ABSTRACT


The sample of 3,974 employees of Apple Computer were divided into male (n = 2,088) and female (n = 1,886) groups and then further categorized according to age and the degree of participation in the Apple Health and Fitness Program. Mean age for males was 34.5 years ± 7.55, while the mean age for females was 34.7 years ± 7.58. The mean health care cost was $1,053.8 ± 3,705 for males and $1,420.0 ± 4,168.1 for females. Participation was measured over an 11 month testing period and divided into 4 subgroup headings: no use, low use, moderate use, and high use. Rather than use overall health care means, independent age group means were used to assign cost status. After skewness and kurtosis measurements determined that the sample was not normally distributed, chi-square tests were applied to locate statistical significance. In both males and females, chi-square tests examined differences in high and low cost status for the subjects within a particular age group. For both male and female subjects no significant differences were found within the age and participation subgroups (p > .05). The same subjects and age groups were then categorized into just 2 usage groups: user and nonuser. No significant difference was found among male users and the nonusers within the three age groups (p > .05). Meanwhile, a significant difference was found in females 31 to 40 years old and females 41 and older (p < .05). In females 31 to 40 the nonusers were found to have significantly lower medical costs while the opposite was true for females over 41 years of age.
EFFECTS OF A CORPORATE SPONSORED FITNESS PROGRAM
ON HEALTH CARE COSTS: A COMPARISON OF
USERS AND NONUSERS

A THESIS PRESENTED
TO
THE GRADUATE FACULTY
UNIVERSITY OF WISCONSIN-LA CROSSE

IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE
MASTER OF SCIENCE DEGREE

BY
MICHAEL W. BLACK
May 1995
Candidate: Michael W. Black

We recommend acceptance of this thesis in partial fulfillment of this candidate's requirement for the degree:

Masters of Science - Adult Fitness/Cardiac Rehabilitation

The candidate has successfully completed his final oral examination.

Thesis Committee Chairperson Signature: 4/26/93

Thesis Committee Member Signature: 4-26-93

Thesis Committee Member Signature: 4/26/93

This thesis is approved by the College of Health, Physical Education, and Recreation.

Associate Dean, College of Health, Physical Education, and Recreation: 1-17-95

Dean of UW-L Graduate Studies: 16 February 1995
ACKNOWLEDGEMENTS

I would like to express my deepest thanks to the members of my committee, Dr. Philip Wilson, Dr. John Porcari, and Dr. John Castek. Their patience and time were greatly appreciated.

Next, I would like to thank Robert Veldhuis, whom I consider a great friend and human being. My best wishes for a full and eventful life.

Lastly, I would like to thank my family. I owe them everything.
# TABLE OF CONTENTS

**ACKNOWLEDGEMENTS** ................................................................. iii

**LIST OF TABLES** ........................................................................... vii

**CHAPTER** .................................................................................. 1

I. INTRODUCTION ........................................................................ 1

   Need for the Study ................................................................. 3

   Statement of the Problem ................................................. 4

   Hypothesis ........................................................................ 4

   Assumptions ........................................................................ 4

   Limitations ........................................................................ 5

   Definition of Terms ............................................................ 5

II. REVIEW OF RELATED LITERATURE .................................... 7

   Introduction ......................................................................... 7

