A RETROSPECTIVE STUDY: THE RELATIONSHIP BETWEEN HEALTH CARE COSTS, ABSENTEEISM, AND BODY MASS INDEX IN A GROUP OF MUNICIPAL EMPLOYEES

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This study evaluated the relationship of varying body mass index and average annual health care costs and absenteeism in a group of 524 municipal employees. The 269 employees with health care claims and the 487 employees with attendance records were categorized into five different BMI categories based on self-reported weight and height. Findings from the study suggest that as BMI increases, average annual health care costs and average annual absenteeism increase. However, BMI was only significantly related to absenteeism. The study also found significant relationships between education and health care costs and absenteeism. No significant differences for health care costs or absenteeism were found based on race, age, gender, wellness center membership, or smoking status.

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CHAPTER 1

INTRODUCTION

Rising health care costs and absenteeism are critical personnel problems for employers in the United States. Direct and indirect costs of absenteeism are believed to be as high as $25 billion dollars per year (Boyce, Jones, & Hiatt, 1991). Total national medical expenditures for employees and dependents exceed $900 billion annually and continue to escalate (Medical Financing Administration, 1996). Consequently, employers seek to identify key factors within their work forces that are directly related to these costs, develop strategies to minimize these factors, and ultimately minimize costs.

Researchers in the field of health promotion have found significant relationships between an individual's health risks and behaviors, quality of life, morbidity and mortality, and health care costs (Blair & Powell, 1994). Employees who have one health risk, or who in engage in one risk behavior, also tend to have other health risks or engage in other risk behaviors (Heaney & Goetzel, 1997). There is little controversy that employees with fewer health risks, or employees who engage in health promoting behaviors, report fewer and less costly medical claims, and fewer absences (Burton, Chen, Schultz, & Edington, 1998; Goetzel et al., 1998; Golaszewski, Lynch, Clearie, & Vickery, 1989; Pelletier, 1993; Pope, 1982; Vickery, Golaszewski, Wright, & McPhee, 1986; Weaver et al., 1998; Wetzler & Cruess, 1975; Yen, Edington, & Witting, 1991, 1992).

Obesity is one of the most commonly identified health risks, and is significantly related to increased morbidity and mortality, and elevated health care expenditures (Bray, 1996; Dorn, Schisterman, Winkelstein, & Trevisan, 1997). It is estimated that obesity and obesity related medical conditions are responsible for between 5% and 8% of total health care expenditures in the United States (Kortt, Langley, & Cox, 1998; Wolf & Colditz, 1998). Obesity and its related conditions are responsible for between 1% and 5% of the total health care expenditures across Europe (Seidell, 1995) and 2% of the health care expenses in France (Levy, Levy, Le Pen, & Basdevant, 1995).

Previous studies in this area have used population attributable risks to estimate obesity-related costs of care. However, research indentifying the costs associated with obesity at an individual level is limited. Burton et al. (1998) showed a significant relationship between obesity and health care costs for bank employees. Employees at risk for Body Mass Index (BMI $\geq$ 27.8 kg/m^2 for men and 27.3 kg/m^2 for women) incurred an average of $2,326.00 more in medical claims per year than employees not at risk because of BMI. The optimal BMI range for all employees associated with the lowest costs was between 25 and 27. Furthermore, as employees' BMIs deviated from this range, health care costs progressively increased.

Goetzel et al. (1998) showed that employees at risk for obesity or serious underweight had 21% higher medical expenditures over a three-year period than employees with a healthy body weight. Between 1984 and 1988, employees at risk for overweight at the DuPont Company spent $401.00 more on health care costs per year than not at risk employees (Bertera, 1991). Quesenberry et al. (1998) studied over 17,000 members of the Kaiser Health Plan during 1993, and found that members with body mass indexes between 30 and 34.9, and body mass indexes 35 or greater, had 25% and 44%, respectively, higher annual total health care costs than healthy weight members. Yen et al. (1991), however, found no significant differences in health care costs among different weight employees of a large manufacturing company.

Four studies document the relationship of absenteeism at the work-site and obesity. Burton et al. (1998) found that employees at risk for obesity incurred twice as many sick days as the non-obese, amounting to an average of $863.00 in excess lost work time and decreased productivity costs per year. Narbro et al. (1996) estimated that in comparison to non-obese women, obese Swedish females had 1.5 to 1.9 times more sick days over a one-year period, attributing to an excess of approximately $1.9 million for that year. Bertera (1991) determined that obese employees incurred an excess of .36 sickness days per year over non-obese employees. Leigh (1991) determined that overweight significantly predicted absenteeism in a large cross-section of employees across the U.S.

Finally, research that explores the relationship between spousal or parental health risks and behaviors and their dependents health care claims is limited. Research has shown that parental obesity is a significant predictor of obesity in children (Franzese et al., 1998). Additionally, Moll, Burns, and Lauer (1991) suggest that a shared family environment accounts for 12% of the variation in spousal, and 10% of the variation in sibling BMI. Thus, as stated above, if obesity increases morbidity and mortality, then it is possible that health care claims for family members of obese employees may be elevated in comparison to normal weight employees. However, this has not been adequately examined.

Problem of the Study

Obesity is a serious national health care problem. It costs Americans directly and indirectly an estimated $99.2 billion dollars annually, and is expected to rise (Wolf & Colditz, 1998). Employers bear the burden for a majority of these direct economic costs, but are unsure of the extent to which obesity impacts them at the work-site. Therefore, the purpose of this study is to describe the effects of body mass index on health care costs and absenteeism in a group of municipal employees.

Justification of the Study

As employers attempt to minimize absenteeism and health care expenditures, more attention will be given to defining relationships between worker health status, health care costs, and absenteeism. Obesity is directly related to increased morbidity and mortality, and contributes independently and aggregately to increased health care expenditures and absenteeism. However, few studies have attempted to determine the individual impact of obesity on health care expenses and absenteeism while controlling for the impact of other factors such as: age, sex, race, smoking habits, and education.

Existing research is limited by varying definitions of obesity or “at risk for obesity or overweight.” Additionally, these studies are limited by their selection bias (i.e., only health fair or health risk appraisal participants were included). Thus, a select demographic and healthier population may be involved in the studies, which could underestimate the true effects of BMI on health care costs and absenteeism (Glasgow, McCaul, & Fisher, 1993; Lerman & Shemer, 1996; Stange et al., 1991). Two studies were limited by the education and job classes of the employees.

