nutrition education piece cannot be expected to change behavior alone but it can enhance the learning process coupled with other motivational strategies.
Literature Cited:

Ahima R.S. Adipose tissue as an endocrine organ. Obesity (Silver Spring) 2006; 14(Suppl 5):242S-249S.


Reference:


WHO. Global Strategy on Diet, Physical Activity and Health 2007.


Nutrition Guide

Restaurant Guide

- Ask them not to bring the bread basket
- Ask for salad dressing on the side and choose an oil based salad dressing instead of milk based
- Split a meal or take half home
- Limit alcoholic beverages
- Order gravies and sauces on the side
- Order baked, grilled or broiled meats instead of fried
- Do not eat the fat or skin on the meat
- Order a whole grain side dish in place of fries or mashed potatoes

Items to Limit or Avoid

Fats:
Choose items that are unsaturated or vegetable fats instead of saturated animal fats
Include Omega polyunsaturated fat in your diet found in salmon, fish and seeds
Avoid trans fats found in processed foods identified by the word hydrogenated in the ingredient label

Sugar:
Items with more than 10g of sugar per serving should be avoided or limited
Do not add sugar to cereals or beverages use Splenda as a replacement
Watch sauces, dressings and condiments which contain a lot of sugar
Replace sugars, teas and hot chocolate items with excess sugar

Salt:
Do not add salt to a meal prior to serving
Look for reduced sodium canned items
Limit frozen meals with high sodium
Shopping List Helpful Hints

Produce Dept.
- Fruits, Vegetables
- All colors and varieties
- Bagged salads
- Chopped vegetables for convenience
- Berries
- Whole grain bread, rolls
- Low sugar desserts
- Deli items
- Lean meat Luis
- Low fat cheese
- Olive oil based salad dressings
- Roasted Chicken

Meal/Seafood Dept.
- Lean cuts of beef, Pork, Chicken
- Whole eggs, Turkey, Chenged
- Lean ground meats
- Fresh fish, shrimp
- Scallops

Dairy Foods Dept.
- Vegetables, no butter, oil or cream sauce
- Fruit, no added sugar
- Low fat meat
- Lean meats, low fat desserts

Condiments & Dressings
- Mustard
- Low Fat Mayonnaise
- Low fat dressings
- Low sugar dressings & sauces
- Low fat yogurt

Refrigerated section
- Whole grain
- Fiber 2-3 g
- Low cholesterol

Beverages
- Diet soda
- Low or no sugar tea
- Juice 100%, no added sugar
- No calorie drinks
- Low sugar sports drinks

Portions
- Whole grain
- Brown rice
- Low sugar sauce
- Cereals

1/2 Plate Vegetables & Fruit
- Frozen, canned, & fresh full variety, all colors

1/4 Plate Whole Grains
- Whole wheat, brown rice, oatmeal, wild rice, quinoa, popcorn, corn, and millet

1/4 Plate Lean Meat or Protein
- Chicken, fresh fish, eggs, beans, nuts, seeds & tofu

Cooking Plate Guide

Portion Plate Guide

Lean
Meat &
Protein

Fruits
&
Vegetables

Whole
Grain

1/2 Plate Vegetables & Fruit
- Grill, Steam, Bake (olive oil or canola oil)

1/4 Plate Whole Grains
- Whole wheat, brown rice, oatmeal, wild rice, quinoa, popcorn, corn, and millet

1/4 Plate Lean Meat or Protein
- Chicken, fresh fish, eggs, beans, nuts, seeds & tofu

Nutrition Facts

Serving Size: 1 cup (226g)
Servings Per Container: 2

Amount Per Serving

Calories: 880
Calories from Fat: 180

% Daily Value

Total Fat: 13g
20%
Saturated Fat: 5g
25%
Trans Fat: 2g

Cholesterol: 30mg
10%

Sodium: 600mg
25%

Total Carbohydrate: 35g
12%
Dietary Fiber: 3g
6%
Sugars: 5g

Protein: 5g

Vitamin A: 4%

Vitamin C: 3%

Calories from Fat: 14%

*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

1000 mg of sodium

1. How many servings do you consume? Many items have more than 1.
2. How many total calories in a serving? How many from fat? Is this a high calorie item?
3. Total fat includes saturated fat, polyunsaturated fat & monounsaturated fat. Limit fat to 100% or less.
4. 40% is a low percentage of intake for fat, cholesterol & sodium. 50% or more is a high percentage. Aim high in vitamins, minerals & fiber. Not other nutrients.
5. Daily Values (DV) based on 2,000 calorie diet. Same on all products. Recommended amounts of intake for all.
# Nutrition Evaluation Assessment Tool