   Economics Involved in Health Care ....................................... 8

      Historical View of Health Care in Business ................... 9

      Current Conditions of the Health Care System ............. 9

      Causes of Growth in the Health Care Market ............... 12

      Health Care Management ............................................. 13

      New Era in Medical Care .............................................. 15

      The Status of the Voluntary Hospital ............................. 15

      Examining Health Care From the Employer's Point of View 16

   Terms and Concepts in an Exercise Program ..................... 19

   Analysis of Fitness Programs ............................................. 19

      Cost-containment ....................................................... 19
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-effectiveness analysis</td>
<td>20</td>
</tr>
<tr>
<td>Cost-benefit analysis</td>
<td>21</td>
</tr>
<tr>
<td>Risk of a Sedentary Life-Style</td>
<td>22</td>
</tr>
<tr>
<td>Health Based on Socioeconomic Position</td>
<td>24</td>
</tr>
<tr>
<td>The Impact of a Corporate Fitness Program</td>
<td>27</td>
</tr>
<tr>
<td>Benefits of a Corporate Fitness Program</td>
<td>29</td>
</tr>
<tr>
<td>Absenteeism</td>
<td>29</td>
</tr>
<tr>
<td>Job Turnover</td>
<td>31</td>
</tr>
<tr>
<td>Corporate Image and Recruitment</td>
<td>32</td>
</tr>
<tr>
<td>Participation Rates</td>
<td>32</td>
</tr>
<tr>
<td>Medical Costs and Health Related Improvements</td>
<td>33</td>
</tr>
<tr>
<td>Interviews With Directors of Corporate Fitness Programs</td>
<td>37</td>
</tr>
<tr>
<td>Summary</td>
<td>40</td>
</tr>
<tr>
<td>III. METHODS AND PROCEDURES</td>
<td>45</td>
</tr>
<tr>
<td>Introduction</td>
<td>45</td>
</tr>
<tr>
<td>Subject Selection</td>
<td>45</td>
</tr>
<tr>
<td>Development of the Data Base</td>
<td>46</td>
</tr>
<tr>
<td>Data Collection</td>
<td>46</td>
</tr>
<tr>
<td>Analyzing the Data Base</td>
<td>47</td>
</tr>
<tr>
<td>Statistical Treatment</td>
<td>48</td>
</tr>
<tr>
<td>IV. RESULTS</td>
<td>49</td>
</tr>
<tr>
<td>Introduction</td>
<td>49</td>
</tr>
<tr>
<td>Sample Characteristics</td>
<td>49</td>
</tr>
<tr>
<td>Demographics of the Sample</td>
<td>49</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of age demographics</td>
<td>50</td>
</tr>
<tr>
<td>2. Demographic characteristics of subjects</td>
<td>51</td>
</tr>
<tr>
<td>3. Distribution of medical cost (in dollars) per male employee, according to age</td>
<td>51</td>
</tr>
<tr>
<td>4. Distribution of medical costs (in dollars) per female employee, according to age</td>
<td>52</td>
</tr>
<tr>
<td>5. Distribution of medical costs (in dollars) per employee, according to age and sex</td>
<td>52</td>
</tr>
<tr>
<td>6. Distribution of medical costs (in dollars) per male employee, according to age and frequency of use</td>
<td>53</td>
</tr>
<tr>
<td>7. Distribution of medical costs (in dollars) per female employee, according to age and frequency of use</td>
<td>54</td>
</tr>
<tr>
<td>8. Comparison of health care cost among the usage categories for males</td>
<td>55</td>
</tr>
<tr>
<td>9. Comparison of health care cost among usage categories for females</td>
<td>56</td>
</tr>
<tr>
<td>10. Comparison of health care costs for male users vs. nonusers</td>
<td>57</td>
</tr>
<tr>
<td>11. Comparison of health care costs for female users vs. nonusers</td>
<td>57</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

Research conducted in the past decades indicates that an individual's habits and life-style strongly contribute to his or her state of health and the duration of life span (Paffenbarger, Jung, Leung, & Hyde, 1991). Despite growing emphasis of risk factor reduction (discontinuing cigarette smoking, eating a healthy diet, and physical activity), recent literature shows that 53% of all cardiovascular deaths are due to the effects of life-style (Bernstein, 1986). In addition, the American Heart Association (AHA) reminds us that heart and blood vessel diseases are not found exclusively in the elderly population. In fact, more than 170,000 Americans under the age of 65 die each year as a result of cardiovascular disease (AHA, 1991). Recognizing that through behavior and life-style modifications, cardiovascular disease (along with other health related problems) may be markedly reduced, corporations are investing in health and fitness programs as a means of limiting health care expenditures.

In 1990, per capita expenditures on medical care reached $2,560, nearly 1.5 times greater than expenditures during each of the 10 prior years. Personal health care expenditures claimed 88% of that amount, or $2,255 per person. With large per capita increases it is not surprising that expenditures for professional services (including physician and dental services) climbed 11% in 1989, exceeding $191.3 billion, or 28.7% of all health spending in 1990 (Levit & Cowan, 1991).