More research is needed using health care claims data and absenteeism records within a work force with wide variation in employee demographics and job skills, such as a municipality. The uniqueness of this study is that it will compare actual health care claims and attendance records for a random sample of employees within a municipal work force, and evaluate the relationship between BMI and absenteeism and health care costs over a multi-year period. Furthermore, previous work-site research on obesity related health care costs evaluated employees with similar education levels and job skills (i.e., bank employees or manufacturing laborers). The current sample population is unique in that employees' backgrounds and job-types are diverse and vary from unskilled and skilled labor positions to clerical, administrative, and professional jobs.

Hypothesis

The following hypothesis will be investigated:

Male employees who have body mass indexes greater than 27.8, and female employees who have body mass indexes greater than 27.3 will have significantly higher mean annual health care costs and more absences from work per year than employees with "desirable body mass indexes" (Burton et al., 1998).

Definition of Terms

The following terms are defined relative to this study:

1. <u>Absenteeism:</u> computed as the overall number of hours absent each year from

work per subject. The number is representative of total hours absent regardless of reason (i.e., personal illness, death, family, etc.). It excludes vacation time, family medical leave, and military leave taken by employees. The information is derived from the personnel computer database at the city. For the purpose of the study, it will be measured in average hours per year.

2. Body Mass Index: (BMI), or Quetelet's index, is defined as an individual's weight in kilograms divided by their height in meters squared. It is a measure of weight adjusted by stature, and is a "convenient and reliable indicator of obesity" (Garrow & Webster, 1985).

Using information obtained from the NHANES III, Flegal, Carroll, Kuczmarski, and Johnson (1998) recommended the following five classifications for Body Mass Index. A BMI greater than 25 kg/m^2 is classified as overweight. A BMI between 25 and 29.9 kg/m^2 is considered pre-obese. BMI between 30 and 34.9 kg/m^2 is considered class I obesity. BMI between 35 and 39.9 kg/m^2 is class II obesity. BMI greater than or equal to 40 kg/m^2 is considered class III obesity.

3. CPT code: acronym for Current Procedural Technology. It is a listing of codes and descriptions for procedures, services, and supplies published by the AMA, and used to bill insurance companies (Practice Management Information Corporation, 1997).

4. Health care costs: computed as the dollar amount of claims charged per participant each year. Additionally, health care cost excludes any premium, co-payments, or deductibles owed or paid by the participant. The information is derived from the benefits

database at the city, with consent from each participant, and is expressed in dollars charged per claim, and dollars paid per claim.

5. ICD-9 CM: acronym for International Classification of Diseases, 9^{th} Revision, Clinical Modification. It is an alpha-numeric statistical classification system that arranges diseases and injuries into groups (Practice Management Information Corporation, 1997).

6. Level of exercise: a one statement, self-reported measure that determines if the employee meets the ACSM guidelines for sufficient physical activity for a health benefit. This will be evaluated as a bipolar measure of risk (they meet the guidelines or they do not meet the guidelines) (J. Morrow, NCPPA telephone survey, June 9, 1997).

7. Level of usual day at work activity: self-report of occupational activity, divided into three categories of intensity; low, moderate, and vigorous. Subjects were asked to identify which one statement in each intensity category most closely describes their activities at work (J. Morrow, NCPPA telephone survey, June 9, 1997). Referent occupational activities proposed in each category are derived from the Modifiable Activity Questionnaire (Kriska, 1990).

8. Major disease classifications: for the purposes of this study, major diseases will be divided into six categories: neoplasms, mental disorders, circulatory, digestive, respiratory, and musculoskeletal disorders. These categories are derived from the ICD-9 CM diagnosis code book.

9. Obesity: as defined by the National Institutes of Health Consensus on the Health

Implications of Obesity, and used as the definition for this study, is a BMI of 27.8 or higher for men and 27.3 or higher for women. These represent approximately 124% of men's desirable weight and 120% of women's desirable weight as the midpoint of the range of weights for a medium frame from the 1983 Metropolitan Height and Weight tables (Willet & Monson, 1995).

The latest categories of obesity by Flegal, Carroll, Kuczmarski, and Johnson (1998) do not distinguish obesity levels by gender, but merely define obesity as a BMI greater than or equal to 30. Overweight is a BMI between 25 and 29.9.

10. <u>Participation:</u> is a self reported measure of attendance at the city's wellness center. Low participation is defined as attendance of less than once a week, moderate participation as once or twice a week, and high participation as three or more times per week.

Limitations

For the purposes of this study, the following limitations are identified:

1. Use of a small and non-random sample may limit the generalizability of the results of this study.

2. Attendance records of the city only include the hours of sick time taken, and do not indicate the reason for absence (i.e., actual sick day, family illness, death, other, etc.). Thus, actual obesity, and/or sick related absence may be overestimated.

3. Use of a retrospective questionnaire limits results, as recall bias may affect response accuracy.

4. Use of a relatively short time frame (6 years) limits reliable evaluation and

prediction of the actual impact of obesity on costs. Obesity related morbidity and mortality oftentimes do not appear until substantial health decline over a long period of time (Bly, Jones, & Richardson, 1986). Thus, obesity related health care costs and absenteeism may be underestimated. Furthermore, not all employees may have claims for the 6-year time period. Thus, the average total of claims for the years information is available will be used.

5. Self reported height and weight is a less reliable source of information than measured weight and height. Thus, based on recent research, obesity may be underreported in the study group (Nieto-Garcia, Bush, & Keyl, 1990; Rowland, 1990).

6. Outliers (employees with claims above the 99th percentile) are excluded from the study; additionally all participants with pregnancy claims are excluded from the study.

Summary

The heightened awareness of the increasing health care costs and absenteeism has led researchers to actively quantify relationships between health risks and economic costs. To date, research in this area is limited by scope, definition, and outcome. More research is needed to investigate this topic at the employee and dependent level and validate previous findings. To meet this need, health care costs and absenteeism will be studied in relationship to employee body mass index. One hypothesis was listed, terms were defined, and limitations were presented in this chapter.

CHAPTER 2

LITERATURE REVIEW

This chapter includes a review of the literature related to the epidemiology of obesity and the economic costs of obesity related to health care and absenteeism.

Epidemiology of Obesity

Obesity is a disorder of energy balance and is defined as an accumulation of body fat sufficient to endanger health (Neggers et al., 1989). It is often defined in terms of body mass index (BMI), or Quetelet's index. Several prominent international health organizations define and classify degrees of obesity differently. Although researchers from the most recent NHANES III study define obesity as a BMI greater than or equal to 30 (Flegal, Carroll, Kuczmarski, & Johnson, 1998), current research in work-site health uses the National Institutes' of Health definition for obesity. This is a body mass index greater than or equal to 27.8 for men, and 27.3 for women (Burton et al., 1998; Goetzel et al., 1998).

