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The effects of an employee fitness program on absenteeism and health care costs

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THE EFFECTS OF AN EMPLOYEE FITNESS PROGRAM ON ABSENTEEISM AND HEALTH CARE COSTS

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THESIS ACCEPTANCE

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CHAPTER I

INTRODUCTION

Health care expenditures in the United States have continued to climb at an alarming rate. In 1982, health care expenditures accounted for nearly $322.4 billion of the gross national product (U.S. Department of Health and Human Services, 1982). Health care expenditures are expected to consume nearly 12 percent of the nation's economic output by the year 1990, reaching nearly $756 billion in projected costs (Cullen and Towe, 1983). Although health care costs have climbed at an annual rate of less than 10 percent, these costs have continued to increase in the private sector, which currently absorbs one-fourth of the nation's health care expenses (Chenoweth, 1987).

With the costs of health care rising, many corporations have been searching for strategies which will help reduce their medical expenses. Several companies have shown interest in the development of physical fitness programs as a means of improving employee health and reducing health care costs. Some corporations have invested large sums of money towards comprehensive health and fitness programs in an effort to improve employee morale and productivity, while decreasing absenteeism, turnover, disability, and health insurance claims. These companies have anticipated decreases in absenteeism and health care utilization among employee

participants as a result of improved health and well-being. Although economic benefits from improved job attitudes and morale have been found in some studies (Fielding, 1979; Rhodes and Dunwoody, 1980), there is currently little evidence to support the theory that monetary benefits can be obtained from the implementation of work-site fitness programs (Fielding, 1982).

Several studies have attempted to measure the effectiveness of health and fitness programs on medical expenses and absenteeism (Shephard, Corey, Renzland and Cox, 1982; Bowne, Russell, Morgan, Optenburg and Clarke, 1984; Gibbs, Mulraney, Henes and Reed, 1985; Baun, Bernacki and Tsai, 1986), however many have failed to control for factors which could alter results, namely selection bias, noncomparable control groups, unmonitored fitness program participation, few males, and short study periods (Elias and Murphy, 1987). As a result, further investigation into the effects of employee health and fitness programs appears warranted. Therefore, the purpose of this study was to examine the effects of a work-site fitness program on absenteeism and health care costs between participants and nonparticipants of a recently developed employee fitness center.

CHAPTER II

THE PROBLEM

Controversy over the effects of employee fitness programs on absenteeism and health care costs has warranted further investigation into this issue. The purpose of this study was to examine the effects of a comprehensive health and fitness program between participants and nonparticipants of the recently developed Union Pacific Fitness Center (UPFC).

RESEARCH HYPOTHESIS

It was hypothesized that a significant difference would be found between the absenteeism rates of UPFC program participants and nonparticipants. It was also hypothesized that a significant difference would be found between UPFC participants and nonparticipants in relation to health care costs, due to an initial increase in health care utilization by program participants. Initial increases in health care costs among exercise program participants has been shown in previous research (Baun et al., 1986; Gibbs et al., 1985) and has been attributed to a general increase in health awareness and subsequent health care utilization by participating employees.

DELIMITATIONS

This study involved a total of 283 agreement clerks employed by the Union Pacific Railroad (UPRR) who were chosen according to the following criteria:

1. Must have been an agreement employee of UPRR.
2. Must have had a job position of company clerk.
3. Must have had a work location situated in the headquarters building of UPRR located in Omaha, Nebraska, and/or in the Omaha and/or Council Bluffs, Iowa vicinity.
4. Must have been a member of the Employees' Health System (EHS) of UPRR.
5. Must have had all major medical claims filed through EHS without supplemental coverage from a secondary insurance provider of UPRR.
6. Must have been an employee of UPRR for a minimum of two years.

Subjects were also required to meet an additional criteria based upon their assignment to a test or control group. Test group subjects were required to be members of the UPFC program for a minimum of three months during the study period. Control group subjects were not members of the UPFC program during the study period.

LENGTH OF STUDY

Data for absenteeism and health care utilization were collected and analyzed for a period beginning eight months prior to the initiation of the UPFC program, and ending eight months following the program's implementation. The study period was from February 1, 1987 through May 31, 1988.

LIMITATIONS

The following limitations existed in this study:

1. Participation in the UPFC program was based upon self-selection by UPRR employees. Individuals defined as test group subjects were members of the UPFC as a result of self-selection.
2. A short measurement period existed prior to, and following the implementation of the UPFC program. The study period was from February 1987 through May 1988.
3. Results of the data analysis represented absenteeism and health care costs associated with agreement clerks. This data did not represent the total UPRR work force.
4. Control and test group subjects were selected on a nonrandom basis.
5. Computer-recorded exercise sessions were completed on a voluntary basis. Therefore, these records did not reflect the total

number of exercise sessions and/or accumulated activity hours possible for each participant.

6. Unmonitored exercise activity conducted by control and test group subjects outside the UPFC program was not accounted for in this study.
7. Seasonal variations in absenteeism and health care utilization among control and test group subjects was not accounted for in this study.

DEFINITION OF TERMS

For clarity, the following terms are defined:

AGREEMENT EMPLOYEE: An individual who is represented by a labor union organization and is employed by UPRR under contract agreement with the representative union.

NONAGREEMENT EMPLOYEE: An individual who is not represented by a labor union organization, and is employed by UPRR on an independent basis.

ABSENTEEISM: The total number of paid and unpaid hours of absence from work excluding: (1) holidays; (2) personal leave; (3) bereavement leave; and (4) vacation time.

HEALTH CARE COSTS: The total major medical expenses per employee excluding: (1) dependent costs; (2) co-payments; (3) deductibles, and (4) expenses related to normal childbirth.

SIGNIFICANCE OF THE STUDY

The implementation of physical fitness programs at the work-site has become an important component of employee health promotion programs. Their impact on the containment of employee health care costs are of paramount concern. Many corporations, including Union Pacific Railroad, have developed employee fitness centers with the premise that such programs can improve the health of their workers, in addition to reducing costs associated with disability, absenteeism, decreased productivity, and job turnover.

If employee health and fitness programs are to be effective in reducing health care costs, evaluation of their impact upon medical expenses is necessary in order to establish whether or not such programs can contain costs associated with increased absenteeism and health care utilization. Moreover, the notion that business can contain costs and improve the health of its workers by developing work-site fitness programs remains to be clearly shown in research literature.

Therefore, this study was a preliminary attempt at assessing the effectiveness of the UPFC program in reducing absenteeism and

health care costs of UPRR employees. Of major importance in this study was the development of a comprehensive evaluation system and associated procedures of methodology which will be used for further long-term evaluations of the UPFC program.

CHAPTER III

REVIEW OF LITERATURE

Several studies have been conducted in an effort to determine the effects of employee health and fitness programs on absenteeism and health care costs. Research in this area indicates that work-site health promotion programs can produce economic savings for employers. These savings are believed to occur as a result of reductions in employee absenteeism, disability costs, and health care utilization which result from participation in a variety of health awareness programs. These programs often include smoking cessation, weight management, hypertension control, stress management, nutrition education, alcohol and drug abuse control, colorectal and breast cancer screening, lower-back injury prevention, and physical fitness (Rentmeesler, 1984). However, controversy has arisen concerning the actual economic benefits of health promotion programs in relation to measured decreases in absenteeism and health care utilization. It has been suggested that a majority of studies which have reported decreases in absenteeism and health care costs failed to control for factors which could alter results, namely those which involved self-selection, unmonitored fitness program participation, and noncomparible control groups (Elias and Murphy, 1987). In addition, one author has stated that an empirically sound understanding of the basic behavioral effects of

workplace health promotion is not present in scientific literature, and that the methodology necessary to evaluate the cost-effectiveness of such programs does not exist (Warner, Wickizer, Wolfe, Schildroth and Samuelson, 1988). Therefore, the purpose of this review will be to examine current research on the effects of employee health and fitness programs on absenteeism and health care costs.

The effects of an employee fitness program on absenteeism and productivity were investigated by Shephard, Cox and Corey (1981) in a controlled, six-month study involving employees of two large office buildings. Subjects were recruited on a volunteer basis at each company. The management of the control company expressed interest in developing an employee fitness program, but deferred its plans to implement the center for a one-year period for research purposes. The test company agreed to construct a gymnasium in the main headquarters for its employees and the fitness program was initiated three months after research volunteers were recruited. A total of 672 subjects at the test company were organized into age-and-sex-specific classes. Individual exercise programs based on three, 30-minute sessions of aerobic exercise per week were developed for each subject. Over the course of the study, subjects at the test company were self-sorted into four categories which included: (1) nonparticipants (NP)-subjects who took part in initial fitness testing, but failed to attend any fitness classes; (2) drop-outs (DO)-subjects who participated in the fitness classes for two months or less and then dropped out; (3) high adherents (HA)-subjects who

attended an average of more than two classes per week throughout the study period; and (4) low adherents (LA)-subjects that attended an average of fewer than two classes per week throughout the study period. Two hundred and fifty seven volunteers from the control company served as the control group.

Supervisors at each company were asked to complete questionnaires at one-month intervals which evaluated subject's productivity, cooperation, satisfaction, accuracy of work, and attendance. Subjects at both companies reported the number of health care visits, days absent, illness related colds, and expenses related to prescription and non-prescription drugs at similar one-month intervals. A total of 431 out of an initial 672 volunteers at the test company remained participants in the fitness program over the course of the study.

Following the six-month study, results from both companies showed that health care utilization, illness, and absenteeism decreased slightly from initial measurements. Health care utilization was found to be more frequent among women than among men, while men showed higher expenditures for both prescribed and non-prescribed medications. Supervisory ratings for subjects at the test company showed a slight improvement in productivity, cooperation, job satisfaction, accuracy of work and promptness of arrival. However, similar results were observed in supervisory ratings collected at the control company.

Among the self-sorted groups, absenteeism was observed to be higher among women than among men, while absences at the control company were substantially higher than at the test company. An analysis of attendance records at the test company showed that subjects with high adherence to the program developed a 22 percent advantage relative to other workers despite similar absenteeism rates as compared to other employees prior to the program's initiation.

Researchers suggested that observed decreases in absenteeism and health care utilization were possibly a result of selective sampling, seasonal trends, and nonspecific response to experimental intervention. Researchers concluded that longer duration, and more intensive investigation involving larger sample groups would be needed to clarify the significance of these trends.

A one-year follow-up study conducted by Song, Shephard and Cox (1982) examined the effects of an employee fitness program on absenteeism, turnover, and sustained exercise participation. This study involved the same subjects at the test company previously investigated by Cox, Shephard and Corey (1981). The purpose of this investigation was to provide a longer-term evaluation of adherence to fitness programs, with further analysis on the influence of program participation on absenteeism and turnover patterns within the same company.

Subjects from the original test company were reorganized into four categories distinguished as nonparticipants, drop-outs, low

adherents, and high adherents as previously reported (Cox, Shephard and Corey, 1981) on the basis of their participation in the fitness program one-year after the initial study. Over the one-year period, 44 of the original 431 study participants were no longer employed by the company. The overall annual turnover rate was 10.2 percent, with 7.6 percent attributed to the high adherents, 20.7 percent for low-adherents, and 2.4 percent for the drop-outs. Men showed a lower turnover rate (5.1%) as compared to women (13.8%). Absenteeism rates for the test subjects after one-year of program participation were similar to previous findings (Cox, Shephard and Corey, 1981), with high adherents demonstrating similar absenteeism rates as that of other employees, with a progressive decrease in total absences observed during the course of the study.

Researchers concluded that these results add support to the existence of an exercise-specific effect on employee absenteeism, since the difference of absenteeism rates between exercisers and non-exercisers disappeared during the initial study (Cox, Shephard and Corey, 1981), but reappeared when the subjects were re-classified according to their current exercise participation levels. Investigators suggested that the observed decrease in absenteeism may have been part of an overall improvement in company morale as a result of the implementation of the fitness program.

An additional study by Shephard, Corey, Renzland and Cox (1982) examined changes in health care utilization in a controlled trial of an employee fitness and lifestyle modification program.

Subjects included 234 men and 300 women from the head offices of two insurance companies previously examined in other research studies (Shephard, Cox and Corey, 1981; Song, Shephard and Cox, 1982). A total of 721 employees (44 men, 677 women) from the two companies agreed to complete a series of three fitness assessments conducted during the study period. Each fitness assessment consisted of six separate tests which included: (1) three-minute heart rate by electrocardiographic recording; (2) predicted maximum oxygen uptake (VO2 max) as determined by the formula of Jetta et al. (1976); (3) total body mass using a clinical scale; (4) body fat estimation as determined by skinfold thickness using the procedure of Durnin and Womersley (1974); (5) muscle strength as measured on the right hand by a handgrip dynamometer; and (6) flexibility using the sit-and-reach test. Analysis of changes in health care costs were restricted to subjects who attended all three fitness evaluations.

Medical claims were grouped into four categories which included: (1) electrocardiography; (2) obstetrics and gynecology; (3) orthopedic care; and (4) all other diagnoses. Subjects from the test company were encouraged to participate in up to three, 30-minute sessions of physical activity per week under supervised conditions. Exercise activity included both rhythmic calisthenics and aerobic conditioning at a minimum of 60 percent of VO2 max. Exercise sessions were conducted at the work-site in the fitness facility. Subjects from the control company were not involved in any exercise

program, and no program was developed for their use during the study period.

Results from this study showed that hospital utilization at the test company was initially higher than that of the control company. However, health care utilization among subjects at the test company was found to decrease ($p<0.02$) after the implementation of the fitness program. Nonparticipants of the fitness program showed a higher initial hospital utilization than participants, yet both were found to contribute to the observed decrease in health care usage.

Total costs of medical claims at both companies were initially the same, however no significant change was observed between the test company and the control company following the study period. Likewise, little change was observed in electrocardiographic costs in either of the two companies. Obstetric and gynecological costs were found to be initially higher at the test than at the control company, but were found to substantially decrease in the test company during the study period. Little change in orthopedic costs was observed among subjects at either of the two companies. Costs of other medical claims not included in the previous categories showed little change in the test company, but was observed to significantly increase in the control company after the study period. Researchers suggested that observed benefits in health care utilization among test company subjects was a result of an overall increase in health awareness rather than actual improvements in fitness levels from participation in the fitness program.

Another study conducted by Shephard, Corey, Renzland and Cox (1983) examined changes in health care costs as related to changes in fitness and perceived lifestyle associated with the introduction of an employee fitness program. Subjects were volunteers from two large office buildings previously involved in earlier studies (Shephard, Cox and Corey, 1981; Song, Shephard and Cox, 1982; Shephard, Corey, Renzland and Cox, 1982). A total of 140 men and 186 women participated in the study which consisted of three sessions of comprehensive fitness testing conducted at three-month intervals. Subjects completed a Health Hazard Appraisal (HHA) as developed by Health and Welfare Canada (1976) at each of the three testing sessions. Fitness evaluations consisted of the same measures previously used by Shephard, Corey, Renzland and Cox (1982).

The HHA included basic demographic information along with data on perceived smoking and alcohol consumption, driving mileage, physical activity, history of depression, medical history, and measured values for blood pressure and total cholesterol. Data on health care usage for each subject included information on total annual hospital days, total claims for medical care, and additional claims for medical care excluding those related to electrocardiography, orthopedic, obstetric and gynecological services.

Results from this investigation showed a significant ($p<0.05$) association between a decrease in resting heart rate and a decrease in hospital utilization in male subjects. No significant associations for

heart rate and hospital utilization were observed in the women. Likewise, a significant ($p<0.03$) association between poor hand grip strength and increased hospital utilization was found in the male subjects but not in the women. However, a decrease in body mass in female subjects was associated with an increase in hospital utilization ($p<0.05$). For both men and women, a decrease in body fat was significantly related ($p<0.04$) to an increase in hospital utilization and medical care costs. No significant associations were found in relation to predicted VO2 max and health care costs in either the men or women. With respect to the HHA, no significant association was found between changes in composite risk and appraised age in relation to health care costs.