Annual increases in medical insurance premiums compound the financial burden placed on businesses offering medical plans to their employees. Furthermore, the massive spending on health care has far reaching repercussions in areas outside the
business community of the U.S. Corporations are forced to pass their added expenditures to consumers in the form of inflated costs. For example, automotive manufacturers must add approximately $500 to each car produced to cover the cost of medical plans. Even more alarming is a claim by Chrysler Corporation President Lee Iacocca. Reports from the spring of 1989 found employee health insurance costs greater than the cost of steel going into Chrysler Corporation’s cars (Briggs, 1991). Additionally, Herzlinger and Calkins (1986) found that payments for medical insurance amounted to 24% of net profits, while industrial expenditures for prevention amounted to only 0.11%.

Many executives believe that excess money spent on health care and benefits translates into money not spent on employee training, new plants, and equipment. These factors pose a threat to U.S. competitiveness. According to Chrysler, the cost per hour worked in a U.S. auto plant is $8.04, while in foreign based U.S. auto plants, the cost is only $2.85 an hour. Walter Maher, Chrysler’s director of federal relations, says this is in large part due to the many more retirees accompanied by the higher percentages of older workers in the U.S.

The urgency of reducing the health care problem in corporate America became evident in 1990, as the U.S. entered a recession. The recession caused a reduction in consumer spending on most goods and services, while spending on health care continued to grow unabated (Jencks & Schieber, 1992). In fact, the crisis in health care could be prolonging the current recession and unemployment problems. Experts claim that to avoid incurring additional health care expenditures, companies pay their employees to work overtime rather than hire new workers (Brown, 1992).

Understandably, the rising cost of health care has alarmed corporate America, but before companies invest substantial time and money into solutions, all options are carefully considered. Increasingly, businesses are opting for wellness and life-style
modification programs as a means of slowing their growing expenses (Karan, 1987),
even though some experts believe the payoff period is both long and uncertain (Baun,
Bemacki, & Tsai, 1986). Annual investments of $100 to $400 per employee (or $500 to
$2,000 per participant) are increased to cover the costs of fitness facilities, maintenance,
and cleaning of the facilities, and the depreciation of equipment and accident insurance
(Shephard, 1989). While cost of operation may be considerable, managers hope that
diminished health care expenditures and reduced absenteeism rates outweigh the costs of
starting and maintaining a health promotion program.

Need for the Study

In response to the soaring health care cost in industry, Apple Computer of
Cupertino, California, has made a commitment to developing a health and fitness program
for its employees. To accomplish such a goal, Apple Computer devised a multidisciplinary
approach to wellness. This program consists of fitness activities, preventive medicine,
recreation services, and health education. Currently, 5 Apple Health and Fitness
Programs exist in the U.S.; 3 in California, 1 in Colorado, and 1 in Texas.

A previous study conducted with Apple Computer established that a majority of
workers felt the Apple Health and Fitness Program was beneficial to the company. In
addition, those who used the facilities reported personal benefits, including improvements
in physical fitness, weight control, and the ability to lead a healthier life-style. These
results indicated that employees share a positive outlook on the fitness center (Ocel,

After several years of operation, Apple Computer wishes to examine the
effectiveness of their investment by evaluating the health care cost of nonusers and users
of their fitness program. The issues of greatest interest to executives include the cost
effectiveness of the health and fitness program, and its overall progress. These leaders of
Apple Computer feel that adequate time has passed for an accurate assessment of differences in health care costs between employee participants and nonparticipants in the fitness program.

**Statement of the Problem**

Through the use of health care information supplied by Apple Computer, the differences in cost of medical care were compared between individuals using the fitness program and individuals who did not use the program. The categories used for examination included gender, age, frequency of use, and total health care cost. The objectives for this study, related to the Apple Health and Fitness Program, were as follows:

1. To determine the differences in health care costs between 4 variations of usage subgroups (no use, low use, moderate use, and high use).
2. To determine the effects of age and gender on health care spending.

**Hypothesis**

The following null hypotheses were examined in this study:

1. There were no significant differences in health care cost between the 4 usage groups established according to age and gender.
2. There were no significant differences between strictly users and nonusers of the Apple Health and Fitness Program according to age and gender.

**Assumptions**

The researcher had the following assumptions for the study:

1. The participants in the study utilized the fitness center as indicated by their attendance.
2. The health care information obtained by Apple Computer was accurate and complete.
3. Expenditures for similar medical care were equal in the different medical centers utilized by the subjects.