<table>
<thead>
<tr>
<th>Topic</th>
<th>In an average week, how often do you:</th>
<th>Usually/Often</th>
<th>Sometimes</th>
<th>Rarely/Never</th>
<th>Does not apply to</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic habits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meals</td>
<td>Eat Breakfast?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat Breakfast from a fast food or take out restaurant?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Go out to lunch?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat dinner after 7?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat a snack between breakfast and lunch?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat a snack between lunch and dinner?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat a snack before bedtime?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat dinner from a fast food or take out restaurant?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Restaurant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Order regular colas or ice tea with sugar?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order items with cheese?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order condiments or sauces on the side?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order dressing on the side of salads?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Ask server to not bring the bread basket?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Add butter to rolls, crackers and bread?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order items with Heavy cream or milk sauce?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order Fried meats?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order Fried or mashed potatoes?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order white bread for sandwiches?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Order dessert?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Take home leftovers?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Split a meal?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>At Home or Work</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eat Canned Soups?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat reduced sodium Soup?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Cook Prepared boxed meals or side dishes</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat in front of the TV?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eat white chicken breast instead of dark meat chicken (i.e thighs or legs)?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat beef burgers instead of veggie or turkey burgers?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat fried chicken instead of baked or broiled?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat bacon and sausage?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat ribs?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat Roast?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat Meatloaf with regular ground beef?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat steaks larger than a stack of playing cards?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat fat and or skin on the meat?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Grains</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eat less than 3 servings of whole grain product per day? (i.e. 1 slice wheat bread, 1 cup oatmeal, 1/2 cup brown rice or whole wheat pasta)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat whole wheat crackers for lunch or snack?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat whole grain cereal for breakfast?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat brown or whole grain rice instead of white rice?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eat less than 2 or 3 servings of fruit per day? (i.e. 1/2 cup of fruit or a medium piece of fruit or 1/2 cup of fruit juice)?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Add fruit to cereal?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat fruit salad with meals?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Eat a piece of fruit as a snack?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Eat less than 3 to 4 servings of vegetables a day? (i.e. 1/2 cup broccoli or potatoes, 1/2 cup leafy salad vegetables)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>Eat a salad for lunch?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Eat a salad with dinner?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Eat peas, green beans or broccoli with Lunch or dinner?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Eat grilled vegetables (i.e. tomatoes, onions, peppers, zucchini)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Add salsa to eggs?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Dairy</td>
<td>Eat or drink less than 2 to 3 servings of milk, yogurt, or cheese? (i.e. 1/2 cup milk or yogurt, 1-2 oz cheese)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Use 2% (reduced fat) or whole milk</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Use skim or 1% low fat milk</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Use regular cheese (i.e. American, cheddar, Swiss, Monterey Jack) instead of part skim Mozzarella cheese?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Choose hard cheese instead of soft cheese?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Drink milk with meals?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat yogurt for breakfast or for a snack?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat cheese on sandwiches?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat Cottage cheese?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Snacks/ Dessert</td>
<td>Eat fried snacks like potato chips or tortilla chips?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat cookies for snacks?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat crackers with peanut butter?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat nuts like peanuts, almonds or cashews?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Choose unsalted snacks?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat regular pudding or Jello?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat Pies, cakes or donuts?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat regular ice cream or ice cream treats?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Eat candy?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Beverages</td>
<td>Drink specialty coffee drinks with milk and cream?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink specialty coffee drinks with sugary syrups?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink hot chocolate?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink Sports drinks like Powerade or Gatorade?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink energy drinks like Red bull?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink more than a cup of fruit juice a day?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink more than one Cola that is not diet in a day?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink Tea with regular sugar?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink Tea with honey?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink wine with a meal?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink a mixed alcoholic drink with a meal?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>~</td>
<td>Drink soy or rice milk?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>