Researchers suggested that the most probable explanation for the observed decrease in health care costs was primarily related to changes in reported measures not covered by the HHA, since it was found to have no significant association with changes in health care utilization. In addition, researchers reasoned that health care costs accumulated by normal working employees related mainly to minor ailments, with little effect caused by gains in physical fitness. Investigators suggested that a general increase in health awareness, as a result of the fitness program, may have contributed to a non-specific association with exercise and health care expenditures. This suggestion mirrors earlier reports by the same researchers concerning observed decreases in health care costs among the same

test and control company subjects (Shephard, Corey, Renzland, and Cox, 1982).

Reduced disability and health care costs in an industrial fitness program were examined by Bowne, Russell, Morgan, Optenburg and Clarke (1984) over the course of a five-year period. This prospective longitudinal study investigated disability days and major medical costs of participants in a physical fitness program at the Southwestern Home Office of the Prudential Insurance Company. A total of 74 male and 110 female subjects were included in the disability study group according to the following criteria: (1) must have been an employee of the company for at least one-year prior to entry in the fitness program; and (2) must have remained in the program for at least one-year after entry into the program. Of the 184 participants in the disability study group, 121 employees were included in the major medical study and were participants in a major medical health insurance plan which excluded Health Maintenance Organization (HMO) assistance.

Number of days of disability absences and major medical costs were determined for each participant for a one-year period immediately prior to their entry into the program, and for a one-year period immediately after their entry. A total of 74 males and 110 females participated in the study, and each received a submaximal treadmill exercise test using the Ellestad protocol (1975) with 85 percent of maximum predicted heart rate as a target intensity. Percent body fat was assessed from skinfold

measurements according to the methods of Behnke and Wilmore (1974). A program of gradually increasing aerobic exercise was prescribed for each individual following the initial testing. All exercise activity was done on the employee's own time, either on or off the fitness center premises. Random assignment of subjects to exercise and nonexercise groups was not done, as a rolling-entry permitted employees to enter the program at any time. Therefore, self-selection of test subjects determined fitness program participation.

Results from this study showed that of the 184 participants in the disability group, 42.6 percent had fewer days of disability than the five-year average for other employees. After one-year in the program, subjects had 54.1 percent fewer days of disability which accounted for a 20.1 percent reduction as compared to the group's average for the year prior to entry into the fitness program.

The group of 121 participants in the major medical study showed a combined reduction of 45.7 percent in total medical expenses, with an average reduction of $262.14 per participant one-year after entry into the program. However, the average cost reduction was observed only in the female subjects (49.7%), while male subjects showed an average cost increase of $215.35 per participant.

Researchers suggested that an inverse relationship seen between medical costs and levels of fitness, and the decrease in disability days of absence were primarily due to the participants'

involvement in a structured and voluntary exercise program. Investigators suggested that for better-educated, white collar workers, a higher level of fitness can bring a significant decrease in major medical expenses and a substantial reduction in disability days.

In another study, a five-year trend in employee health care costs was examined by Gibbs, Mulvaney, Henes and Reed (1985). Information was gathered from the Blue Cross and Blue Shield of Indiana's (BCBSI) employee health promotion program between January 1978 and September 1982. The health promotion program included health risk screening by questionnaire, physiological measurements, verbal and written feedback, and referral to intervention programs. In addition, group programs were offered in nutrition, weight reduction, smoking cessation, and fitness.

Participants and nonparticipants were compared in seven, six-month time periods from January 1978 to September 1982. Two smaller groups were compared for six-months prior to the program's initiation, and for five years after the program had been in operation. Nonparticipants included 1256 individuals who were employed during the study period, but were not involved in the health promotion program. Participants included 980 employees who were actively involved in the health promotion program during the research period. Both groups consisted of more than 90 percent female subjects, with a mean age between 30 and 35 years. Data

analysis included hospital inpatient costs, medical and surgical costs, and other medical expenses not included in these categories.

Results from the data analyzed from the seven, six-month periods showed that participants averaged more claims and higher payments than nonparticipants in almost all comparison periods. However, none of the differences were found to be statistically significant. Researchers suggested that the increase in medical claims in the participants was a result of increased health awareness and health risk detection. Further analysis indicated that the participants' excess utilization was a result of a higher incidence of claim filing rather than a more intensive utilization by each employee.

A long-term analysis of health care utilization at the same company involved 667 participants and 892 nonparticipants whose health care costs were examined for six-months prior to the program, and for five-years after the program had been initiated. Results from this analysis showed that after the inception of the program, payments per participant were 76 percent of those for nonparticipants. The average yearly reduction in health care costs for the five-year period was estimated at $519.09 per participant. When this reduction in total payments was compared to the total amount of payments for all employees at BCBSI (n=2,411) rather than the cohort (n=667), annual savings per employee became $143.60. Total program costs per employee was estimated at $98.89, which translated to a benefit to cost ratio of 1:45 per employee.

Researchers concluded from these findings that participation in a work-site health promotion program can impact health care costs and utilization and yield economic benefits for the employer. Investigators also concluded that the economic benefits associated with the implementation of a health promotion program are not solely a result of increased awareness among employees, but are dependent upon the amount of participation by the employees.

The effects of a pilot health promotion program at AT&T Communications were investigated by Spilman, Goetz, Schultz, Bellingham and Johnson (1986) in an effort to measure the effects of the Total Life Concept (TLC) program in the areas of employee health status, health-related attitudes and behaviors, and employee attitudes toward the company. The study group (G1) consisting of employees from Kansas City, Missouri (n=834) and Bedminster, New Jersey (n=789), was given a Health Risk Appraisal (HRA) and was offered a series of health education classes. Health education classes ranged from four- to six-weeks in duration, and were held between one and three times per week. Educational classes consisted of modules directed at fitness, reduction of low-back pain, weight control, stress management, smoking cessation, cholesterol reduction, cancer screening, nutrition, and interpersonal communication.

The second study group (G2), comprised of 1673 randomly selected employees from five different AT&T locations within the United States, completed the HRA but was not offered health education modules. The third study group (G3) included 1425

randomly selected employees from Chicago and New York City. No specific intervention was offered to the subjects in the third study group. Health status, health-related attitudes and behaviors, and attitudes toward the company were measured prior to the implementation of the program and one-year later.

Results from this investigation showed that G1 subjects had greater overall improvements than G2 and G3 subjects with regards to exercise activity, the ability to stop smoking, perceptions of individual health, and type A behavior. As compared to G3 participants, G1 and G2 subjects exhibited an increase in commitment toward improving health-related behaviors, in addition to indicating a more positive attitude toward AT&T, co-workers and supervisors. Likewise, G1 and G2 participants indicated an increase in feelings of productivity and physical energy.

Results also showed that employees who participated in the health education modules had greater improvements in the areas of smoking cessation, reduction in cholesterol, and reduction in hypertension as compared to subjects who did not have the opportunity to participate in the educational classes. A different analysis for high-risk subjects in G1 showed a substantial reduction in blood pressure and cholesterol, and an increase in exercise activity as compared to initial measures of these variables. Researchers suggested that the TLC intervention may have had the greatest impact on the high risk subjects of G1 as compared to G2 and G3.

Investigators concluded that health promotion in the workplace can significantly improve employee health risks, health behaviors and attitudes, and attitudes toward the employer and the organization. Researchers suggested that health promotion programs can offer substantial benefits not only to employees, but also to the organizations that choose to implement health enhancement programs. These findings support the contention that health enhancement programs at the work-site can contribute to overall decreases in health care utilization among participating employees.

A preliminary investigation into the effect of a corporate fitness program on absenteeism and health care costs was conducted by Baun, Bernacki and Tsai (1986). A random sample of 517 employees of the Tenneco Health and Fitness Program was studied in an effort to determine differences in health care costs and absenteeism among exercisers and nonexercisers one-year prior to, and one-year following the start-up of a work-site fitness center. A total of 296 nonexercisers and 221 exercisers participated in the study. Subjects were divided into three categories which included: (1) gender; (2) age (younger than 35 years, 35 to 54 years, and 55 years or older); and (3) exercise activity (no recorded activity, and recorded activity). Exercise activity was measured as the total number of computer-recorded exercise sessions after one-year of program initiation. Absenteeism was defined as the total number of illness related absences, excluding extended pregnancy leave, for each employee during the study period. Health care costs included

all expenses paid to health care providers by Tenneco's group health insurance carrier, excluding those related to out-of-pocket expenses, deductibles, co-payments, and other medical expenses.

Results from this study indicated that exercisers had fewer sick hours than nonexercisers with a significant ($p<0.05$) difference observed between female exercisers and nonexercisers (47 vs. 69 hours). Both female exercisers and nonexercisers showed significantly higher absenteeism rates than males. An inverse relationship between sick hours and advancing age was observed in both the female and male exercise groups, while the reverse was found in the nonexercise groups.

With respect to health care reimbursements, exercisers demonstrated a higher utilization rate than nonexercisers for both males and females. The overall average medical care cost for male nonexercisers was found to be twice as high as that of the exercisers ($1,003 vs. $561). Likewise, the same pattern was observed in the female employees ($1,535 vs. $639). The average nonhospital cost for a nonexerciser was shown to be significantly higher ($p<0.05$) as compared to the average cost of an exerciser ($596 vs. $339). This trend was observed in all age and gender groups except for subjects less than 35 years of age, and for those subjects aged 55 and older. Results from this study indicate that exercisers have fewer sickness absenteeism rates and health care costs than nonexercisers of the same age and sex. Investigators suggested that exercisers are generally healthier, and therefore utilize the health care system for

relatively minor illness. In addition, researchers suggested that the observed decrease in absenteeism rates among exercisers was a reflection of absence proneness among nonexercisers, and that the difference may have been more related to personality traits of successful exercisers than to the beneficial effects of exercise. Investigators concluded that work-site fitness programs can attract and retain employees who are more likely to have positive work and health behaviors.

The impact of a work-site health promotion program on health care costs and utilization was investigated by Bly, Jones and Richardson (1986) over the course of a five-year period. Research involved employees of Johnson and Johnson who were participants in a comprehensive health promotion program entitled "Live for Life" (LFL). Lifestyle improvement programs of LFL were offered to employees on a voluntary basis and were conducted at the work-site. Health enhancement programs included classes in smoking cessation, weight control, stress management, nutrition education, fitness, and blood pressure intervention. Three groups of employees were identified for analysis based upon the length of time LFL had been in operation at the selected study locations. Group one (G1) included 5,192 subjects from locations which had operated LFL programs for more than 30 months. Group two (G2) included 3,259 subjects from sites which had conducted LFL programs for 18 to 30 months. Group three (G3) was comprised of 2,955 employees from locations which had no previous involvement in LFL programs. Subjects assigned to

the study groups were not randomized, but were selected by following the implementation pattern of LFL programs. Only individuals who were employed for the full study period (1979 to 1983) were selected for the analysis.

At the beginning of the study, subjects averaged 36 years of age in each group and had been employees of Johnson and Johnson for an average of seven years. Initial comparisons of health screen data for employees of G1 and G2 indicated that baseline health habits were relatively similar prior to LFL intervention. Medical cost and utilization data for all three study groups consisted of employee medical claims paid by Johnson and Johnson over the five-year research period.

Analysis of the five-year trend revealed that all three groups experienced increases in health care costs and utilization during the study period. However, G3 costs were observed to exceed those of G1 and G2 in 1982, with a substantial difference being observed in 1983. Subjects of G2 showed the greatest improvement, with significantly lower costs, admissions, and days of hospital care as compared to employees of G3. In addition, cost differences between G1 and G3 employees were also found to be significant. However, no significant differences in health care utilization was observed between G1 and G3 subjects. No significant differences between the three study groups were found with respect to outpatient or other medical costs. For inpatient costs, G1 and G2 experienced significantly lower rates ($p<0.001$) during the study period as

compared to employees of G3. Mean annual increments for G1, G2, and G3 were $43, $42, and $76 respectively. The mean annual increment in hospital days per 1,000 employees was also found to be significant ($p<0.001$), with G1, G2, and G3 accounting for 109, 67.5, and 171.9 days of hospital care respectively. Researchers suggested that LFL programs produced a favorable impact on the health behavior of participating employees. Investigators suggested that further investigation into the effects of the LFL program on health care costs was needed.

SUMMARY

Previous research into the effects of work-site health and fitness programs on absenteeism and health care costs suggests that possible economic benefits may result from employee participation in physical activity programs. Several researchers (Bowne et al., 1984; Shephard, 1985) have concluded that involvement in exercise programs can reduce medical costs. It is generally concluded that individuals who have high levels of fitness have fewer absences due to illness and work more productively as a result of improved health (Donoghue, 1977). However, some studies (Baun et al., 1986; Gibbs et al., 1985) have involved self-selection of test subjects. This may indicate that health and fitness programs attract a majority of individuals who are currently exercising rather than those who are not exercising. Research involving self-selected subjects may lead to

inaccurate conclusions concerning observed decreases in absenteeism and health care utilization. However, in many studies, random assignment of test and control subjects was not possible due to the structure of the programs in operation. With respect to decreases in health care costs, one study (Shephard et al., 1982) showed no change in health care costs between participants and nonparticipants in a corporate fitness program. Results such as this may indicate that observed decreases in health care costs might be a reflection of increases in health awareness, rather than improved fitness among employees.

Other studies have shown an association between enhanced physical fitness and a reduction in absenteeism (Cox et al., 1981; Shephard et al., 1981). However, it has been suggested that reductions in absenteeism may be more related to attitudinal and morale changes among employees rather than reductions in illness (Fielding, 1982). Due to the inconsistent results among these studies, the effectiveness of health enhancement and physical fitness programs on absenteeism and health care costs remains to be shown. The question of whether improved fitness is responsible for good health, or whether good health encourages involvement in work-site fitness programs remains to be answered. Therefore, further investigation into the effects of health and fitness programs on absenteeism and health care utilization is needed.

CHAPTER IV

METHODS

Before analysis began, the study was approved by the University of Nebraska Institutional Review Board (IRB). Data collected for absenteeism and health care utilization was by a method which ensured confidentiality of information as approved by UPRR and the IRB. Results of this study did not affect the job status of the research subjects.

DEFINITION OF SUBJECTS

This study involved a total of 283 agreement clerks (mean age=39.6 yrs; mean years service=15.3 yrs) employed by the Union Pacific Railroad (UPRR) who were chosen according to the following criteria:

1. Must have been an agreement employee of UPRR.
2. Must have had a job position of company clerk.
3. Must have had a work location in the headquarters building of UPRR located in Omaha, Nebraska, and/or in the Omaha and/or Council Bluffs, Iowa vicinity.
4. Must have been a member of the Employees' Health Systems (EHS) of UPRR.

5. Must have had all major claims filed through EHS without supplemental coverage from a secondary insurance provider of UPRR.
6. Must have been an employee of UPRR for a minimum of two years.

Subjects involved in this study were grouped into the following categories:

PARTICIPANTS: Employees of UPRR who had been members of the UPFC program for a minimum of three-months, and had a minimum of one computer-recorded exercise session and/or one or more recorded visits to the UPFC facility during the study period.

NONPARTICIPANTS: Employees of UPRR who were not members of the UPFC program during the study period.

For the purposes of data analysis, members who had less than one computer-recorded exercise session and/or less than one computer-recorded fitness center visit during the study period were classified as member-nonparticipants.

SAMPLING PROCEDURE

Research subjects were selected from a total of 1,108 agreement clerks employed by UPRR located in Omaha, Nebraska. Agreement clerks were chosen as research subjects due to the accessibility of health care and absenteeism information. Information for health care utilization for nonagreement employees of UPRR was not accessible, as these employees currently share health insurance coverage with an additional insurance provider and a health maintenance organization. Data on absenteeism was obtained for 283 subjects of which 162 were male (mean age=40.1 yrs; mean years service=16.4 yrs) and 121 were female (mean age=38.9 yrs; mean years service=13.8 yrs). Health care utilization data was collected for 270 subjects of which 155 were male (mean age=40.1 yrs; mean years service=16.3 yrs) and 115 were female (mean age=39.2 yrs; mean years service=13.8 yrs).