Obesity has become a serious national health care problem. Epidemiological surveys indicate that between 20% and 50% of the people in America are overweight. Based on information from phase 1 of the third National Health and Nutrition Examination Survey (NHANES III), the prevalence of obesity during 1988 and 1991 in the United States was estimated to be 33.4% of the adult population, or an estimated 58 million adults (Kuczmarski et al., 1994). The overall prevalence of obesity is currently highest in men and women ages 50 to 59, and becomes progressively lower at older ages. Furthermore, prevalence of obesity is disproportionately high among minority women and individuals of lower socioeconomic or lower educational backgrounds. Approximately 50% of African-American and Mexican-American women are overweight (DiPietro, 1995).

Comparisons between NHANES II and NHANES III indicate the prevalence of obesity increased by 8% over the period from 1976 to 1991 (Kuzcmarski et al., 1994). African-American men and women experienced a 6% and 5% increase in prevalence of obesity, respectively. However, white women and men experienced the greatest increases in prevalence (8-9%), with the mean body mass index increasing from 25.3 to 26.3.

Overweight is associated with a multitude of other health risks. Obese adults are at an increased risk for morbidity and mortality related conditions such as noninsulin-dependent diabetes mellitus, hypertension, cardiovascular disease, gallbladder disease, depression, muscuoloskeletal disorders, colon and post menopausal breast cancer, and many other conditions and illnesses (Clark & Mungai, 1997; Dorn et al., 1997; Kortt, Langley, & Cox, 1998). At weights greater than 120% of desirable weights, obesity significantly increases the risks of death associated with diabetes, digestive diseases, cancer, smoking, coronary heart disease, and stroke (Dorn et al., 1997; Troiano, Frongillo, Sobal, & Levitsky, 1996; Wienpahl, Ragland, & Sidney, 1990). Consequently, individuals with obesity are more likely to utilize medical services, visit the doctor more often and have increased health care costs (Black, Sciacca, & Coster, 1994; Heithoff et al., 1997; Quesenberry, Caan, & Jacobson, 1998; Wetzler & Cruess, 1985; Wolfe & Gabay, 1987).

Evidence suggests a significant relationship between parental and child obesity. In a longitudinal study of the 1958 British birth cohort, Lake, Power, and Cole (1997) demonstrated that children of obese parents are more likely to be obese as adults. Sons and daughters with two obese parents are 8.4 and 6.8, respectively, times more likely to be overweight as adults than children with normal weight parents. Franzese et al. (1998) showed in a group of obese children, children with two obese parents had significantly higher mean ideal body weights than children with either one or no obese parents.

Moll, Burns, and Lauer (1991) studied the role of genetic and environmental factors determining the variability in body mass index. Although they found that genetic factors accounted for 75% of the incidence of obesity and the variation of body mass index was, spouses living in the same household account for 12% of the incidence of obesity and variation in body mass index. Vogler, Srensen, Stunkard, Srinivasan, and Rao, (1995) studied genetic and environmental effects on body mass index in adoptive families, and found no significant relationships between shared family environments and obesity or body mass index. More than half of the differences were due to non-shared individual environmental influences.

Economic Costs

The economic costs of obesity can be divided into three categories (Seidell, 1998). Direct costs are those to the community related to treatment of obesity and obesity related disorders. These costs include visits to health practitioners, inpatient costs, and medications and supplements. Direct costs have been estimated to be between 1% and 5% of national healthcare expenditures in the United States, Sweden, Norway, and Australia (Levy et al., 1995; Seidell, 1995; Segal, Carter, & Zimmet, 1994; Wolf & Colditz, 1996).

Indirect, or societal costs are those related to productivity loss caused by absenteeism, disability pensions, and premature death. If employees were absent one fewer day per year, savings accrued in 1980 alone would have been $1.1 billion (Tucker, Aldana, & Friedman, 1990).

Personal costs include social discrimination such as: being less likely to gain admittance to prestigous schools or enter desirable professions, and earning less than lean counterparts. Sargent and Blanchflower (1994) showed a significant inverse relationship between girls who were obese at age 16 and their earnings at age 23. Additionally, personal costs may include increased premiums on health insurance (Sarlio-Lahteenkorva, Stunkard, & Rissanen, 1995). In general, however, personal costs are difficult to quantify.

Prevalence Based Studies

Utilizing information from the National Center for Health Statistics between 1976 and 1980, and estimating prevalence for 1986, Colditz (1992), determined that direct medical costs associated with obesity and obesity related medical conditions were estimated to be $39.3 billion dollars or between 5.5% and 7.8% of total health care expenditures. He determined the direct costs of health care expenditures for chronic diseases attributable to obesity were $11.3 billion for Non-Insulin Dependent Diabetes Mellitus (NIDDM), $22.2 billion for cardiovascular disease, $2.4 billion for gall bladder disease, $1.5 million for hypertension, and $1.9 billion for breast and colon cancer.

By 1990, Americans spent an excess of $45.8 billion or 6.8% of health care expenditures on obesity and obesity related illness. Direct costs of health care attributed to obesity were $19.05 billion for NIDDM, $39.3 billion for cardiovascular disease, $12.1 billion for hypertension, and $9.9 billion on gall bladder disease (Wolf & Colditz, 1996). They found a J-shaped curve, relating direct costs of disease, physician visits, work-loss days, bed days and restricted activity days, to three levels of BMI. Higher costs were associated with BMIs lower than 23 and proportionally increased with BMIs greater than 25. These findings are consistent with other research (Boyce, 1991; Burton et al., 1998; Wetzler & Cruess, 1985).

Wolf and Colditz (1998) used information from the 1988 and 1994 National Health Interview Survey, and estimated the economic costs of obesity in 1995 to be $99.2 billion dollars! Direct medical costs were responsible for $51.64 billion dollars, and indirect costs (loss of productivity) were $3.9 billion dollars. The direct cost of obesity in 1995 accounted for 5.7% of the national health care expenditure in the United States.

Gorsky, Pamuk, Williamson, Shaffer, and Koplan (1996) extrapolated the health care costs of three hypothetical cohorts of 10,000, 40-year-old women to age 65. They determined that the moderately overweight (BMI 25-28.9) incurred $22 million more in health care costs and 212 more deaths than the healthy weight cohort (BMI 21-24.9).

The severely overweight cohort (BMI $\geq$ 29) incurred $53 million more in health care costs and 497 more deaths than the healthy weight cohort over the 25-year period.