A separate analysis of absenteeism and health care utilization was conducted for 80 fitness center participants (mean age=38.9 yrs; mean years service=15.5 yrs) who had exhibited computer-recorded exercise activity between October 1987 and May 1988. A total of 50 males (mean age=39.5 yrs; mean years service=17.1 yrs) and 30 females (mean age= 37.6 years; mean years service=12.8 yrs) were involved in the cohort absenteeism study, while data for 44 males (mean age=39.1 yrs; mean years service=16.7 yrs) and 27 females

(mean age=37.1 yrs; mean years service=12.4 yrs) was analyzed in the cohort health care utilization study.

Subjects in the control group were matched by age, gender, job position, and years of service to subjects in the test group to obtain a homogeneous research population. Subjects were assigned to the test or control group based on the following criteria:

TEST GROUP: Must have met the criteria for subject selection, and must have been identified as a UPFC program participant.

CONTROL GROUP: Must have met the criteria for subject selection, and must have been identified as a UPFC program nonparticipant.

Employees in the test group were members of the recently developed Union Pacific Fitness Center between October 1987 and May 1988. The Union Pacific Fitness Center provides members with an 8,000 sq. ft. fitness facility which includes a classroom, aerobic dance floor, testing and consultation room, exercise activity area, locker rooms, and a towel and exercise clothing service. The facility maintains various types of exercise equipment for use by its members including treadmills, stationary bicycles, rowing machines, and weight training equipment.

Employees of Union Pacific are required to obtain a medical release waiver from their personal physician before becoming members of the fitness center. All members are required to

complete a series of basic fitness assessments followed by a facility orientation before using the center. Fitness assessments consist of five separate measurements which include: (1) height; (2) weight; (3) resting systolic and diastolic pressures; (4) body composition as determined by skinfold calipers; and (5) sit-and-reach flexibility. During the study period, participants were offered various services which included cholesterol screening, submaximal stress tests, exercise prescriptions, nutrition education, and lecture-based health and lifestyle programs.

VARIABLES

Several dependent variables were examined in this study. The dependent variables included absenteeism and health care costs of participants and nonparticipants of the UPFC program. Absenteeism was defined as the total number of paid and unpaid hours of illness absence from work excluding: (1) holidays; (2) personal leave; (3) bereavement leave; and (4) vacation time. Health care costs were defined as the total medical expenses paid to health care providers by Union Pacific's EHS for each employee excluding: (1) dependent expenses; (2) co-payments; (3) deductibles, and (4) costs related to normal childbirth. Additional dependent variables which were examined in this study included: (1) the total number of illness related claims for each subject; and (2) the total number of days of

hospital care for each subject. The independent variable was participation in the UPFC program.

MEASUREMENT

Data was collected and analyzed for a 16-month period beginning eight-months prior to and including the month of UPFC program initiation, and ending eight-months following the start of the program (February 1, 1987 through May 31, 1988). The initial eight-month study period included the month of UPFC program initiation, since the program officially began accepting members on September 21, 1987. Data on membership status and exercise activity was obtained from the UPFC computer system (UPFIT). Subject participation in exercise activity was measured from computer-recorded exercise sessions and computer-recorded attendance between October 1987 and May 1988. Computer-recorded exercise sessions were completed on a voluntary basis by UPFC participants. Information on attendance was supplemented with data obtained from a mandatory computer sign-in system implemented on March 19, 1988. For the purposes of data analysis, three categories of factors were considered. These factors included: (1) gender; (2) age (greater than 40 years and 40 years and younger); and (3) exercise activity (no recorded activity, and recorded activity). Age classifications were based on the mean age of all subjects (mean age=39.6 yrs; n=283) and were chosen to allow for

greater likelihood of finding significance in statistical analyses involving age comparisons. Health care data was collected from records obtained from the EHS central headquarters located in Salt Lake City, Utah. Data on absenteeism was collected from employee records obtained from the Personnel Accounting Department and the Information and Communications Systems Department (I&CS) of the UPRR headquarters located in Omaha, Nebraska.

CONFIDENTIALITY OF INFORMATION

Data for absenteeism was made available to the primary researcher from UPRR personnel records matched with a corresponding list of research subjects. Research subjects were identified by name and social security number prior to data analysis. Data returned for analysis by the Personnel Accounting Department and the I&CS Department was grouped for statistical purposes on an anonymous basis according to the research plan. A duplicate list of research subjects identified by name and social security number was coded and stored on a computer record system developed by the I&CS Department. Access to coded data was limited to the primary researcher and designated employees of the UPRR Medical Department.

Data obtained for health care utilization was made available to the primary researcher from medical records stored at the EHS central headquarters located in Salt Lake City, Utah. A list of

research subjects identified by name and social security number was submitted to the Records Department of the EHS. Data returned to the primary researcher was grouped for statistical purposes on an anonymous basis according to the research plan. Data returned for analysis was coded by the EHS to ensure retracing of information if required. Access to coded data was limited to the primary researcher and designated employees of the UPRR Medical Department.

STATISTICAL ANALYSIS

Statistical analyses were conducted under the direction of the primary researcher with a computer program developed by the I&CS Department of UPRR. Further analysis was conducted with the Minitab statistical program of the VAX system at the University of Nebraska at Omaha. Dependent t-tests were used to compare changes in absenteeism hours, hospital days, medical costs, and illness claims within the participant, nonparticipant, and member-nonparticipant groups for combined and separate female data between February 1987 and May 1988. Dependent t-tests were also used to compare changes in absenteeism hours, hospital days, medical costs, and illness claims for the greater than 40 years and the 40 years and younger age groups in both the male and female participant, nonparticipant, and member-nonparticipant study groups. In the cohort analysis, dependent t-tests were used to

compare changes in absenteeism hours, hospital days, medical costs, and illness claims between February 1987 and May 1988 for male and female participants in the very-frequent exerciser (V-FREQ), frequent exerciser (FREQ), and infrequent exerciser (INFREQ) study groups.

Independent t-tests were used to compare changes in absenteeism hours, hospital days, medical costs, and illness claims between the combined and separate male and female participant and nonparticipant groups for data collected between February 1987 and May 1988. Independent t-tests were also used to compare changes in absenteeism hours, hospital days, medical costs, and illness claims from October 1987 to May 1988 between participants and nonparticipants in both the male and female greater than 40 years and 40 years and younger age groups. In the cohort analysis, independent t-tests were used to compare changes in absenteeism hours, hospital days, medical costs, and illness claims between V-FREQ, FREQ, and INFREQ exercise participants between October 1987 and May 1988 for both the male and female study groups.

Chi square analysis was conducted to determine whether there was an association between age and the number of hours of computer-recorded exercise activity for combined male and female participants in the greater than 40 years and 40 years and younger age groups. Chi square analysis was also conducted to determine the association between male and female participants in relation to the total number of hours of computer-recorded exercise activity

between October 1987 and May 1988. For all comparisons, the level of significance was set at the 0.05 level with a 0.95 level of confidence.

CHAPTER V

RESULTS

ABSENTEEISM -- The study population for the absenteeism analysis is described in Table one. A total of 283 employees met the criteria for subject selection of which 175 employees were identified as fitness center members. From the 175 fitness center members, 62 men and 46 women were identified as active participants of the fitness program. The remaining 38 men and 29 women were classified as member-nonparticipants, indicating that they were members of the fitness program but had not exercised in the facility during the study period.

The average hours of illness absence for male and female participants and nonparticipants are summarized in Table two. The results indicate that male participants had significantly higher absence than male nonparticipants (44.6 hrs vs. 33.8 hrs, $p<0.05$), with male participants greater than age 40 having shown significantly higher absenteeism when compared to male nonparticipants of the same age group (54.3 hrs vs. 24.4 hrs, $p<0.01$). Female participants, both greater than 40 years and 40 years and younger, had fewer hours of illness absence when compared to female nonparticipants (Table 2).

Tables three and four describe the average hours of illness absence for male and female participants, nonparticipants, and

Table 1. Demographic Characteristics of Study Groups Involved in the Absenteeism Analysis

Group	N	Mean Age (yrs)	(SD)*	Mean Years Employed by Union Pacific	(SD)
Male					
Participants	62	39.5	6.7	16.8	8.1
Nonparticipants	62	39.6	6.7	15.3	6.6
Member-nonparticipants	38	41.8	8.1	17.3	8.3
Female					
Participants	46	38.4	6.4	12.6	5.9
Nonparticipants	46	38.3	6.6	14.5	6.2
Member-nonparticipants	29	42.1	8.1	14.7	7.7

* Standard deviation as of February 1988.

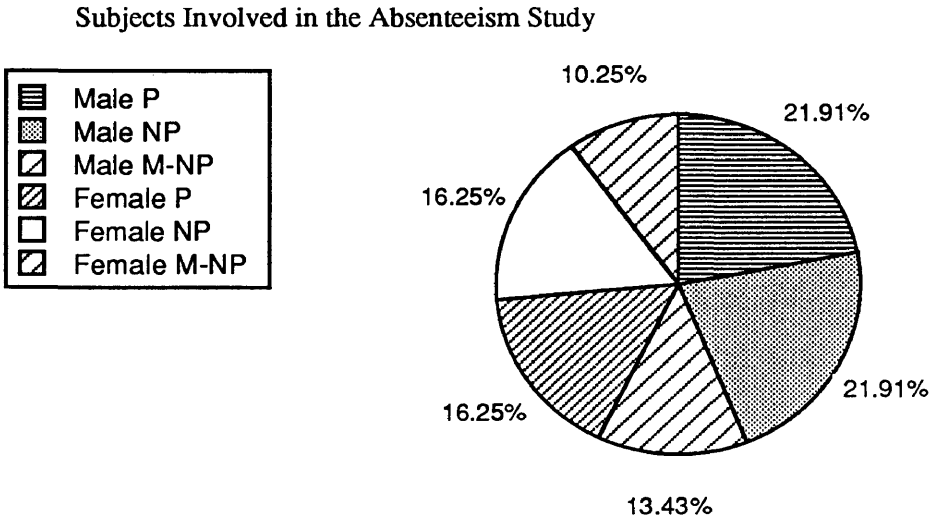
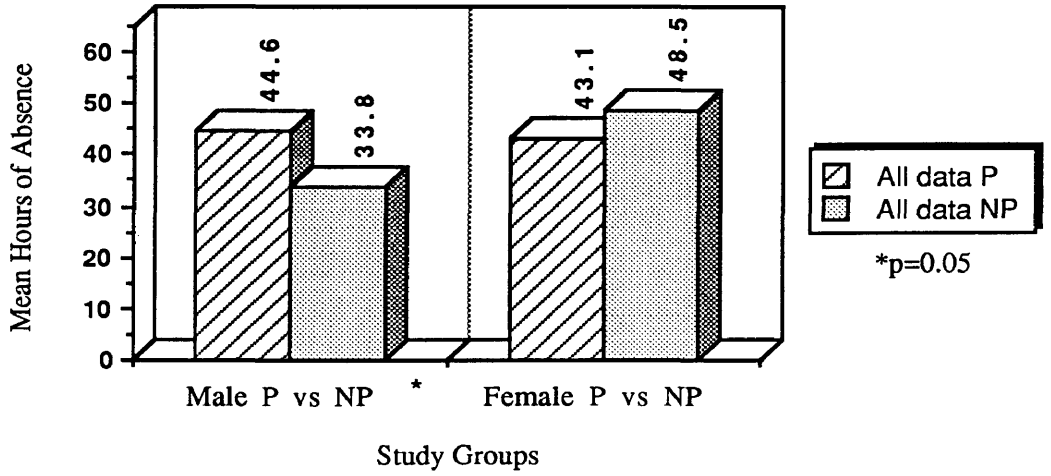


Table 2. Average Number of Hours of Illness Absence from October 1987 through May 1988 by Age, Sex, and Particpant Status

Age Group (yr)	Participants			Nonparticipants			P Value
	N	Mean	SD*	N	Mean	SD	
Males							
≤ 40	38	38.5	22.5	38	39.7	35.7	0.86
> 40	24	54.3	36.3	24	24.4	26.8	0.002***
Total	**62**	**44.6**	**29.4**	**62**	**33.8**	**33.1**	**0.05****
Females							
≤ 40	32	42.5	24.2	32	46.9	31.4	0.53
> 40	14	44.4	32.3	14	52.2	36.4	0.56
Total	**46**	**43.1**	**26.6**	**46**	**48.5**	**32.7**	**0.38**

* SD denotes standard deviation. ** P = 0.05 *** P < 0.01



member-nonparticipants between February 1987 and May 1988. Females, both participants and member-nonparticipants, had fewer hours of illness absence when compared to males for study periods before and following UPFC program initiation. In contrast, results indicate that female nonparticipants had significantly higher absenteeism when compared to male nonparticipants for time periods before and after UPFC program implementation (Feb. 1987-Sept. 1987: 51.5 hrs vs. 27.7 hrs, $p<0.01$; Oct. 1987-May 1988: 48.5 hrs vs. 33.8 hrs, $p<0.05$).

The overall trend indicated that absenteeism increased during the study period (see Table 5), with the average number of hours of illness absence having decreased slightly among female nonparticipants and member-nonparticipants (Table 6). Absenteeism remained relatively unchanged in the male member-nonparticipant group during the study period (Table 6).

HOSPITAL DAYS -- Table seven describes the study population for the hospital days, medical care costs, and illness claims analysis. Data indicated that male participants had fewer hospital days than male nonparticipants (zero days vs. 0.23 days), while the opposite was found between the female participant and nonparticipant groups (0.27 days vs. 0.13 days). These observations were consistent in both the male and female greater than 40 years and 40 years and younger age groups (see Table 8).

Table 3. Comparison of Average Number of Hours of Illness Absence between February 1987 and September 1987

Group	February 1987 to September 1987						
	Male			Female			
	N	Mean	SD*	N	Mean	SD	P Value
P	62	42.6	27.0	46	36.6	23.2	0.23
NP	62	27.7	26.9	46	51.5	29.8	0.001*
M-NP	38	46.6	37.5	29	45.3	35.6	0.88

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* Denotes standard deviation.

** P < 0.01

Table 4. Comparison of Average Number of Hours of Illness Absence between October 1987 and May 1988

Group	October 1987 to May 1988						
	Male			Female			
	N	Mean	SD*	N	Mean	SD	P Value
P	62	44.6	29.4	46	43.1	26.6	0.78
NP	62	33.8	33.1	46	48.5	32.7	0.02**
M-NP	38	46.2	33.3	29	42.6	32.0	0.66

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* Denotes standard deviation.

** P < 0.05

Table 5. Comparison of Average Number of Hours of Absenteeism between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
P	108	40.0	25.5	108	44.2	28.3	0.21
NP	108	37.8	30.4	108	40.1	33.6	0.60
M-NP	67	46.1	36.4	67	39.3	32.6	0.80

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* Denotes standard deviation.

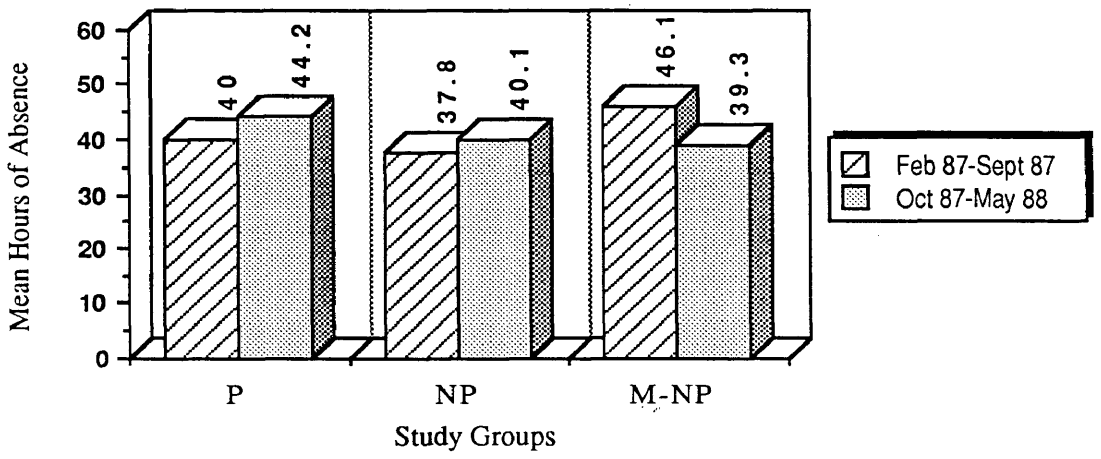


Table 6. Comparison of Average Number of Hours of Illness Absence between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
Male							
P	62	42.6	27.0	62	44.6	29.4	0.68
NP	62	27.7	26.9	62	33.8	33.1	0.27
M-NP	38	46.6	37.5	38	46.2	33.3	0.95
Female							
P	46	36.6	23.2	46	43.1	26.6	0.21
NP	46	51.5	29.8	46	48.5	32.7	0.67
M-NP	29	45.3	35.6	29	42.6	32.0	0.72

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* SD denotes standard deviation.

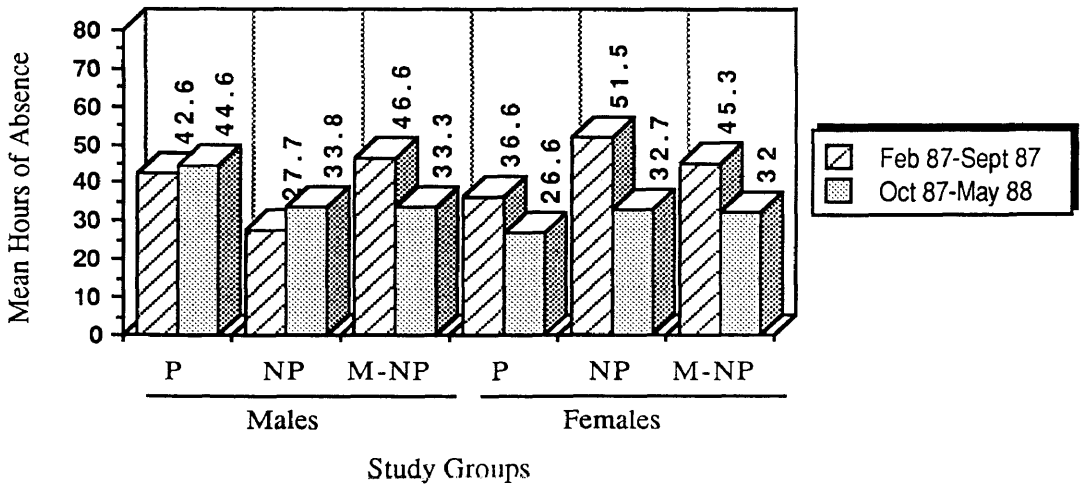


Table 7. Demographic Characteristics of Study Groups involved in the Hospital Days, Medical Costs, and Illness Claims Analysis

Group	N	Mean Age (yrs)	(SD)*	Mean Years Employed by Union Pacific	(SD)
Male					
Participants	57	39.2	6.9	16.5	8.2
Nonparticipants	62	39.6	6.7	15.3	6.6
Member-nonparticipants	36	42.5	7.7	17.9	8.2
Female					
Participants	41	38.2	6.6	12.2	5.8
Nonparticipants	46	38.3	6.6	14.5	6.2
Member-nonparticipants	28	42.1	8.2	14.8	7.8

* Standard deviation as of February 1988.

Subjects Involved in the Hospital Days, Medical Costs, and Illness Claims Analysis

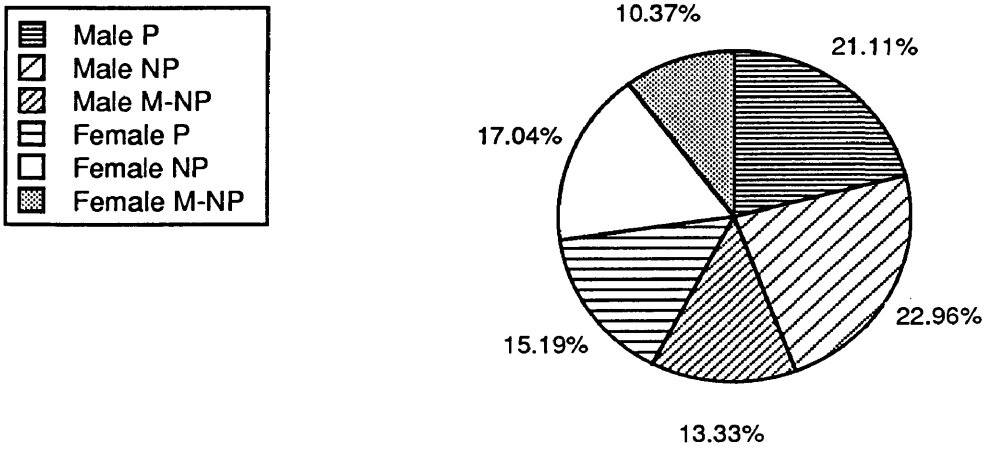
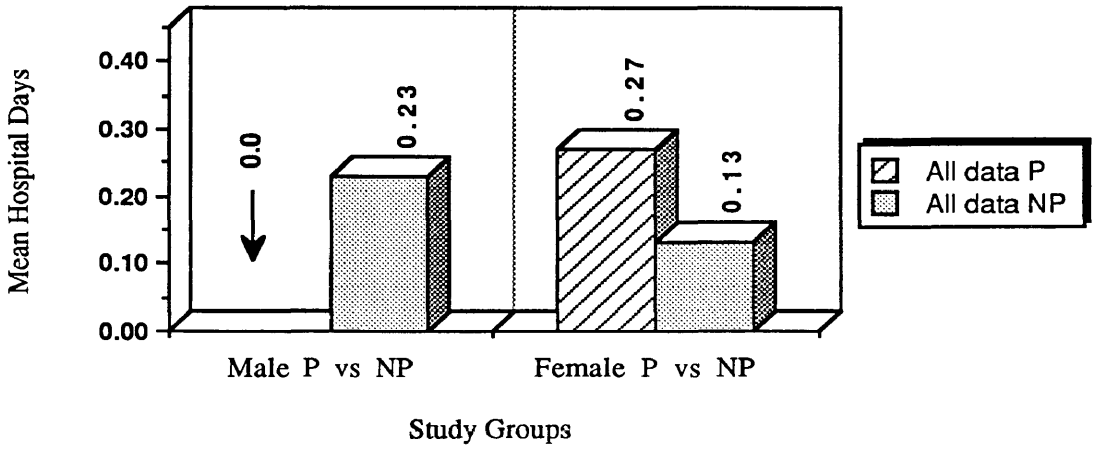


Table 8. Average Number of Hospital Days between October 1987 and May 1988 by Age, Sex, and Participant Status

Age Group (yr)	Participants			Nonparticipants			P Value
	N	Mean	SD*	N	Mean	SD	
Males							
≤ 40	37	0	0	38	0.32	1.65	N/A
> 40	20	0	0	24	0.08	0.41	N/A
Total	**57**	**0**	**0**	**62**	**0.23**	**1.31**	**N/A**
Females							
≤ 40	29	0.31	1.67	32	0.19	1.06	0.73
> 40	12	0.17	0.58	14	0	0	N/A
Total	**41**	**0.27**	**1.43**	**46**	**0.13**	**0.88**	**0.59**

* SD denotes standard deviation.



Male participants had higher hospital days than female participants prior to UPFC program initiation (0.03 days vs. zero days) and fewer days following the program's implementation (zero days vs. 0.27 days, Table 9). In addition, male member-nonparticipants showed fewer hospital days for both time periods when compared to females of the same study group. Male nonparticipants had more hospital days than female nonparticipants (Table 10) for time periods before and after UPFC implementation (0.45 days vs. 0.39 days, and 0.23 days vs. 0.13 days respectively). However, none of the observed changes were found to be statistically significant.

The overall trend for all three study groups indicated an increase in the average number of hospital days within the combined male and female participant group, with decreases in the average number of hospital days being observed within the combined male and female nonparticipant and member-nonparticipant study groups (see Table 11).

MEDICAL CARE COSTS -- Analysis of the medical care costs within the participant and nonparticipant groups indicated that male participants had lower medical costs when compared to male nonparticipants ($176.5 vs. $411.0), while female participants had higher medical costs ($650 vs. $307.0) when compared to female nonparticipants (see Table 12). These observations were consistent for both the male and female greater than age 40 and 40 years and

Table 9. Comparison of Average Number of Hospital Days between February 1987 and May 1988

Group	Feb. 1987 to Sept. 1987							Oct. 1987 to May 1988						
	Male			Female				Male			Female			
	N	M	SD*	N	M	SD	*P*	N	M	SD	N	M	SD	*P*
P	57	0.03	0.26	41	0	0	N/A	57	0	0	41	0.27	1.43	N/A
NP	62	0.45	3.56	46	0.39	1.68	0.92	62	0.23	1.31	46	0.13	0.88	0.67
M-NP	36	0	0	28	0.18	0.94	N/A	36	0	0	28	0.11	0.57	N/A

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

M Denotes mean hospital days.

* Denotes standard deviation.

P Denotes P value for independent t-test.

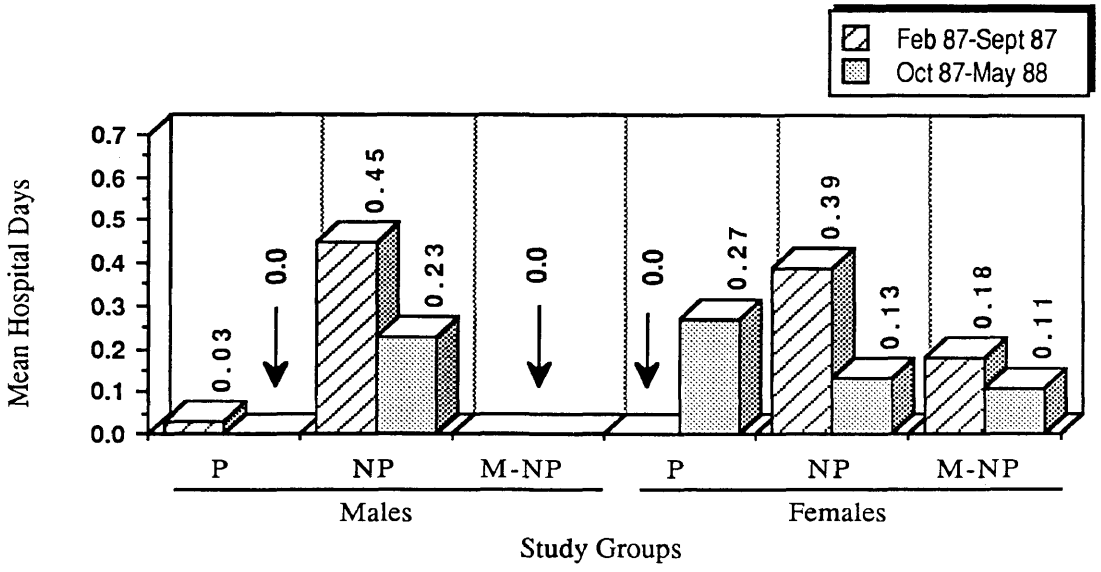


Table 10. Comparison of Average Number of Hospital Days between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
Male							
P	57	0.03	0.26	57	0	0	0.32
NP	62	0.45	3.55	62	0.23	1.31	0.64
M-NP	36	0	0	36	0	0	N/A
Female							
P	41	0	0	41	0.27	1.43	0.24
NP	46	0.39	1.68	46	0.13	0.88	0.36
M-NP	28	0.18	0.94	28	0.11	0.57	0.74

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* SD indicates standard deviation.

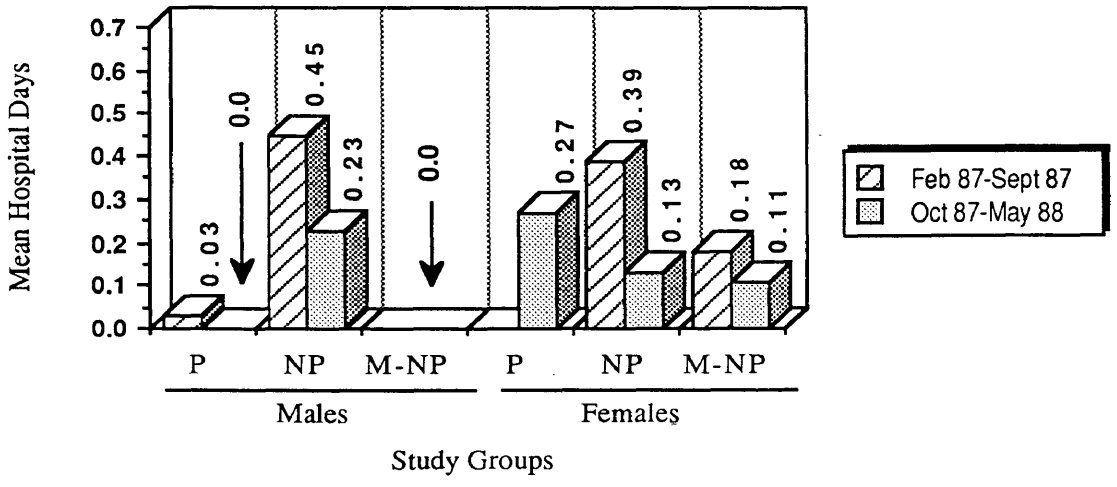


Table 11. Comparison of Average Number of Hospital Days between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
P	98	0.02	0.20	98	0.11	0.93	0.22
NP	108	0.43	2.89	108	0.19	1.15	0.36
M-NP	64	0.08	0.62	64	0.05	0.37	0.32

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* Denotes standard deviation.

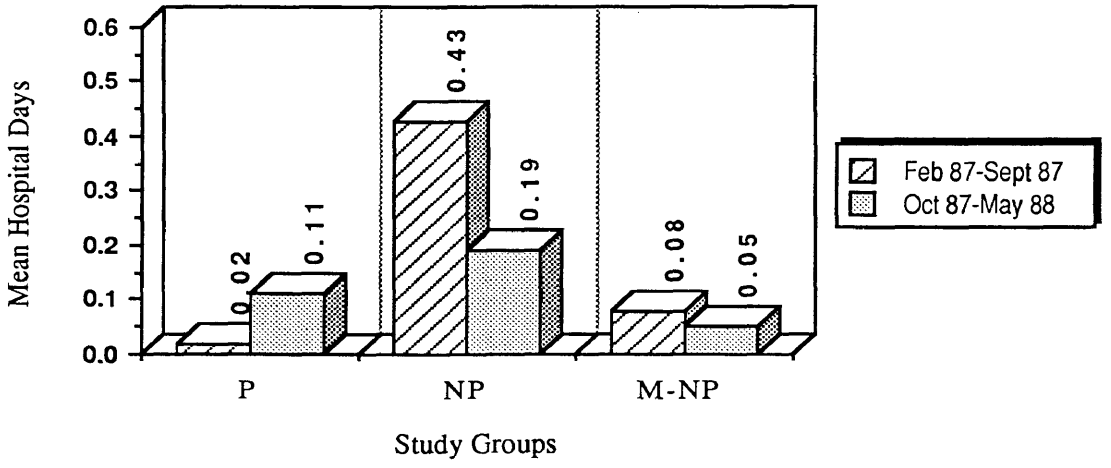
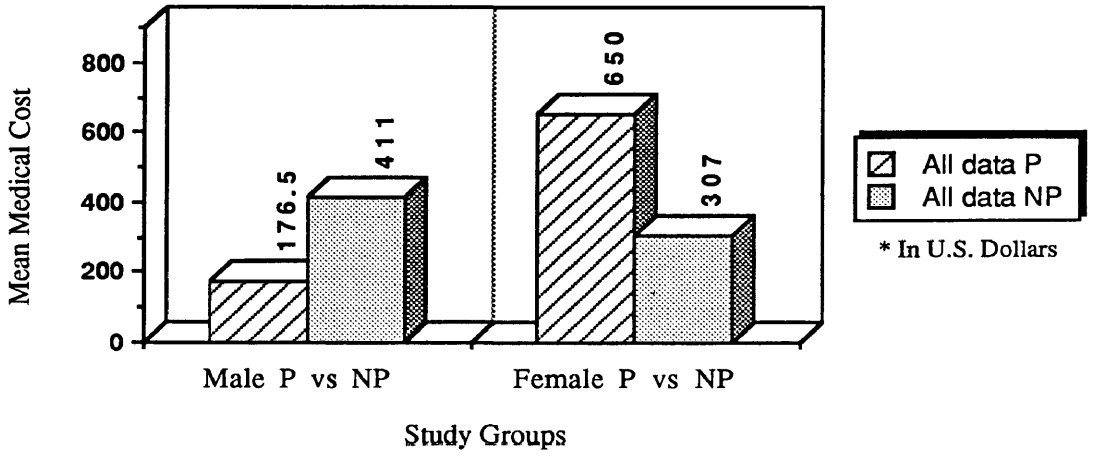


Table 12. Average Medical Care Cost* between October 1987 and May 1988 by Age, Sex, and Participant Status

Age Group (yr)	Participants			Nonparticipants			P Value
	N	Mean	SD**	N	Mean	SD	
Males							
≤ 40	37	188.8	452.5	38	538.0	2156.0	0.34
> 40	20	153.8	330.1	24	210.0	538.0	0.69
Total	**57**	**176.5**	**411.0**	**62**	**411.0**	**1719.0**	**0.32**
Females							
≤ 40	29	412.0	1359.0	32	379.0	1643.0	0.93
> 40	12	1225.0	4038.0	14	141.0	249.7	0.32
Total	**41**	**650.0**	**2432.0**	**46**	**307.0**	**1374.0**	**0.41**

* In U.S. dollars. ** Denotes standard deviation.



younger age groups. However, none of the observed differences were found to be statistically significant.