Foreign researchers, such as Levy et al. (1992), determined that the direct cost of obesity in France during 1992 was 2% of the total health care costs. Seidell (1995) estimated that obesity accounted for 4% of the total Dutch health care costs. In Australia, Segal et al. (1995) estimated that obesity related illness was responsible for 50,931 hospital admissions, 433,165 hospital bed days, and 3.1 million medical consultations during 1989. The costs related to obesity were estimated to be 5% of the total health expenditures, which was considered an underestimation according to the authors. Finally, Swinburn, Ashton, and Gillespie (1997) estimated that in New Zealand the costs attributable to obesity during 1991 represented approximately 2.5% of total health care expenditures.

It is clear that obesity constitutes a significant proportion of national and international health care expenditures. However, it is difficult to accurately compare results between these prevalence-based studies because the researchers used different criteria to characterize obesity. North American research utilizes the National Center for Health Statistics Criteria (BMI $\geq$ 27.8 for men and $\geq$ 27.3 for women) (Burton et al., 1998; Wolf & Colditz, 1996); and foreign research typically utilizes the World Health Organization criteria (BMI > 30) (Levy et al., 1995; Seidell, 1995; Segal, Carter, & Zimmet, 1994).

Individual level or work-site studies

There are only a few studies that evaluate the direct and indirect obesity costs at work-site and individual levels using individual information. Burton et al. (1998) retrospectively and prospectively studied a group of 3,006 banking employees to determine if a progressive relationship existed between BMI, health care costs, and absenteeism. They found a “J-shaped” curve relationship between BMI and mean total medical costs. Employees with a BMI below 25 incurred greater costs, as did employees with a BMI above 27.

Over the three-year period, women at risk for BMI incurred an average of $4,717 more in medical costs, and men at risk incurred $2,586 more in medical costs than did healthy weight women and men. In general, as BMI increased, costs increased, and the number of claims increased. However, high BMI was not associated with outlier claims (extremely high claims). This study excluded all pregnancy related charges and charges associated with open heart surgery, but included outlier claims.

They also determined that employees at risk for BMI ($\geq$ 27.8 for men; $\geq$ 27.3 for women) had twice as many sick days than not at risk employees. When sick days were converted to costs, those at risk for BMI cost $863.00 more during the three year period than healthy weight employees. Furthermore, as BMI increased, the number of sick days utilized increased. The major limitation to this study was that the employees of the sample population were all banking employees and had similar education backgrounds and job skills and attributes.

Goetzel et al. (1998) retrospectively investigated the relationship between ten modifiable health risks and health care expenditures of over 46,000 employees across a wide range of employers and geographic sections in the United States. Over the three year study period they found that the likelihood of having any medical expenditures was significantly greater among employees who were at risk for depression, stress, high glucose, high blood pressure, lack of exercise, serious underweight, and obesity.

Employees at risk for weight (20% or more under or 30% or more above the midpoint of their frame adjusted desirable weight range for their height) had 21% higher medical expenditures when compared with those at lower risk. Furthermore, they discovered that employees “at risk for weight” were almost 1.4 times as likely to have outlier expenditures (expenditures $\geq 99^{th}$ percentile). As previously identified by Burton et al. (1998), at risk women incurred more costs than men, and expenses increased with age. This study, however, only included subjects who participated in a health promotion program, and the author stated that employees were “healthy workers.” Thus, this study may not be representative of the general population.

The findings of Goetzel et al. (1998) were also consistent with a study of 17,000 members of a national health maintenance organization (Quesenberry et al., 1998). Relative to a body mass index of 20 to 24.9, members with body mass indexes between 30 to 34.9 (moderately overweight) had 25% greater health care costs, 17% higher outpatient visit rate, 60% higher pharmacy costs, and 33% higher inpatient costs than healthy weight members. Severely overweight members (BMI of 35 or greater) incurred 44% greater total health care costs, 24% higher outpatient visit rate, 78% higher pharmacy costs, and 70% higher inpatient costs than healthy weight members. The association between BMI, heart disease, hypertension, and diabetes largely explained the elevated costs.

At the DuPont Company between 1984 and 1988, employees at risk for obesity incurred $400.60 more in health care costs than employees with healthy weights (Bertera, 1991). This number was calculated as a function of employee compensation, health care claims, other employee benefits, and the number of sickness absences.

Findings from Yen, Edington, and Witting (1991) conflict with the previously mentioned studies. After evaluating health risks of 1838 employees of a manufacturing company, they determined that when controlling for age and sex, overweight (more than 20% overweight) was not significantly related to health care costs. If they did not control for age and sex, however, weight was significantly related to costs. This study, however, was limited by sample population. It excluded married employees and employees with no health care claims. Furthermore, the population had similar skill or education attributes – they were primarily skilled and unskilled laborers. Thus, the conclusions may not be generalizable across all sections of the workforce. Leigh (1991) evaluated employee and job attributes of a national cross section of employees and found that obesity was a significant predictor of absenteeism.

Furthermore, most of these studies indicated that obese individuals are more likely to have multiple risk profiles (low level of fitness and physical activity, diabetes, hypertension, and high cholesterol), and outlier (very high) expenses (Burton et al., 1998; Kortt, Langley & Cox, 1998). Employees at high risk for cardiovascular disease (includes weight, exercise, blood pressure, tobacco use, and cholesterol) are 1.06 times more likely to use medical services and 2.09 times more likely to be in a high cost group. Furthermore, those with high total risk (cardiovascular, risk taking behavior, psychosocial risk factors) are 1.16 times more likely to use medical services and 3.31 times more likely to be in a high cost group (Weaver et al., 1998). Kingery et al. (1994) found that high risk employees cost an average of $1341 more per person per year than low risk employees.

Summary

Obesity is costing Americans, directly and indirectly, over $90 billion per year. Although some studies have indicated that the average annual excess health care costs per obese employees ranges from $177.09 (Yen et al., 1992) to $3514 (Burton et al., 1998), further study on individual health care costs and rates of absenteeism across a broad demographic cross section is needed.

CHAPTER 3

METHODOLOGY

A retrospective study design was used to investigate the relationship between BMI and health care costs and absenteeism. A description of the sample and setting, protection of human subjects, instrument, data collection, and data analysis are included in this chapter.

Sample and Setting

The population for this study consists of permanent employees of a municipal city government in a large metropolitan area in the southwestern United States. This city government currently has approximately 13,000 permanent employees and 2,000 temporary employees at over 75 different work-sites, across 50 square miles.

Approximately 70% of the employees are male, 30% are female, and 53% are members of a minority group. There are approximately 20 different departments with the three largest being police, fire and rescue, and water. Other city departments include: personnel, legal department, mayor and council, controller and finance, streets and sanitation, libraries, recreation and parks, maintenance, communications and information, and public works and engineering. There is wide variation among employee socioeconomic status, educational achievement, skill background and job type.