Females, both participants and member-nonparticipants, had higher medical care costs than males for both study periods, with the exception of the male nonparticipant group which had higher medical costs ($411.0 vs. $307.0) between October 1987 and May 1988 (Tables 13 and 14). Female nonparticipants had significantly higher medical costs than male nonparticipants prior to UPFC program development ($996.0 vs. $175.0, $p<0.05$).

The overall trend indicated an increase in medical care costs for the combined male and female participant group, with decreases being observed among the combined male and female nonparticipant and member nonparticipant study groups (Table 15). Likewise, increases in medical costs were observed within the male and female study groups, with decreases observed in the male member-nonparticipant and female nonparticipant and member-nonparticipant study groups (see Table 16).

ILLNESS CLAIMS -- Results indicated that male participants had fewer illness claims when compared to male nonparticipants (1.7 vs. 1.9), while female participants showed an increase in the number of medical claims (2.6 vs 1.5) when compared to female nonparticipants. Male participants in the 40 years and younger age group showed a higher incidence of claim filing when compared to male nonparticipants of the same age group (Table 17).

Table 13. Comparison of Average Medical Care Cost* between February 1987 and September 1987

Group	February 1987 to September 1988						
	Male			Female			
	N	Mean	SD**	N	Mean	SD	P Value
P	57	166.0	337.0	41	333.0	1353.0	0.37
NP	62	175.0	559.0	46	996.0	2799.0	0.02***
M-NP	36	188.0	346.0	28	418.0	1082.0	0.23

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* In U.S. dollars. ** Denotes standard deviation. *** $P < 0.05$

Table 14. Comparison of Average Medical Care Cost* between October 1987 and May 1988

Group	October 1987 to May 1988						
	Male			Female			
	N	Mean	SD**	N	Mean	SD	P Value
P	57	177.0	411.0	41	650.0	2437.0	0.15
NP	62	411.0	1719.0	46	307.0	1374.0	0.73
M-NP	36	151.0	326.0	28	333.0	534.0	0.09

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* In U.S. dollars. ** Denotes standard deviation.

Table 15. Comparison of Average Medical Costs* between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD**	N	Mean	SD	
P	98	235.8	909.5	98	374.0	1610.0	0.47
NP	108	525.0	1908.0	108	367.0	1575.0	0.50
M-NP	64	288.4	762.7	64	230.5	435.5	0.59

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* In U.S. dollars. ** Denotes standard deviation.

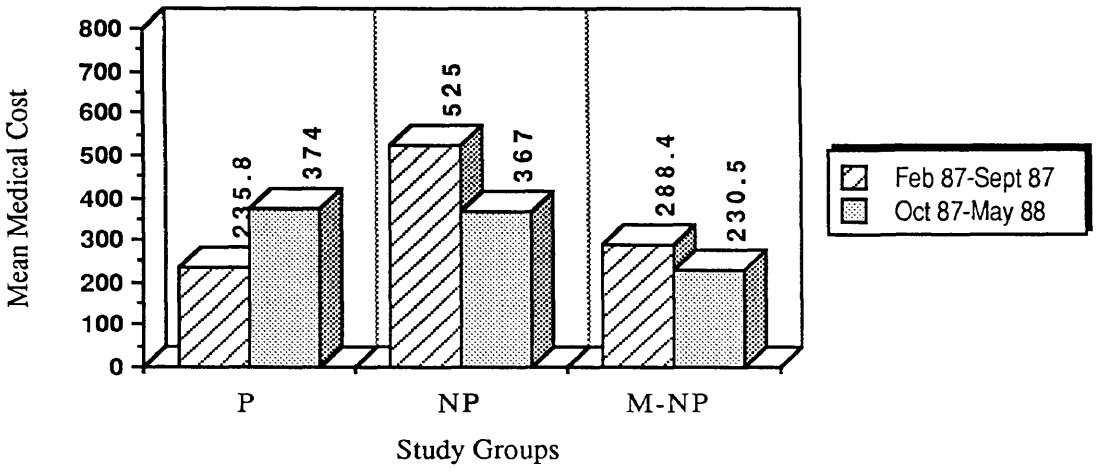


Table 16. Comparison of Average Medical Cost* between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD**	N	Mean	SD	
Male							
P	57	166.2	336.5	57	176.5	411.0	0.88
NP	62	175.4	559.0	62	411.0	1719.0	0.31
M-NP	36	187.6	346.2	36	150.5	325.9	0.66
Female							
P	41	333.0	1353.0	41	650.0	2432.0	0.48
NP	46	996.0	2799.0	46	307.0	1374.0	0.13
M-NP	28	418.0	1082.0	28	333.0	534.0	0.70

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* In U. S. dollars. ** Denotes standard deviation.

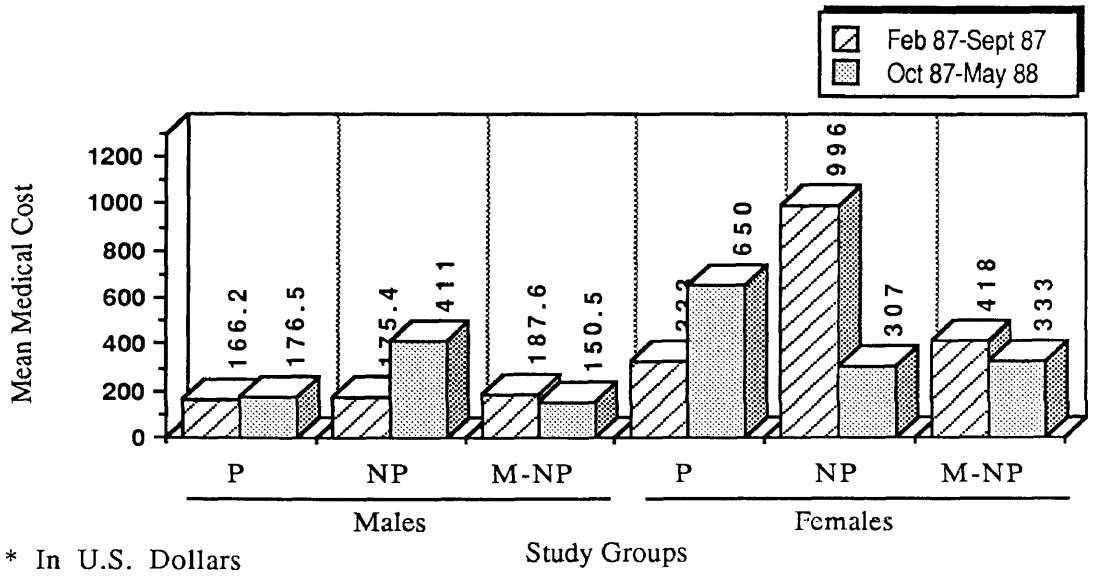
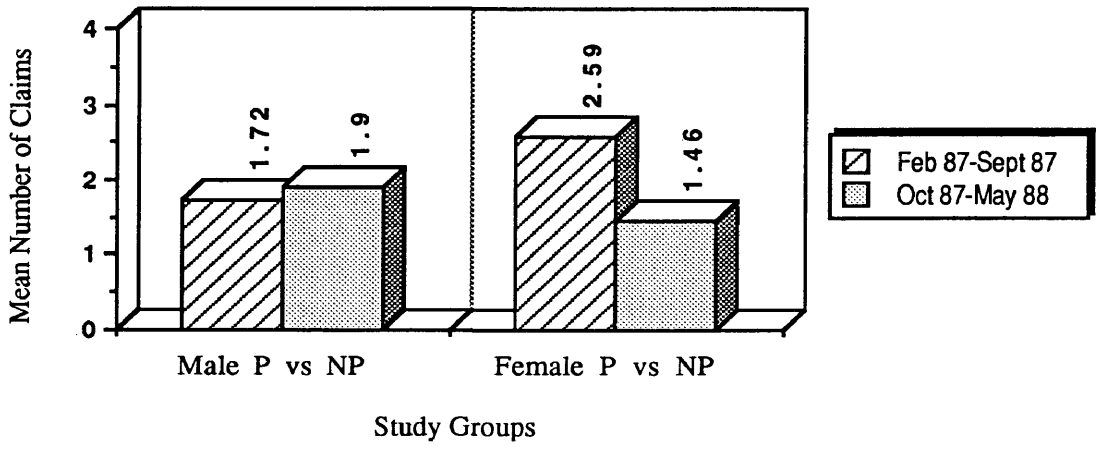


Table 17. Average Number of Illness Claims between October 1987 and May 1988 by Age, Sex, and Participant Status

Age Group (yr)	Participants			Nonparticipants			P Value
	N	Mean	SD*	N	Mean	SD	
Males							
≤ 40	37	1.70	2.55	38	1.32	3.15	0.56
> 40	20	1.75	2.67	24	2.83	5.55	0.43
Total	**57**	**1.72**	**2.57**	**62**	**1.90**	**4.26**	**0.78**
Females							
≤ 40	29	2.93	4.72	32	1.53	2.69	0.16
> 40	12	3.25	5.59	14	1.29	1.82	0.23
Total	**41**	**2.59**	**4.10**	**46**	**1.46**	**2.44**	**0.12**

* Denotes standard deviation.



Overall, males in each of the three study groups had fewer illness claims than females prior to UPFC program initiation (Table 18), with male nonparticipants and member-nonparticipants demonstrating a significantly lower incidence of claim filing when compared to females of the same study group (1.2 vs. 3.5, $p<0.01$; 1.6 vs. 3.0, $p=0.05$, respectively). Likewise, male participants and member-nonparticipants had fewer incidences of claim filing between October 1987 and May 1988 when compared to females, with male member-nonparticipants having a significantly lower number of claims when compared to females of the same study group (1.5 vs. 4.3, $p<0.05$). Male nonparticipants had a slightly higher number of claims between October 1987 and May 1988 when compared to female nonparticipants (Table 19).

Overall, the number of illness related claims tended to decrease among the male participant and member-nonparticipant groups, with female nonparticipants having shown a significantly lower number of claims following UPFC program implementation (3.5 vs. 1.5, $p<0.01$). The average number of illness claims were observed to increase slightly within the male nonparticipant, female participant, and female member-nonparticipant groups (see Table 20), while having increased slightly in the combined female and male participant and member-nonparticipant study groups (Table 21).

When the combined male and female participant group was compared to the combined nonparticipant group, participants showed slightly higher absenteeism (44.2 hrs vs. 40.1 hrs), medical costs

Table 18. Comparison of Average Number of Illness Claims between February 1987 and September 1987

Group	February 1987 to September 1987						
	Male			Female			
	N	Mean	SD*	N	Mean	SD	P Value
P	57	1.9	3.3	41	2.1	3.5	0.76
NP	62	1.2	3.0	46	3.5	5.5	0.006***
M-NP	36	1.6	2.1	28	3.0	3.4	0.03**

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* SD denotes standard deviation. ** $P < 0.05$ *** $P < 0.01$

Table 19. Comparison of Average Number of Illness Claims between October 1987 and May 1988

Group	October 1987 to May 1988						
	Male			Female			
	N	Mean	SD*	N	Mean	SD	P Value
P	57	1.7	2.6	41	2.6	4.1	0.20
NP	62	1.9	4.3	46	1.5	2.4	0.53
M-NP	36	1.5	2.3	28	4.3	6.9	0.02**

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* SD denotes standard deviation. ** $P < 0.05$

Table 20. Comparison of Average Number of Illness Claims between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
Male							
P	57	1.93	3.28	57	1.72	2.57	0.66
NP	62	1.18	2.97	62	1.90	4.26	0.14
M-NP	36	1.56	2.06	36	1.50	2.29	0.92
Female							
P	41	2.15	3.52	41	2.59	4.10	0.50
NP	46	3.48	5.54	46	1.46	2.44	0.007**
M-NP	28	3.00	3.39	28	4.25	6.93	0.34

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* SD denotes standard deviation. ** P < 0.01

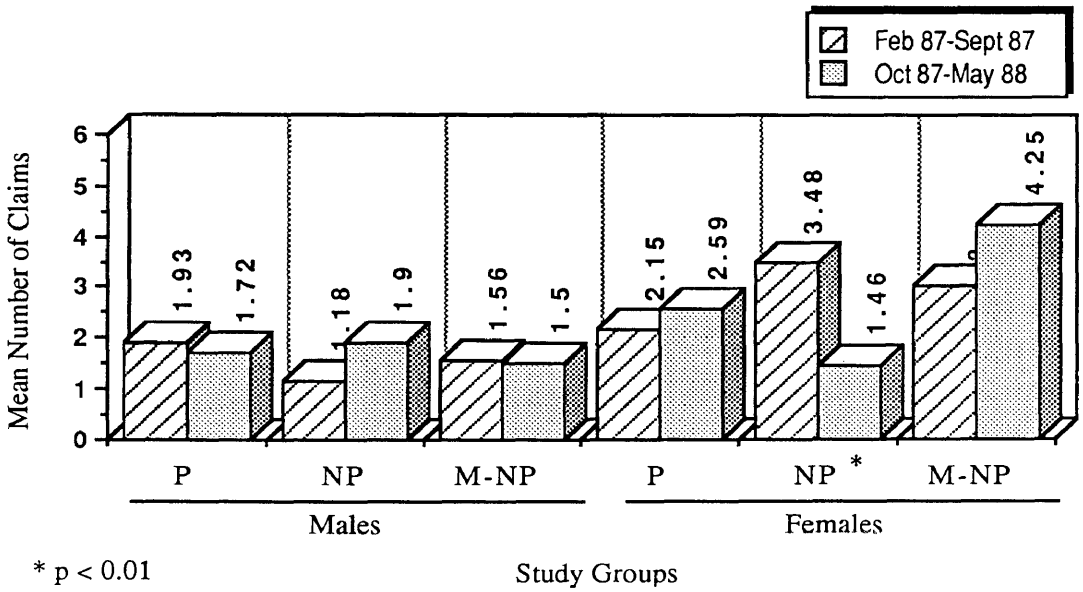
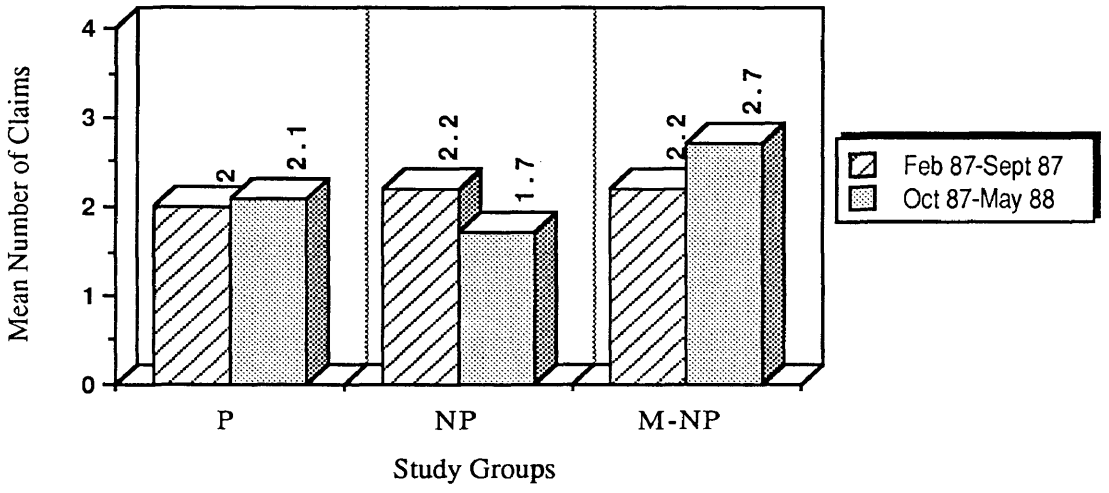


Table 21. Comparison of Average Number of Illness Claims between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
P	98	2.0	3.4	98	2.1	3.3	0.87
NP	108	2.2	4.4	108	1.7	3.6	0.31
M-NP	64	2.2	2.8	64	2.7	5.0	0.41

P = Participants NP = Nonparticipants M-NP = Member-nonparticipants

* Denotes standard deviation.



($374.0 vs. $367.0), and illness claims (2.1 vs 1.7) between October 1987 and May 1988 (see Table 22). In all comparisons, the differences between all three of the combined study groups were not found to be statistically significant.

COHORT ANALYSIS

Further investigation included analysis of absenteeism between February 1987 and May 1988 for a total of 80 UPFC participants (Table 23). A separate analysis of hospital days, medical costs, and illness related claims was conducted for 71 UPFC participants (Table 24). Participants were placed into three separate groups based on gender and the total number of hours of computer-recorded exercise activity between October 1987 and May 1988. These groups included: (1) Very-frequent exercisers (greater than 32 hours of recorded activity); (2) Frequent exercisers (21 to 32 hours of recorded activity); and (3) Infrequent exercisers (less than 21 hours of recorded activity).

Chi square analysis revealed no significant associations between age (those greater than 40 years of age, and those 40 years and younger) and the total number of computer-recorded exercise hours (see Table 25). Chi square analysis between male and female participants revealed significant associations (Chi Square=82, df=2, $p<0.001$) between the total number of hours of computer-recorded exercise activity and gender, with males showing a greater than

Table 22. Comparison of Average Number of Hours of Illness Absence, Hospital Days, Medical Costs*, and Illness Claims between October 1987 and May 1988

Dependent Variable	Participants			Nonparticipants			P Value
	N	Mean	SD**	N	Mean	SD	
Absenteeism	108	44.2	28.3	108	40.1	33.6	0.33
Hospital Days	98	0.11	0.93	108	0.19	1.15	0.62
Medical Costs	98	374.0	1610.0	108	367.0	1575.0	0.97
Illness Claims	98	2.1	3.3	108	1.7	3.6	0.45

* In U.S. dollars. ** Denotes standard deviation.

Table 23. Demographic Characteristics of Study Groups Involved in the Cohort Analysis of Absenteeism

Group	N	Mean Age (yrs)	(SD)*	Mean Years Employed by Union Pacific	(SD)	Mean Hours of Computer-Recorded Exercise Activity	(SD)
Male							
V-FREQ	14	41.1	6.4	17.4	8.8	92.6	62.3
FREQ	6	40.7	7.2	20.3	9.0	25.1	1.9
INFREQ	30	38.5	7.0	16.3	7.5	5.3	5.5
Total	**50**	**39.5**	**6.8**	**17.1**	**8.0**	**31.9**	**50.2**
Female							
V-FREQ	4	37.0	7.3	15.3	8.4	88.4	28.5
FREQ	3	39.3	5.0	19.0	6.2	28.6	2.6
INFREQ	23	37.5	6.3	11.5	5.0	5.6	5.1
Total	**30**	**37.6**	**6.2**	**12.8**	**5.9**	**18.9**	**30.4**

V-FREQ = Very frequent exercisers FREQ = Frequent exercisers
INFREQ = Infreqent exercisers * Standard deviation as of February 1988.

Subjects Involved in the Cohort Absenteeism Analysis

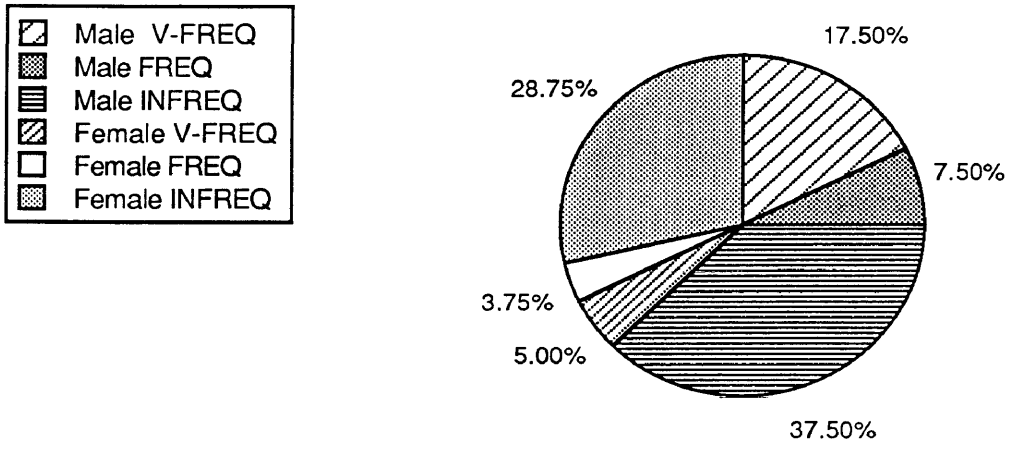


Table 24. Demographic Characteristics of Study Groups Involved in the Cohort Analysis for Hospital Days, Medical Costs*, and Illness Claims

Group	N	Mean Age (yrs)	(SD)**	Mean Years Employed by Union Pacific	(SD)	Mean Hours of Computer-Recorded Exercise Activity	(SD)
Male							
V-FREQ	13	41.0	6.6	17.2	9.1	78.9	40.3
FREQ	4	38.5	8.3	17.3	9.9	24.7	1.5
INFREQ	27	38.4	7.2	16.4	7.8	5.0	5.2
Total	**44**	**39.1**	**7.1**	**16.7**	**8.2**	**28.1**	**39.5**
Female							
V-FREQ	2	37.7	8.7	16.0	10.2	89.2	34.9
FREQ	3	37.0	4.2	16.5	6.4	27.9	3.3
INFREQ	22	37.0	6.1	11.5	5.1	5.8	5.1
Total	**27**	**37.1**	**6.1**	**12.4**	**5.9**	**16.7**	**28.8**

V-FREQ = Very frequent exercisers FREQ = frequent exercisers.
INFREQ = Infrequent exercisers * In U.S. dollars. ** SD denotes standard deviation.

Subjects Involved in the Cohort Analysis for
Hospital Days, Medical Costs, and Illness Claims

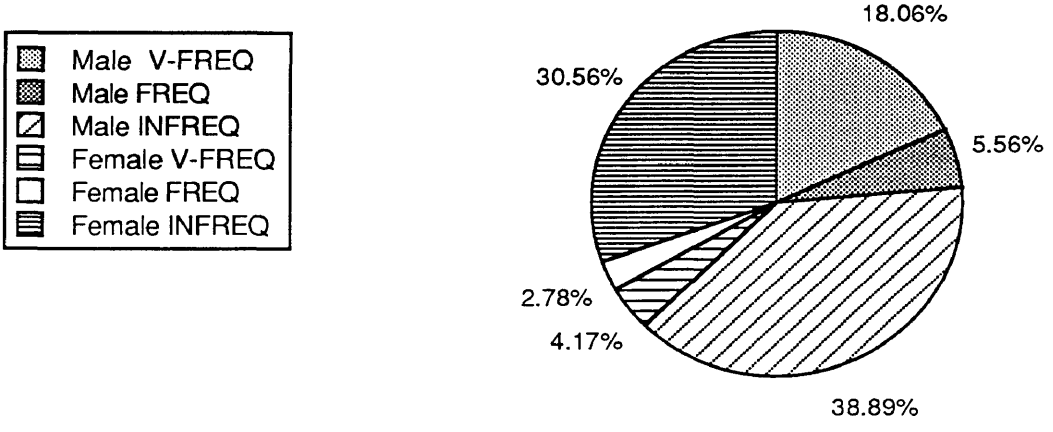


Table 25. Chi Square Analysis to Determine the Association between Age, and the Number of Hours of Computer-Recorded Exercise Activity for 80 Fitness Center Participants

Age Group (yrs)	< 21 hours	21 - 32 hours	> 32 hours	**Total**
≤ 40				
Observed	37	4	11	**52**
Expected	34	6	12	
> 40				
Observed	16	5	7	**28**
Expected	19	3	6	
Total Participants	**53**	**9**	**18**	**80**

Chi Square = 2.33 df = 2 p = 0.30

predicted total number of exercise hours in the greater than 32 hours of activity category (see Table 26). In the same analysis, females showed a greater than expected number of computer-recorded exercise hours in the equal to or less than 21 hours category.

ABSENTEEISM -- Comparison of the average number of illness hours of absence between very-frequent (V-FREQ) and infrequent exercisers (FREQ) revealed that both male and female V-FREQ exercisers had fewer hours of absenteeism than FREQ exercisers of the same sex (males: 48.6 hrs vs. 51.0 hrs; females: 34.2 hrs vs. 43.8 hrs) between October 1987 and May 1988 (see Table 27). Likewise, both male and female V-FREQ exercisers had fewer hours of absence (Table 28) when compared to infrequent (INFREQ) exercisers of the same sex (males: 44.7 hrs vs. 48.6 hrs; females: 34.2 hrs vs. 46.2 hrs) for the time period following UPFC program implementation. Both the male and female FREQ exercise groups had higher absenteeism (Table 29) when compared to INFREQ exercisers of the same sex (males: 51.0 hrs vs. 44.7 hrs; females: 43.8 hrs vs. 46.2 hrs). Due to the wide variances in data and small sample size, none of the observed differences were found to be statistically significant. Overall, absenteeism tended to increase in all study groups, with the exception of the male INFREQ and female FREQ groups (see Table 30).

Table 26. Chi Square Analysis to Determine the Association between Male and Female Participants in Relation to the Total Number of Computer-Recorded Exercise Hours between October 1987 and May 1988*

Gender Group	< 21 hours	21 - 32 hours	> 32 hours	**Total**
Males (n=50)	(n=30)	(n=6)	(n=14)	
Observed	159 hrs	151 hrs	1287 hrs	**1547 hrs**
Expected	212 hrs	174 hrs	1209 hrs	
Females (n=30)	(n=23)	(n=3)	(n=4)	
Observed	129 hrs	86 hrs	354 hrs	**569 hrs**
Expected	76 hrs	62 hrs	431 hrs	
Total Hours	**288 hrs**	**237 hrs**	**1641 hrs**	**2166 hrs**

Chi Square = 82 df = 2 * $p < 0.001$

Table 27. Comparison of Average Number of Hours of Illness Absence Hospital Days, Medical Costs*, and Illness Claims for Very Frequent and Frequent Exercisers between October 1987 and May 1988

Dependent Variable	Very Frequent Exercisers			Frequent Exercisers			P Value
	N	Mean	SD**	N	Mean	SD	
Males							
Absenteeism	14	48.6	43.7	6	51.0	40.8	0.91
Hospital Days	13	0	0	4	0	0	N/A
Medical Costs	13	267.0	693.0	4	401.0	672.0	0.74
Illness Claims	13	1.1	1.8	4	1.8	2.2	0.54
Females							
Absenteeism	4	34.2	27.5	3	43.8	32.5	0.69
Hospital Days	2	0	0	3	0	0	N/A
Medical Costs	2	30.4	43.0	3	37.5	40.3	0.86
Illness Claims	2	1.0	1.4	3	1.3	1.5	0.82

* In U.S. dollars. ** Denotes standard deviation.

Table 28. Comparison of Average Number of Hours of Illness Absence Hospital Days, Medical Costs*, and Illness Claims for Very Frequent and Infrequent Exercisers between October 1987 and May 1988

Dependent Variable	Very Frequent Exercisers			Infrequent Exercisers			P Value
	N	Mean	SD**	N	Mean	SD	
Males							
Absenteeism	14	48.6	43.7	30	44.7	23.1	0.70
Hospital Days	13	0	0	27	0	0	N/A
Medical Costs	13	267.0	693.0	27	130.8	200.7	0.35
Illness Claims	13	1.1	1.8	27	2.2	3.1	0.23
Females							
Absenteeism	4	34.2	27.5	23	46.2	29.9	0.47
Hospital Days	2	0	0	22	0.5	2.0	N/A
Medical Costs	2	30.4	43.0	22	1098.0	3281.0	0.66
Illness Claims	2	1.0	1.4	22	4.1	6.4	0.52

* In U.S. dollars. ** Denotes standard deviation.

Table 29. Comparison of Average Number of Hours of Illness Absence Hospital Days, Medical Costs*, and Illness Claims for Frequent and Infrequent Exercisers between October 1987 and May 1988

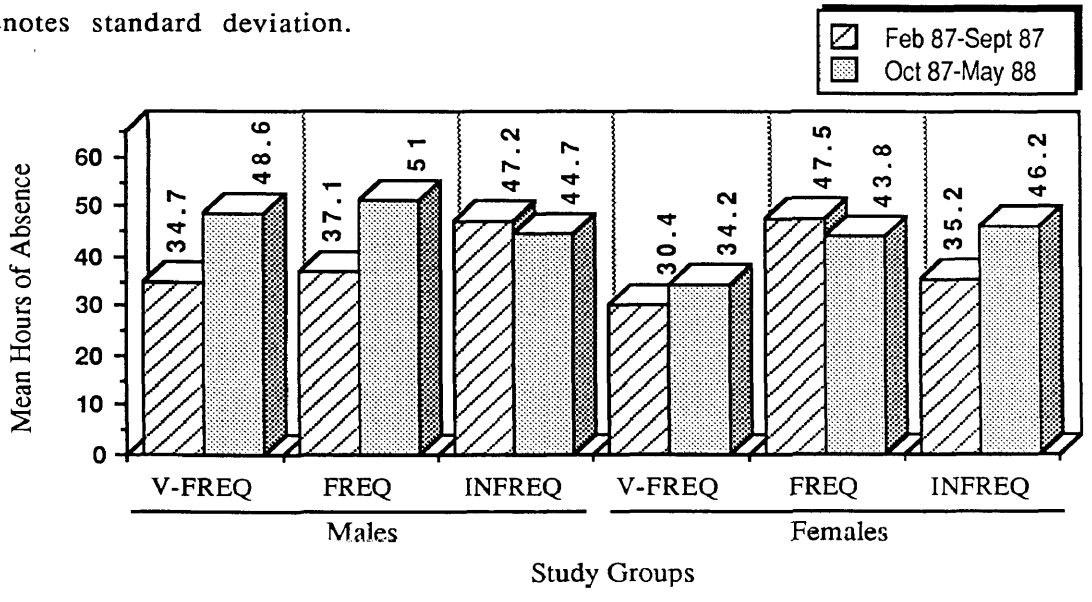
Dependent Variable	Frequent Exercisers			Infrequent Exercisers			P Value
	N	Mean	SD**	N	Mean	SD	
Males							
Absenteeism	6	51.0	40.8	30	44.7	23.1	0.60
Hospital Days	4	0	0	27	0	0	N/A
Medical Costs	4	401.0	672.0	27	130.8	200.7	0.09
Illness Claims	4	1.8	2.2	27	2.2	3.1	0.79
Females							
Absenteeism	3	43.8	32.5	23	46.2	29.9	0.90
Hospital Days	3	0	0	22	0.5	2.0	N/A
Medical Costs	3	37.5	40.3	22	1098.0	3281.0	0.59
Illness Claims	3	1.3	1.5	22	4.1	6.4	0.48

* In U.S. dollars. ** Denotes standard deviation.