The city makes available to all full-time, temporary, and retired employees and their families access to two different city operated wellness centers. A nominal yearly fee of $75 is payroll deducted for the membership. Approximately 6 staff members oversee both centers between 6:00 a.m. and 7:00 p.m. Monday through Friday. Shower and locker facilities are provided for wellness center members.

All employees, regardless of job type were included in the study. A convenient sampling technique was used to obtain the sample from the population, with approximately one-quarter of the permanent employee population sent consent forms and questionnaires (Appendix A). Subjects were excluded if they did not meet the following criteria:

1. Participants must be permanent employees, and have been a permanent employee with the city for at least 1 year.
2. Participants must complete the entire questionnaire.
3. Participants must be members of the preferred provider organization (PPO) offered and managed by the city benefits department.

Protection of Human Subjects

Approval to conduct this study was obtained from the University of North Texas Institutional Review Board. No risks were identified for participants in this study. Each subject who completed a questionnaire was assured that the information collected would be kept confidential. Subjects' identities were numerically coded for data entry. Findings were reported in group format without name identification. Questionnaires remained in control of the investigator, and destroyed at the project's completion.

Instrument

The instrument used in this study was a written questionnaire (Appendix A) which included the following self-reported variables: age, height, weight, education, smoking habits, wellness center membership and wellness center attendance. Furthermore, one question on self-reported level of exercise, and three questions relating to level of activity during a usual day at work were included. Other information, such as race, gender, and type of health plan, was obtained from city databases.

A pilot test was performed on 47 subjects to detect unclear directions, ambiguously worded questions, and potential problems in administering the questionnaire. Test-retest reliability estimates were computed with a ten-day interval between administrations. Correlations were .777 for weight change, .979 for physical activity, .996 for weight, .999 for height and 1.00 for education and smoking status. Data from these questionnaires were excluded from the actual study. No changes were made in the questionnaire as a result of the pilot testing.

Data Collection

Data were collected in two ways. Questionnaires and consent forms were mailed to work addresses of the initial sample population. Additionally, the researcher went to several different job-sites during the workday and requested volunteer participation. An explanatory letter, inviting participation and briefly stating the study’s purpose, accompanied each questionnaire. Those who agreed to participate completed and returned the questionnaires and consent forms sealed in the envelope provided to the city wellness center or to the researcher.

Furthermore, employee health care costs and absenteeism incidence were obtained from the city benefits and personnel databases for the period between 1993 and 1998. Health care cost information extracted from the city benefits database included: number of claims, type of claim, diagnosis related to each claim, fee charged per claim, and amount paid per claim for each study participant. However, only fees charged per claim and diagnosis information was used for this study. Absenteeism information was identified as the number of hours a participant was absent from work each year from 1993 through 1998 as recorded in the personnel database. The researcher gave a city benefits department employee a list of study participants, and the employee extracted the cost and absenteeism information from the databases.

Data Analysis

Data were analyzed using the Statistical Package of the Social Sciences (SPSS). Frequency distributions were used to describe age, gender, ethnicity, education, health plan option, wellness center membership, exercise and activity habits, health care costs, and absence hours taken of the sample.

Linear regression was used to determine the presence of a significant relationship between the medical claims and attendance rates and BMIs. The regression analysis controlled for age, gender, education, wellness membership, and physical activity. Anovas and t-tests were used to describe differences in the sample. The level of statistical significance was $p \leq 0.05$ for all tests.

Summary

A retrospective study design was used to investigate the relationship between body mass index, health care costs, and absenteeism in a municipal workforce. Approximately half of the sample subjects were obtained via mailout and half were obtained conveniently from the permanent city employee database. The data analyzed includes demographic information, body mass index, health promoting behaviors, health care costs, and absenteeism.

CHAPTER 4

RESULTS

The purpose of this study was to examine the relationship between body mass index and health care costs and absenteeism. A description of the sample and the findings is presented.

Description of the Sample

Participants were recruited for this study from the population of permanent employees within a municipal government organization. The sample recruitment included three stages. The first stage of subject recruitment included randomly selecting 1300 (approximately 10% of the workforce) employees and mailing questionnaires and consent forms to their work addresses. Of the 1300, only 127 consented to participate and returned the completed questionnaires. The second stage included randomly selecting an additional 2000 employees, and mailing questionnaires and consents to their work addresses. Approximately 240 were returned with completed consents and questionnaires. Finally, because of the low response rate, the researcher went to various work sites and personally recruited approximately 200 more participants. Of the approximate 3500 employees asked to participate in the study, 575 volunteered. Data were collected over a 6-month period during the spring and summer of 1998. The final data analysis was completed on 524 subjects. The remainder were excluded for the following reasons: lack of a signature on the consent (n=8), incomplete information (n=36), and temporary employment status (n=7). Of the 524 subjects, medical claims costs were available for 269 subjects and absenteeism information was available for 487 subjects.

Of the 524 subjects, 290 (55.3%) were Caucasian, 160 (30.5%) were African American, 58 (11.1%) were Hispanic, 11 (2.1%) were Asian Pacific, and 5 (1.0%) were American Indian. Approximately 61% of the subjects were male and 39% were female. Sample population comparisons with the workforce population are presented in Table 1. The mean age of the sample was 42.8 years. The average BMI for the group was 27.9. Fifty three percent (n=278) of the sample had normal or ideal body mass indexes (BMI $\leq$ 27.8 for men and $\leq$ 27.3 for women) and 46.9% (n=246) had high body mass indexes.

Table 1

Sample Population Demographics in Comparison to City Employee Population

Variable	Study Population	City
N	524	12,626
Gender		
Males	60.9%	70.2%
Females	39.1%	29.8%
Race		
Non-minority	55.3%	46.9%
African American	30.5%	33.3%
Hispanic	11.1%	17.2%
Asian Pacific	2.1%	1.5%
American Indian/Other	1.0%	1.1%

Characteristics of the sample population by level of BMI are presented in Table 2. The sex distribution varied by BMI with no clear pattern across BMI categories. The Asian Pacific population showed significantly lower BMIs than both the Caucasian, African American and Hispanic population ($p \leq .05$).

Table 2

Characteristics of 524 Subjects by BMI Levels

Variable	BMI <20	BMI 20-25	BMI 25-30	BMI 30-35	BMI 35-40
N	18	120	231	112	43
Age	39.3±9.8	41.6±9.6	43.6±9.2	43.8±8.3	40.4±9.4
Female(%)	77.8	55.0	27.7	33.9	53.5
Race (%)					
White	66.7	59.2	55.8	50.9	48.8
Black	27.8	25.0	32.0	30.4	39.5
Hispanic	-	10.0	10.0	16.1	11.6
Asian	5.6	5.8	1.3		
Other		.9	2.7		
College Degree (%)	72.2	57.5	53.7	42.9	32.6
Current Smoker (%)	11.1	11.7	10.4	8.9	9.3
Wellness Membership (%)	38.9	46.7	35.9	40.2	39.5

One-way ANOVAs were used to identify and describe various demographic and survey related differences of subjects between various BMI groups. No significant differences were found in mean ages of subjects in each of the five BMI groups. The educational levels of subjects within the two lowest BMI groups were significantly different than the educational levels of the subjects in the highest BMI group ($\underline{p} = .02$). As BMI increased, education levels decreased. There were also significant differences in the reported physical activity between individuals in each of the BMI ranked groups. Both the normal BMI group (20-24.99) and the high BMI group (25-29.99) reported higher exercise intensity than the severely high BMI group (≥ 35) ($\underline{p} < .05$).

While controlling for age, gender, race, smoking, wellness membership, exercise intensity, and education, linear regression analysis indicated that BMI did not have a significant relationship with average health care claims ($\underline{p} = .066$). Futhermore, it accounted for only 1.2% of the variance in health care costs. There was a trend, however, for mean annual claims costs to increase as BMI increased (Table 3). The mean health care costs of the sample were $2,044.98 (SD = $3,046.65), with average medical claims for men of $1,986.29 and for women of $2,156.05. The group at risk for BMI (men with BMI $\geq$ 27.8; women with BMI $\geq$ 27.3) incurred average health care costs of $2,356.18 in comparison to $1,740.65 for the not at risk population (Table 4).

Upon analyzing the relationship between BMI and health care costs by diagnosis, no trends were present for any diagnostic related group. Furthermore, no significant relationships were found between BMI and diagnosis.

Table 3

Mean Annual Health Care Costs and Absenteeism by BMI Rank

BMI Rank	Health Care Costs ($) (n=269)	Absenteeism (Hrs) (n=487)
$\leq$ 20 (n=7; 15)	$847.26 $\pm$ 959.89	24.8 $\pm$ 23.7
20-24.99 (n=61; 110)	$1,361.35 $\pm$ 1,678.34	28.3 $\pm$ 27.4
25-29.99 (n=126; 212)	$2,154.33 $\pm$ 3,101.72	30.7 $\pm$ 32.4
30-34.99 (n=60; 109)	$2,567.59 $\pm$ 3,993.37	33.6 $\pm$ 32.0
$\geq$ 35 (n=15; 41)	$2,375.06 $\pm$ 2,822.43	44.6 $\pm$ 29.17

Unlike BMI, educational status was a significant predictor of health care costs. College graduates spent an average of $1,416.78 (SD = $1,714.99) per year in comparison to non-graduates who spent an average of $2,668.53 (SD = $3,854.68) per year ($p = .001$). There were no significant differences between groups' health care costs based on age, gender, race, self reported physical activity levels, wellness center membership or participation

Average absenteeism for the 487 employees in the sample was 31.8 hours per year. Males reported a mean absence of 29.5 hours per year, while women reported a mean absence of 35.5 hours per year. Independent t-test between gender groups revealed a significant difference ($t_{485} = 2.078$, $p < .04$).

Table 4

Gender Differences by BMI Risk and Relationships
With Health Care Costs and Absenteeism

Variable	Overall	At BMI Risk	Not At BMI Risk
Health care costs (n=269)	$2,044.98	$2,356.18	$1,740.65
Men (n=176)	$1,986.29	$2,208.90	$1,747.97
Women (n=93)	$2,156.05	$2,675.27	$1,728.46
Absenteeism (Hrs) (n=487)	31.8	36.0	27.9
Men (n=301)	29.5	33.6	25.5
Women (n=186)	35.5	40.2	31.7

There was a moderate trend between increasing age and increasing absenteeism. The most important differences in age groups were observed in employees aged 30 to 50. Individuals between the ages of 30 to 39 years and 40 to 49 years were absent 2 more days per year than individuals between the ages of 20 and 29 years. Moderate differences in absenteeism between races were also found ($p < .05$). African Americans were absent a mean of 35.5 hours per year in comparison to Asian Americans who were absent a mean of 8.1 hours per year.

Table 3 also shows the average absenteeism for employees of varying BMI levels. While controlling for age, gender, race, education, wellness membership, exercise intensity, and smoking, linear regression analysis showed a significant relationship (p =

.04) between BMI and absenteeism. As BMI increased, absenteeism increased. However, BMI accounted for less than 1% of the variance in absenteeism.

Normal weight subjects (BMI 20-25) had significantly fewer absences than severely overweight subjects (BMI $\geq$35) (p = .03) . At risk subjects (men with BMI $\geq$ 27.8; women with BMI $\geq$ 27.3) had an average of 36 sick hours, while normal weight subjects had an average of 27.9 sick hours (p = .04).

Table 5

Variations In Demographics and Risks by Education Level

Variable	College Degree	No Degree
Race		
White (N=290)	52.4%	47.6%
African American (N=160)	56.3%	43.8%
Hispanic (N=58)	31%	69%
Asian Pacific (N=11)	72.7%	27.3%
American Indian (N=5)	0	100%
BMI		
At Risk (N=246)	43.5%	56.5%
Not at Risk (N=278)	57.9%	42.1%
Ave Absenteeism Per Subject	24.5 Hours	39.3 Hours
Ave Claims Per Subject	$1,656.53	$3,117.56
Physical Activity Sufficient for Health Benefit	54.5%	45.7%

Education was also a significant predictor of absenteeism ($p < .001$) (Table 5). As education increased, absenteeism decreased. Education accounted for 4% of the variance in absenteeism. Employees with college degrees were absent a mean 24.5 hours per year in comparison to 39.3 hours per year for employees without college degrees ($p < .001$).

Likewise, as reported physical activity increased, absenteeism decreased. Individuals who reported being physically active sufficient for a health benefit (n=242) were absent 28.6 hours in comparison to 35.0 hours for employees not physically active sufficient for a health benefit (n=245, $p = .02$).

Findings

A hypothesis in this study was that overweight employees would have higher average health care costs than normal weight individuals. Although there was a trend for health care costs to increase as BMI increased; BMI was not a significant predictor of health care costs.

The second hypothesis of this study stated that overweight employees would have greater absenteeism than normal weight individuals. BMI had a significant association with absence. Overweight employees were absent eight hours more per year than normal weight employees. Moreover, education and physical activity also displayed significant associations with absenteeism.