Table 30. Comparison of Average Number of Hours of Illness Absence between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
Male							
V-FREQ	14	34.7	19.8	14	48.6	43.7	0.22
FREQ	6	37.1	25.7	6	51.0	40.8	0.34
INFREQ	30	47.2	25.2	30	44.7	23.1	0.65
Female							
V-FREQ	4	30.4	25.9	4	34.2	27.5	0.61
FREQ	3	47.5	27.3	3	43.8	32.5	0.63
INFREQ	23	35.2	21.0	23	46.2	29.9	0.08

V-FREQ = Very frequent exercisers FREQ = Frequent exercisers
INFREQ = Infrequent exercisers
* SD denotes standard deviation.



HOSPITAL DAYS -- Analysis of the average number of hospital days between all three study groups indicated no significant increases for either the male or female participants. Hospital care between October 1987 and May 1988 was observed in only the female INFREQ exercise group (n=22, mean=0.5 days, SD=2.0 days), while all other groups recorded zero days of hospital care (see Table 31).

MEDICAL COSTS -- Average medical care costs were observed to be lower among male V-FREQ exercisers as compared to male FREQ exercisers ($267.0 vs. $401.0). In addition, female V-FREQ exercisers had lower medical costs when compared (see Table 27) to female FREQ exercisers ($30.4 vs. $37.5). Likewise, female V-FREQ exercisers showed lower medical costs ($30.4 vs. $1098.0) when compared to female INFREQ exercisers (see Table 28). In contrast, the male V-FREQ group had higher costs ($267.0 vs. $103.8) when compared to the male INFREQ group (see Table 28). Male FREQ exercisers also had higher medical costs than male INFREQ exercisers ($401.0 vs. $130.8), whereas the female FREQ group had lower costs ($37.5 vs. $1098.0) than the female INFREQ group (see Table 29). Overall, medical costs were observed to increase for all groups, with the exception of the male INFREQ and female V-FREQ exercise groups (Table 32). Due to small sample size and wide variances in the data, no significant changes were observed among the measured values.

Table 31. Comparison of Average Number of Hospital Days between February 1987 and May 1988

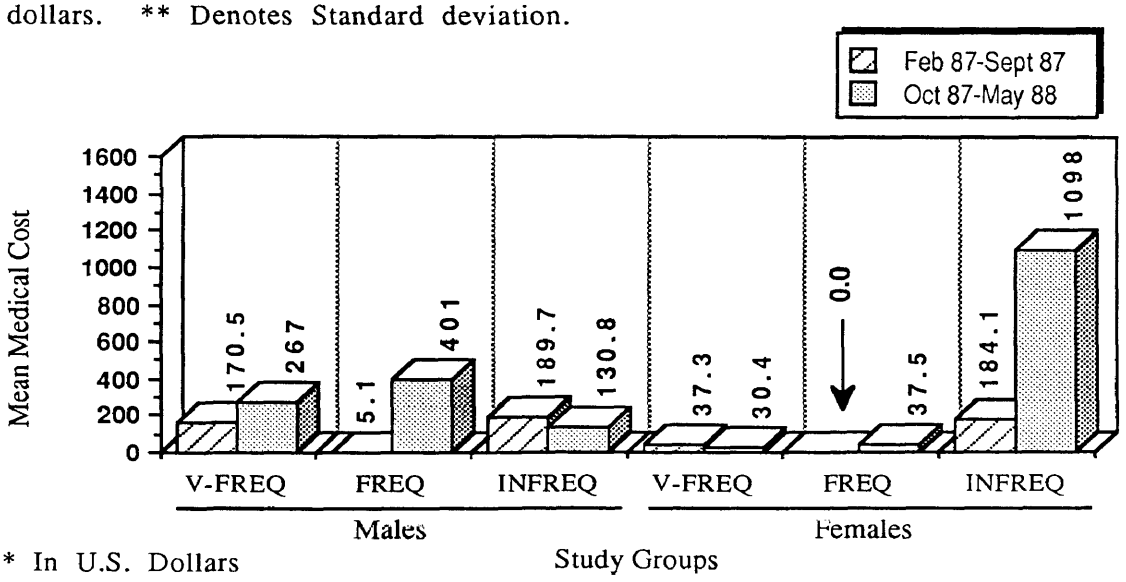
Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
Male							
V-FREQ	13	0.2	0.6	13	0	0	0.34
FREQ	4	0	0	4	0	0	N/A
INFREQ	27	0	0	27	0	0	N/A
Female							
V-FREQ	2	0	0	2	0	0	N/A
FREQ	3	0	0	3	0	0	N/A
INFREQ	22	0	0	22	0.5	2.0	0.24

V-FREQ = Very frequent exercisers FREQ = Frequent exercisers
INFREQ = Infrequent exercisers * SD denotes standard deviation.

Table 32. Comparison of Average Medical Care Cost* between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD**	N	Mean	SD	
Male							
V-FREQ	13	170.5	332.5	13	267.0	693.0	0.68
FREQ	4	5.1	10.2	4	401.0	672.0	0.32
INFREQ	27	189.7	378.5	27	130.8	200.7	0.47
Female							
V-FREQ	2	37.3	26.5	2	30.4	43.0	0.66
FREQ	3	0	0	3	37.5	40.3	0.25
INFREQ	22	184.1	301.4	22	1098.0	3281.0	0.19

V-FREQ = Very frequent exercisers FREQ = Frequent exercisers
INFREQ = Infrequent exercisers
* In U.S. dollars. ** Denotes Standard deviation.

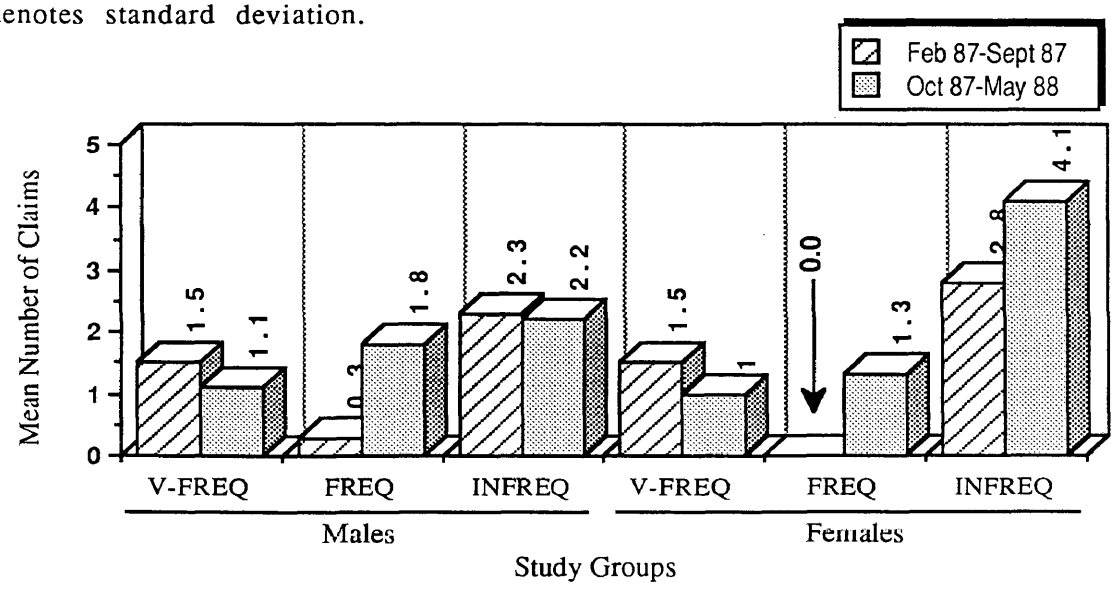


ILLNESS CLAIMS -- Comparison of the average number of illness related claims between V-FREQ and FREQ exercisers showed that male V-FREQ exercisers had fewer claims than male FREQ exercisers (1.1 vs. 1.8), while female V-FREQ exercisers had lower claims (1.0 vs. 1.3) than female FREQ exercisers (see Table 27). Both male and female V-FREQ exercisers showed lower illness claims (Table 28) than male and female INFREQ exercisers (males: 1.1 vs. 2.2; females: 1.0 vs. 4.1). Likewise, both the male and female FREQ groups had lower illness claims than INFREQ exercisers of the same sex (males: 1.8 vs. 2.2; females: 1.3 vs. 4.1). The overall trend indicated that the V-FREQ and FREQ exercisers had fewer illness claims than INFREQ exercisers, with only slight increases having occurred in the male and female FREQ groups and in the female INFREQ group (Table 33) during the study period. Due to the large variations in the data, none of the observed differences were found to be statistically significant.

Table 33. Comparison of Average Number of Illness Claims between February 1987 and May 1988

Group	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			P Value
	N	Mean	SD*	N	Mean	SD	
Male							
V-FREQ	13	1.5	2.4	13	1.1	1.8	0.60
FREQ	4	0.3	0.5	4	1.8	2.2	0.30
INFREQ	27	2.3	3.6	27	2.2	3.1	0.88
Female							
V-FREQ	2	1.5	0.7	2	1.0	1.4	0.80
FREQ	3	0	0	3	1.3	1.5	0.27
INFREQ	22	2.8	4.5	22	4.1	6.4	0.31

V-FREQ = Very frequent exercisers FREQ = Frequent exercisers
INFREQ = Infrequent exercisers
* SD denotes standard deviation.



CHAPTER VI

DISCUSSION

Thc data presented in this study represents the observed changes in absenteeism and health care utilization for a select group of fitness center members during the initial eight months of a corporate fitness center's operation. Other studies have attempted to demonstrate the effectiveness of health and fitness programs in reducing absenteeism and health care costs through longitudinal studies ranging from one to five years in length. Although the time period of investigation in this study was relatively small, the principle focus of this research was not to demonstrate the cost-effectiveness of the UPFC program, but rather to examine the initial effects that active participation in a work-site fitness program can have on absenteeism and subsequent health care expenditures.

Before this study began, it was hypothesized that a significant difference would be found between the absenteeism rates of UPFC program participants and nonparticipants. In addition, it was hypothesized that a significant difference would be found between UPFC participants and nonparticipants in relation to health care costs. This premiss was based on previous research (Baun et al., 1986; Gibbs et al., 1985) which reported increases in health care utilization among fitness program participants following the implementation of a work-site fitness facility.

Although not statistically significant, the results from this study demonstrated that participants of the UPFC program incurred higher absenteeism (9%), medical costs (2%), and illness claims (19%) than nonparticipants of the fitness program during the initial eight months of the program's operation. When the study groups were examined according to age and gender, significantly higher absenteeism was observed in the male participant group ($p=0.05$), and in the 40 years and older age category of the male participant group ($p<0.01$). In contrast, the female participant group had fewer hours of illness absence (11%) when compared to the female nonparticipant group. However, the female nonparticipant group had significantly higher absenteeism when compared to the male nonparticipant group for time periods before ($p<0.01$) and following ($p<0.05$) UPFC program implementation.

Further investigation revealed that the combined male participant group had significantly higher absenteeism when compared to the male nonparticipant group eight months prior to the implementation of the UPFC program (42.6 hrs vs. 27.7 hrs, $T=3.08$, $p=0.003$, $df=122$, $p<0.01$). Likewise, male participants greater than 40 years of age had significantly higher absenteeism when compared to male nonparticipants of the same age group for the time period before UPFC program development (48.5 hrs vs. 21.2 hrs, $T=4.2$, $p=0.0001$, $df=46$, $p<0.001$). This may indicate that male participants of the UPFC program might have higher absenteeism as a group,

without any specific effect caused by participation in the fitness program.

Analysis of the data in the cohort study revealed that the male and female very frequent (V-FREQ) exercise groups had fewer hours of absenteeism than both the male and female frequent (FREQ) exercise groups (5% and 22% fewer respectively) and the infrequent (INFREQ) exercise groups (8% and 26% fewer respectively). Although not significant, the observed differences may indicate that the male participants and the female nonparticipants had the highest amount of absenteeism during the study period.

The absenteeism values found in this study conflict with those found in previous research (Baun et al., 1986) which reported significant decreases in illness absenteeism among female exercisers and nonsignificant decreases among male exercisers following one year of fitness program activity. However, the overall findings are similar to those presented by Song et al. (1982) who observed steady increases in absenteeism among persistent high adherents of a fitness program, with significantly lower absenteeism occurring six months following the implementation of a corporate fitness center. The eight percent and 26 percent advantage in absenteeism seen among the male and female V-FREQ exercise groups relative to the INFREQ exercise groups can be compared to similar results observed by Shephard et al. (1981), who reported that subjects with high program adherence developed a 22 percent advantage relative to

other workers after six months of participation in a work-site fitness program.

Analysis of the average number of hospital days for all three study groups showed that participants and member-nonparticipants had fewer hospital days than nonparticipants (42% and 74% fewer respectively) after the implementation of the fitness program. However, none of the comparisons were found to be statistically significant. In addition, all three study groups showed a reduction in the average number of hospital days following UPFC program development. As stated in earlier research (Shephard et al., 1982), this reduction may have indicated an overall improvement in lifestyle rather than a specific effect of exercise. Further investigation showed that male participants in both age groups (greater than 40 years and 40 years and younger) had fewer hospital days than male nonparticipants. The reverse was found in the female participant group which had 52 percent more hospital days than female nonparticipants following UPFC program implementation. Increases in the average number of hospital days were seen in both the female participant and member-nonparticipant groups. Male nonparticipants incurred 43 percent more hospital days than female nonparticipants during the study period. With the exception of the female INFREQ exercise group, none of the cohort study groups exhibited hospital days during the time period following UPFC program implementation.

The increase in the number of hospital days seen among the female participants may suggest that a majority of the 41 subjects in this group received inpatient hospital treatment during the study period. These results conflict with previous research (Shephard et al., 1981) which reported decreases in the average number of hospital days among female participants following a six month exercise program. However, another study (Shephard et al., 1982) has reported higher mean hospital days in female participants when compared to absolute female nonparticipants following one year of participation in a work-site fitness program. Further analysis involving a larger sample size and greater definition of exercise adherence would be required in order to establish the nature of this effect.

Analysis of the medical care costs between the participant and nonparticipant groups indicated that participants incurred two percent higher medical costs following the development of the UPFC program. However, analysis of medical costs within the two groups indicated that male participants had 57 percent lower medical costs when compared to male nonparticipants, while female participants had 53 percent higher medical costs when compared to female nonparticipants. Once again however, these values were not found to be statistically significant. The two percent difference in costs between participants and nonparticipants may have been due to the presence of higher medical costs among female participants of the program.

In the cohort analysis, average medical care costs were observed to be lower among both the male and female V-FREQ exercise groups when compared to FREQ exercisers of the same sex (33% and 19% lower respectively). The female V-FREQ group also showed lower medical care costs when compared to the female INFREQ group. In contrast, the male V-FREQ exercise group had higher costs when compared to the male INFREQ group. Overall, medical care costs increased in the combined male and female participant group, with the exception of the male INFREQ and female V-FREQ exercise groups in the cohort analysis, while health care costs were observed to decrease within the combined male and female member-nonparticipant and nonparticipant study groups. Once again, the observed differences among the study groups were not found to be statistically significant.