Summary

Of the 524 participants in this study, 60.9% were male and 39.1% were female. The average age of the sample was 42.8 years and the average BMI was 27.9.

Approximately half (53.1%) of the participants had normal BMIs ($\leq$ 27.8 for men; $\leq$ 27.3 for women).

Two hundred eighty six individuals reported health care claims with a mean cost of $2,371.56 per year. Four hundred eighty seven subjects reported absenteeism with a mean annual absenteeism of 31.8 hours. A significant relationship was identified between BMI and absenteeism, but not between BMI and health care costs. Although there was no significant relationship, as BMI increased, average health care costs increased. No significant effects of age, gender, race, smoking status, wellness membership, participation, or job characteristics on costs or absenteeism were noted.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

This retrospective study was conducted to assess the relationship between body mass index and health care costs and absenteeism. A summary, discussion of findings, conclusions, implications, and recommendations for further research are presented.

Summary

The independent variable for the statistical comparison of health care costs and absenteeism was self reported body mass index. The dependent variables were defined as the average annual health care costs and average annual absenteeism hours reported by subjects during a six-year period.

One hypothesis was investigated in this study. The first part of the hypothesis stated that overweight individuals would have significantly higher average medical claims. BMI was not a significant predictor of health care costs. However, as BMI increased, health care claims tended to increase. Overall, overweight individuals spent an average of $885.75 more per year in health care claims than healthy weight individuals.

The second part of the hypothesis stated that overweight individuals would have significantly higher absenteeism than healthy weight individuals. Results demonstrated a relationship that as BMI increased, absenteeism significantly increased. Relative to normal weight individuals (20-24.99) severely overweight individuals (BMI $\geq$ 35) incurred 16 more sick hours per year. Healthy weight individuals incurred an average absence of 27.99 hours per year, while overweight individuals incurred an average of 35.99 hours per year. Education and physical activity also demonstrated significant relationships with absenteeism. Education was a strong predictor of health care costs ($p < .001$) and accounted for 4% of the variance.

Discussion of Findings

The results of this study indicated that overweight individuals are absent from work more than healthy weight individuals, and show a trend to incur higher health care costs. Previous studies have also demonstrated these results, but not consistently. Burton et al. (1998) reported that employees at risk for obesity incurred an average of $2,326 more in health care costs per year than employees not at risk for obesity. Burton also found a "J-shaped" curve in health care costs. This present study did not find this pattern, possibly because the low BMI group was very small.

Bertera (1991) found that employees at risk for obesity spent an average of $400.60 more per year than employees not at risk for obesity. Similarly, Quesenberry et al. (1998) found that relative to normal weight subjects (BMI 20-24.9), overweight subjects (BMI) had 25% higher annual health care costs, and severely overweight subjects (BMI $\geq$ 35) had 44% higher annual health care costs.

Consistent with the present study, Burton et al. (1998) and Bertera (1991) also demonstrated relationships between BMI and absenteeism. Burton et al. (1998) determined that employees at risk for obesity had twice as many sick days per year as employees not at risk for obesity. Bertera (1991) also confirmed a significant association between BMI and absenteeism and found that employees at risk for obesity had one-half day more in absenteeism per year than employees not at risk. Yen, Edington and Witting (1991) reported results contrary to the present findings. They found no relationship between BMI and absenteeism.

Education was a significant predictor for both health care claims and absenteeism. Few of the recent studies on absenteeism and health care costs addressed the relationship of education and absenteeism and illness. Both Burton (1998) and Yen, Edington and Witting (1991) studied employee groups with similar job and education attributes and were unable to evaluate possible educational or socioeconomic differences.

In this study, body weight was assessed by self-report. Some researchers question the reliability and accuracy of self-report. However, because the current results were similar to those of recent claims and absenteeism studies, self-reported weight is a feasible method of data collection (Burton et al., 1998; Quesenberry et al., 1998). Furthermore, the questionnaire allowed subjects the opportunity to state their weight change in the five years prior to the study. None of the subjects reported weight changes that would have moved them to different BMI risk groups during the period in question.

Conclusions and Implications

1. This research found that as body mass index increased, average annual absenteeism significantly increased. Likewise, average annual health care costs tended to increase with increasing BMIs, however, not at significant levels.

2. The present study also found that education is significantly related to health care costs, and both education, physical activity, and managed care plan are strong predictors of absenteeism.

The implications of this study suggest that indirect costs to employers increase as BMI increases. Employees with poor BMI not only hurt themselves and cost their employers money, but they also affect the general public. Their poorer health increases the costs to produce goods and services, which leads to inflation.

Employers can no longer take a hands-off approach to employee health. Because employers are paying for employees' poor health status, it is reasonable for them to proactively encourage employees to achieve healthier lifestyles. The benefits to an employee to achieve and maintain a healthy weight may include improved quality of life, reduction in other disease risk factors, and a reduction in avoidable health care costs.

However, research on the effectiveness of work-site health promotion as a means for reducing costs is inconclusive. Employers, health professionals, and managed care organizations will have to creatively and effectively find ways to keep employees from gaining weight and help employees who are overweight to reduce their weight.

Recommendations for Further Research

Future directions for research in the area of health risk factors and associated costs include:

1. Reproduce the study with a true random sample of the population to determine variation in BMI and associated costs by job type, department, and/or skill level.
2. Reproduce the study over a longer time frame and obtain data from both HMO and PPO health plans to assess differences between plans, which will also ensure that claims information will be obtained in the event employees switch plans.
3. Follow a cohort of individuals, and obtain health risk information from them each

year of the study and determine the impact of weight gain or weight loss over time in comparison to constant weight. Furthermore, this study would help researchers to quantify the time frame of impact between increased or decreased weight and subsequent changes in health status and medical costs.

4. Study the impact of negative incentives, such as increased health premiums for high risk employees, on employee absenteeism and health care utilization and costs.

5. Focus attention on education, health risk, and health care costs. Assess the impact of education of individuals during a study period, to determine if the achievement of a degree during the study period has a relationship with health care costs. Furthermore, determine at what point in time or age group is education having the greatest impact on weight and costs.

APPENDIX A

HUMAN SUBJECTS APPROVAL

University of North Texas
Research Services

March 8, 1999

Monica Mallow Satterwhite
1513 Ridgeview Drive
Arlington, TX 76012

RE: Human Subjects Application No. 99-049

Dear Ms. Bennett:

Your proposal entitled "A Retrospective Study: The Relationship Between Body Mass Index, Health Care Costs, and Absenteeism In A Group of Municipal Employees," has been approved by the Institutional Review Board and is exempt from further review under 45 CFR 46.101.

The UNT IRB must re-review this project prior to any modifications you make in the approved project. Please contact me if you wish to make such changes or need additional information.

Sincerely,

Sandra L. Terrell

Sandra L. Terrell, Chair
Institutional Review Board

ST:sb

P.O. Box 305250 • Denton, Texas 76203-5250
(940) 565-3940 • Fax (940) 565-4277 • TDD (800) 735-2989

e-mail: lane@abn.unt.edu

APPENDIX B

QUESTIONNAIRE

Dear City of Dallas Employee:

You have been randomly selected to participate in a research study for the Wellness Program. In an effort to promote the Wellness Center, the staff is conducting a research study focusing on employee's health and health related costs. Although this study may not benefit you directly, it may prove helpful to Employee Benefits and the Wellness Program in planning future wellness activities.

There are no identified health risks to you for your participation in this study. Of course, **participation is voluntary** and you may refuse to participate and/or withdraw from this study *at any time without penalty or prejudice.*

Participation in this study involves the **completion of the included questionnaire**, which should take approximately 2 minutes. Also, your consent allows Employee Benefits to **review your medical claims and attendance records** for the past six years and the current year. ***All information will be kept confidential***. Information obtained may be used for reports and research publications. ***Your name will not be identified in any way with this research, nor will the City of Dallas be mentioned.***

Please discuss any questions you may have with myself or Trevor Richards, RN at (214) 670–7710. Or, you may also contact my faculty advisor, Dr. Tim Bungum at (940) 565-2546.

Thank you,
Monica Satterwhite
Wellness Center Intern / Graduate Student –UNT

STUDY CONSENT

I have read with full understanding the statements above and have had all of my questions answered to my satisfaction.

I, ________________________, agree to be a participant in this study and to the analysis of
Employee signature

records to the extent described above.

Employee PRINTED NAME: ______________________________ Date: ______

Employee Number:___________________________ Work Telephone: _________

Complete Work Address: ____

THIS STUDY HAS BEEN REVIEWD BY THE UNIVERSITY OF NORTH TEXAS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (Phone: (940) 565-3940).

CITY OF DALLAS WELLNESS CENTER SURVEY

INSTRUCTIONS: Please complete the following questionnaire and return it to the wellness center in the envelope provided. Please be sure to seal the envelope. Answer all questions (**on front and back of this survey**) completely and accurately to the best of your knowledge. Please print clearly.

1. Employee Number ______ **2. Date of Birth** ___/___/____ **3. Sex** ___m ___f

4. What is the highest education level you completed?

______ Grade school or less
______ Some high school
______ High school graduate
______ Some college/Trade School
______ College graduate
______ Some graduate school
______ Graduate degree

5. Your height (WITHOUT SHOES). ___ Ft ___ in

6. Your current weight (WITHOUT CLOTHES).________pounds

If you have been pregnant in the past five years, please use your pre- pregnancy weight, or if you are unsure of your weight and/or have not weighed in the past year, please come to the Wellness Center for measurement.

7. Has your weight changed in the past 5 years?

No change _________
Increased by ________ pounds
Decreased by _______ pounds
Don’t know _________

8. Do you smoke presently?______ Yes ______ No

Currently smoke ____Cigarettes/day ____ Cigars/day ____Pipefuls/day
At what age did you start smoking _____________
If you have quit smoking, when did you quit? ___________

9. Are you a member of the City of Dallas Wellness Center? ___ YES ____ NO

10. If yes, on average, how often do you attend the City of Dallas Wellness Center?

___ 3 times per month or fewer
____ 1 time per week (4-7 times per month)
___ 2 times per week (8-11 times per month)
____ 3 or more times per week (12+ times per month)

11. Are you a member of any other fitness or wellness center? ___ YES ___ NO

12. On average, how often do you attend another fitness or wellness center?

___ 3 times per month or fewer
___ 1 time per week (4-7 times per month)
___ 2 times per week (8-11 times per month)
___ 3 or more times per week (12+ times per month)

13. You are about to read some statements about <u>YOUR</u> level of activity. For these statements, keep the following in mind:

<u>THE WORD</u> 'VIGOROUS' refers to activities like baseball, jogging, running, fast cycling, aerobics class, swimming laps, singles tennis, racquetball, etc.
<u>THE WORD</u> 'MODERATE' refers to activities like brisk walking, gardening, slow cycling, dancing, or hard work around the house.

Please indicate which **<u>ONE OF THE FOLLOWING</u>** best identifies your current level of exercise. Please **MARK WITH AN 'X' OR A CHECK MARK** the space in front of the **ONE** statement that describes your current level of exercise.

___I do not exercise or walk regularly now, and I do not intend to start in the future.
___I do not exercise or walk regularly now, but I have been thinking of starting.
___I am trying to start to exercise or walk, or I exercise or walk infrequently.
___I am doing vigorous exercise less than 3 times per week, or moderate exercise less than 5 times per week
___I have been doing moderate exercise 5 or more times per week (or more than 2 ½ hours per week) for the last 1 to 6 months
___I have been doing moderate exercise 5 or more times per week (or more than 2 ½ hours per week) for 7 months or more
___I have been doing vigorous exercise 3 to 5 times per week for 1 to 6 months
___I have been doing vigorous exercise 3 to 5 times per week for 7 or more months

14. You are about to read three questions about your USUAL DAY AT WORK ACTIVITY. Please mark with an 'x' or 'check mark' the space in front of the ONE statement in each group that best describes your activity.

How often does your **USUAL DAY AT WORK** include **LOW INTENSITY ACTIVITY (**like sitting, standing still without heavy lifting, light cleaning, ironing, cooking, washing, dusting, driving a bus, taxi, or truck, general office work, occasional/short distance walking, etc.) for a total of at least 30 minutes or more per day?

____Almost never ____Twice a month
____Once a week ____3 to 4 times per week
____5 + times per week

How often does your **USUAL DAY AT WORK** include **MODERATE INTENSITY ACTIVITY** (like carrying light loads, continuous walking, heavy cleaning, mopping, sweeping, scrubbing, vacuuming, gardening, planting, weeding, painting, plastering, plumbing/welding, electrical work, etc.) for a total of at least 30 minutes or more per day?

___Almost never ____Twice a month
____Once a week ____3 to 4 times per week
____5 + times per week

How often does your **USUAL DAY AT WORK** include **VIGOROUS INTENSITY ACTIVITY (**like carrying moderate to heavy loads, heavy construction, hoeing, digging, mowing, raking, digging ditches, shoveling, chopping, sawing wood, tree/pole climbing, water/coal/wood hauling) for a total of at least 30 minutes or more per day?

____Almost never____ ____Twice a month
____Once a week ____3 to 4 times per week
____5 + times per week

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