The higher medical care expenditures encountered in the participant group compare similarly to results obtained in previous research (Gibbs et al., 1985) which reported that participants of a fitness program incurred higher payments than nonparticipants after the first six months of membership in a corporate fitness program. The lower health care costs seen among the male and female V-FREQ exercise groups, with respect to the male FREQ, and female FREQ and INFREQ exercise groups, are similar to other results (Shephard et al., 1982) which have reported lower medical care costs in both male and female high-level participants as compared to low-level participants of the same sex. The higher medical costs observed in

the male V-FREQ exercise group as compared to the male INFREQ exercise group may have been a result of increased health awareness and subsequent health risk detection as a result of participation in the fitness program.

The observed reductions in health care costs in the member-nonparticipant and nonparticipant groups may have been due to an overall improvement in health awareness within these groups, rather than actual participation in the fitness program. This hypothesis has been suggested in earlier research (Shephard et al., 1982) involving members and nonmembers of a work-site fitness program. The higher medical costs seen among the participants of the UPFC program may have been a result of improved health risk detection among these subjects, since all employees are required to obtain physician approval before actively participating in the UPFC program. This hypothesis has been suggested in other research (Gibbs et al., 1985) involving participant and nonparticipants of a corporate fitness center. Although employees are not required to obtain specific medical treatment before becoming members of the fitness center, the opportunity to obtain such treatment as a means of determining one's ability to participate in such a program may have contributed to the higher medical costs generated by the participant group.

With respect to gender, females in the participant and member-nonparticipant group had higher medical costs than males both prior to and following UPFC program implementation, with the

exception of the male nonparticipant group which had higher health care costs following the development of the UPFC program. Significantly higher health care costs were observed in the female nonparticipant group ($p<0.05$) as compared to the male nonparticipant group prior to the development of the UPFC program. These results are similar to those reported in other research (Bly et al., 1986; Shephard et al., 1982) in which female participants and nonparticipants were observed to have higher medical expenses as compared to men. Further investigation would be required in order to ascertain the long-term effects that exercise participation has upon the health care costs of the subjects involved in this study.

In regard to the average number of illness claims seen among the study groups, results indicated that male participants had 11 percent fewer illness claims than male nonparticipants, while female participants had a 42 percent higher amount of illness claims when compared to female nonparticipants. However, none of the observed differences were found to be statistically significant. The higher amount of illness claims seen among the female participants may not be surprising, considering that this group also incurred higher medical costs than the female nonparticipant group. This might suggest that membership in the fitness program may have influenced female participants to seek increased health care during the study period. Male nonparticipants demonstrated significantly lower rates of claim filing ($p<0.01$) when compared to females of the same study group prior to the implementation of the fitness center.

Likewise, the male member-nonparticipant group had a significantly lower number of claims when compared to females of the same study group ($p<0.05$) following UPFC program development. This observation is similar to that which was reported in earlier research (Bly et al., 1986; Shephard et al., 1982) which indicated that females had significantly higher health care costs than males ($p<0.01$, Shephard et al., 1982). Overall, the average number of illness related claims were observed to decrease within the male participant and member-nonparticipant groups, with the female nonparticipant group having shown a significantly lower number of claims ($p<0.01$) following the development of the UPFC program.

These results may suggest that membership in the fitness program, along with improved health awareness among the nonmembers of the program, might have been a contributing factor in relation to the decreases in health care claims seen among the male member-nonparticipant and male and female nonparticipant groups during the study period. However, the combined results indicated that participants of the UPFC program had 19 percent more illness claims than nonparticipants, with member-nonparticipants having shown a 37 percent higher level of illness claims as compared to the nonparticipant group. The cohort analysis revealed that the V-FREQ and FREQ exercise groups had fewer illness claims than INFREQ exercisers for both the male and female study groups. This observation mirrors that of Shephard et al., (1982) who reported that

high-level participants had fewer health care claims than low-level participants following participation in a one year fitness program.

Although none of the differences between the three combined male and female study groups were found to be statistically significant, the overall results would suggest that membership in the UPFC program may increase the likelihood of illness claim filing during the first eight months of an employee's membership in the program. However, since the nature of the illness claims was not recorded, further analysis into the type and number of claims would be required in order to better establish these observations. The results of these observations compare similarly with those reported in previous research (Baun et al., 1986; Gibbs et al., 1985) which indicated that exercisers had a higher utilization rate than nonexercisers after one year of participation in a work-site fitness program (Baun et al., 1986) and after six months of participation in a comprehensive health and lifestyle program (Gibbs et al., 1985). Further long-term analysis would be required in order to establish the trends in these observations.

The results of this study may suggest that participants of a work-site fitness program can incur higher absenteeism, hospital days, medical care costs, and illness claims during the initial eight months of fitness program membership. However, with the exception of a few comparisons, none of the study groups revealed significant changes in any of the measured variables between February 1987 and May 1988 (see Tables 34 through 38). The

overall results would suggest that membership and participation in a work-site fitness program does not significantly increase or decrease the amount of absenteeism, hospital days, medical costs, and illness claims in members and nonmembers during the inital eight months of program operation. The results of this study can be compared to similar trends in absenteeism and health care utilization as described in earlier research (Baun et al., 1986; Bly et al., 1986; Gibbs et al., 1985; Shephard et al., 1982; Shephard et al., 1981) which has reported similar changes in these variables. Further research involving members and nonmembers of the UPFC program would be needed in order to establish the long-term benefits of participation in the health and fitness program. Research involving the specific types of medical claims, the type of exercise activity most frequently participated in by UPFC members, individual fitness level measurements for each of the participants and nonparticipants, and a larger and more diverse sample population should be used in further research involving the UPFC program.

Table 34. Comparison of the Average Number of Hours of Absenteeism, Hospital Days, Medical Costs***, and Illness Claims for Participants between February 1987 and May 1988

Study Groups & Variables	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			
	N	Mean	SD**	N	Mean	SD	*P*
Absenteeism	108	40.00	25.50	108	44.20	28.30	0.21
Males	62	42.60	27.00	62	44.60	29.40	0.68
≤40 yrs	38	38.90	29.06	38	38.50	22.47	0.94
> 40 yrs	24	48.50	22.70	24	54.30	36.34	0.49
Females	46	36.60	23.20	46	43.10	26.60	0.21
≤40 yrs	32	35.00	21.93	32	42.50	24.24	0.05*
> 40 yrs	14	40.50	26.22	14	44.40	32.25	0.72
Hospital Days	98	0.02	0.20	98	0.11	0.93	0.22
Males	57	0.03	0.26	57	0.00	0.00	0.32
≤40 yrs	37	0.05	0.33	37	0.00	0.00	0.32
> 40 yrs	20	0.00	0.00	20	0.00	0.00	N/A
Females	41	0.00	0.00	41	0.27	1.43	0.24
≤40 yrs	29	0.00	0.00	29	0.31	1.67	0.33
> 40 yrs	12	0.00	0.00	12	0.17	0.58	0.34
Medical Costs	98	235.80	909.50	98	374.00	1610.00	0.47
Males	57	166.20	336.50	57	176.50	411.00	0.88
≤40 yrs	37	204.60	402.60	37	188.80	452.50	0.87
> 40 yrs	20	95.20	136.00	20	153.80	330.10	0.48
Females	41	333.00	1353.00	41	650.00	2432.00	0.48
≤40 yrs	29	144.30	244.50	29	412.00	1359.00	0.31
> 40 yrs	12	137.40	256.00	12	1225.00	4038.00	0.34
Illness Claims	98	2.00	3.40	98	2.10	3.30	0.87
Males	57	1.93	3.28	57	1.72	2.57	0.66
≤40 yrs	37	2.16	3.66	37	1.70	2.55	0.50
> 40 yrs	20	1.50	2.46	20	1.75	2.67	0.50
Females	41	2.15	3.52	41	2.59	4.10	0.50
≤40 yrs	29	2.38	3.92	29	2.93	4.72	0.53
> 40 yrs	12	1.58	2.35	12	3.25	5.59	0.21

* p = 0.05. ** Denotes standard deviation. *** In U.S. dollars.

Table 35. Comparison of the Average Number of Hours of Absenteeism, Hospital Days, Medical Costs*, and Illness Claims for Nonparticipants between February 1987 and May 1988

Study Groups & Variables	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			
	N	Mean	SD**	N	Mean	SD	*P*
Absenteeism	108	37.80	30.40	108	40.10	33.60	0.60
Males	62	27.70	26.90	62	33.80	33.10	0.27
≤40 yrs	38	31.80	29.04	28	39.70	35.65	0.08
> 40 yrs	24	21.20	22.00	24	24.40	26.79	0.42
Females	46	51.50	29.80	46	48.50	32.70	0.67
≤40 yrs	32	50.70	25.63	32	47.00	31.42	0.53
> 40 yrs	14	53.40	38.70	14	52.20	36.41	0.93
Hospital Days	108	0.43	2.89	108	0.19	1.15	0.36
Males	62	0.45	3.55	62	0.23	1.31	0.64
≤40 yrs	38	0.74	4.54	38	0.32	1.65	0.38
> 40 yrs	24	0.00	0.00	24	0.83	0.41	0.33
Females	46	0.39	1.68	46	0.13	0.88	0.36
≤40 yrs	32	0.47	1.95	32	0.19	1.06	0.16
> 40 yrs	14	0.21	0.80	14	0.00	0.00	0.34
Medical Costs	108	525.00	1908.00	108	367.00	1575.00	0.50
Males	62	175.40	559.00	62	411.00	1719.00	0.31
≤40 yrs	38	199.00	679.00	38	538.00	2156.00	0.36
> 40 yrs	24	138.20	289.40	24	210.00	538.00	0.58
Females	46	996.00	2799.00	46	307.00	1374.00	0.13
≤40 yrs	32	1119.00	3160.00	32	379.00	1643.00	0.03****
> 40 yrs	14	716.00	1784.00	14	141.00	249.70	0.29
Illness Claims	108	2.20	4.40	108	1.70	3.60	0.31
Males	62	1.18	2.97	62	1.90	4.26	0.14
≤40 yrs	38	0.74	1.50	38	1.32	3.15	0.26
> 40 yrs	24	1.88	4.35	24	2.83	5.55	0.27
Females	46	3.48	5.54	46	1.46	2.44	0.007***
≤40 yrs	32	3.59	5.44	32	1.53	2.69	0.01****
> 40 yrs	14	3.21	5.95	14	1.29	1.82	0.20

* In U.S. Dollars. ** Denotes standard deviation. ***p<0.01 ****p<0.05

Table 36. Comparison of the Average Number of Hours of Absenteeism, Hospital Days, Medical Costs*, and Illness Claims for Member-Nonparticipants between February 1987 and May 1988

Study Groups & Variables	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			
	N	Mean	SD**	N	Mean	SD	*P*
Absenteeism	67	46.10	36.40	67	39.30	32.60	0.80
Males	38	46.60	37.50	38	46.20	33.30	0.95
≤40 yrs	20	52.00	44.36	20	41.70	35.81	0.26
> 40 yrs	18	40.70	28.13	18	51.10	30.59	0.15
Females	29	45.30	35.60	29	42.60	32.00	0.72
≤40 yrs	13	44.30	43.30	13	35.10	32.66	0.48
> 40 yrs	16	46.00	29.29	16	48.70	31.19	0.75
Hospital Days	64	0.08	0.62	64	0.05	0.37	0.32
Males	36	0.00	0.00	36	0.00	0.00	N/A
≤40 yrs	18	0.00	0.00	18	0.00	0.00	N/A
> 40 yrs	18	0.00	0.00	18	0.00	0.00	N/A
Females	28	0.18	0.94	28	0.11	0.57	0.74
≤40 yrs	12	0.42	1.44	12	0.00	0.00	0.34
> 40 yrs	16	0.00	0.00	16	0.19	0.75	0.33
Medical Costs	64	288.40	762.70	64	230.50	435.50	0.59
Males	36	187.60	346.20	36	150.50	325.90	0.66
≤40 yrs	18	201.00	438.00	18	60.80	141.50	0.65
> 40 yrs	18	174.20	233.20	18	240.00	426.00	0.49
Females	28	418.00	1082.00	28	333.00	534.00	0.70
≤40 yrs	12	629.00	1597.00	12	145.00	365.00	0.32
> 40 yrs	16	259.00	418.00	16	474.00	605.00	0.11
Illness Claims	64	2.20	2.80	64	2.70	5.00	0.41
Males	36	1.56	2.06	36	1.50	2.29	0.92
≤40 yrs	18	1.33	1.91	18	1.33	2.59	1.00
> 40 yrs	18	1.78	2.34	18	1.67	2.00	0.86
Females	28	3.00	3.39	28	4.25	6.93	0.34
≤40 yrs	12	2.25	2.56	12	2.50	5.13	0.83
> 40 yrs	16	3.56	3.88	16	5.56	7.93	0.37

* In U.S. dollars. ** Denotes standard deviation.

Table 37. Comparison of the Average Number of Hours of Absenteeism, Hospital Days, Medical Costs*, and Illness Claims for Very Frequent, Frequent, and Infrequent Exercisers between February 1987 and May 1988

Study Groups & Variables	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			
	N	Mean	SD**	N	Mean	SD	*P*
MALES							
Absenteeism							
V-FREQ	14	34.68	19.75	14	48.60	43.70	0.22
FREQ	6	37.10	25.70	6	51.00	40.80	0.34
INFREQ	30	47.24	25.17	30	44.66	23.11	0.65
Hospital Days							
V-FREQ	13	0.15	0.56	13	0.00	0.00	0.34
FREQ	4	0.00	0.00	4	0.00	0.00	N/A
INFREQ	27	0.00	0.00	27	0.00	0.00	N/A
Medical Costs							
V-FREQ	13	170.50	332.50	13	267.00	693.00	0.68
FREQ	4	5.08	10.16	4	401.00	672.00	0.32
INFREQ	27	189.70	378.50	27	130.80	200.70	0.47
FEMALES							
Absenteeism							
V-FREQ	4	30.40	25.90	4	34.20	27.50	0.61
FREQ	3	47.50	27.30	3	43.80	32.50	0.63
INFREQ	23	35.16	20.96	23	46.16	29.91	0.08
Hospital Days							
V-FREQ	2	0.00	0.00	2	0.00	0.00	N/A
FREQ	3	0.00	0.00	3	0.00	0.00	N/A
INFREQ	22	0.00	0.00	22	0.50	1.95	0.24
Medical Costs							
V-FREQ	2	37.30	26.50	2	30.40	43.00	0.66
FREQ	3	0.00	0.00	3	37.50	40.30	0.25
INFREQ	22	184.10	301.40	22	1098.00	3281.00	0.19
Illness Claims							
V-FREQ	2	1.50	0.71	2	1.00	1.41	0.80
FREQ	3	0.00	0.00	3	1.33	1.53	0.27
INFREQ	22	2.77	4.53	22	4.05	6.38	0.31

* In U.S. dollars. ** Denotes standard deviation.

Table 38. Comparison of the Average Number of Hours of Absenteeism, Hospital Days, Medical Costs*, and Illness Claims for combined Male and Female Very-Frequent, Frequent, and Infrequent Exercisers between February 1987 and May 1988

Study Groups & Variables	Feb. 1987 - Sept. 1987			Oct. 1987 - May 1988			
	N	Mean	SD**	N	Mean	SD	*P*
Absenteeism							
V-FREQ	18	33.72	20.49	18	45.42	40.38	0.24
FREQ	9	40.56	25.04	9	40.56	25.04	1.00
INFREQ	53	42.00	23.99	53	45.31	26.02	0.47
Hospital Days							
V-FREQ	16	0.12	0.50	16	0.13	0.50	1.00
FREQ	6	0.00	0.00	6	0.00	0.00	N/A
INFREQ	49	0.00	0.00	49	0.22	1.31	0.24
Medical Costs							
V-FREQ	16	143.10	303.30	16	221.00	628.00	0.68
FREQ	6	3.39	8.30	6	286.00	550.00	0.26
INFREQ	49	187.20	342.50	49	565.00	2229.00	0.25
Illness Claims							
V-FREQ	16	1.45	2.19	16	1.0	1.63	0.54
FREQ	6	0.17	0.41	6	1.83	1.84	0.09
INFREQ	49	2.49	4.03	49	3.02	4.87	0.40

* In U.S dollars. ** Denotes standard deviation.

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