4. Accurate records were kept and reported for each subject in the study.

5. Each individual employee had an equal opportunity to participate in the fitness program offered by Apple Computer, and had access to the same information regarding the center.

Limitations

The researcher had the following limitations for the study:

1. The analysis of health care was limited to the workers of Apple Computer, employed during an 11 month (44 week) testing period.

2. Subjects categorized as users (low, moderate, or high) were limited to those participating in activities sponsored by the Apple Health and Fitness Program.

Definition of Terms

The following terms were used in this study:

Cost-Benefit Analysis - A method that attempts to assign a dollar value to all costs and benefits of an exercise program. Data collected are often expressed as a yield on investment (Shephard, 1989).

Cost Containment - An attempt to control the escalating cost of medical care by stressing a healthy life-style (Fardy, 1987).

Cost-Effectiveness Analysis - A tool used to compare possible tactics to control medical costs and industrial practice. This term may also refer to the reasonableness of existing policies (Shephard, 1986).

Fitness - A state of health characteristics, symptoms, and behaviors enabling a person to have the highest quality of life.
Health Care Costs - Any medical cost paid by Apple Computer through Aetna. Out-of-pocket expenses, deductibles, copayments and other medical expenses, and administrative fees, were not included.

High Use - An individual using the fitness portion of the Apple Health and Fitness Program equal to, or more than 88 times in the testing period (8 or more sessions per month).

Life-style - A person's general pattern of living, including healthy and unhealthy living.

Low Use - An individual using the Apple Health and Fitness Program greater than 0, but less than 44 times in the testing period (less than 4 sessions per month).

MET - Metabolic unit used to estimate oxygen uptake.

Moderate Use - An individual using the fitness portion of the Apple Health and Fitness Program equal to 44, but less than 88 sessions during the testing period (greater than or equal to 4 but less than 8 sessions per month).

No Use - An individual using the fitness portion of the Apple Health and Fitness Program 0 times during the testing period (0 sessions per month).

Opportunity Cost - The investment of personal time, along with any sacrifice needed to participate in an exercise program.

Pretransitional Work Force - A type of work force when a high percentage of employees relocate to a different job location shortly after working in an area.

Risk Factor - A characteristic, sign, or symptom associated with increased probability of developing a health problem (Shephard, 1989).

Wellness - A constant and deliberate effort to stay healthy and achieve the highest potential of well-being (Shephard, 1989).
CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

"Eating alone will not keep a man well; he must also take exercise." Although leaders in the field of health and physical fitness now stress the importance of exercise and an active life-style, Hippocrates, the father of medicine, coined this phrase in the fifth century B.C. Today multiple studies have shown a strong association between physical activity and reduced risk for several medical conditions, along with overall mortality. A significant portion of the business community has also heard these statements, concluding that if the employees are physically active, medical costs are likely to be less (not to mention a variety of other beneficial aspects related to job performance). To aid their workers and encourage the importance of a healthy body and mind, many businesses are developing fitness centers to be utilized by their employees.

Employers traditionally offer some type of medical insurance plan to workers. In fact, excluding the elderly, most private insurance coverage is provided through employment-related group policies. Levit, Lazenby, Letsch, and Cowan (1991) found that public programs funded 42.2% of health care, while the private sector picked up the remaining 57.6%. Moreover, data from 1980 showed that premiums paid by individual, or nongroup policy holders, represented only 10% of the total payments to Blue Cross and other commercial insurers (Rosko & Broyles, 1988). The amount of health care contributed by employers has increased over threefold in the past decade alone, from $64.8 billion in 1980 to $186.2 billion in 1990 (Levit et al., 1991). As a result, saving money in the area of health care is a major concern of corporations and businesses throughout America.
The effectiveness of a corporate fitness center is important, since the improved health in an employee population can result in decreased illness, reduced absenteeism, increased productivity, and lower health care premiums. All these factors are beneficial to both the business and the individual worker.

This chapter reviews literature related to medical health care and the benefits of a physically fit individual. Also the role of a corporate fitness program in health care will be addressed. Specifically, this chapter will: 1) introduce the economics involved in health care; 2) identify the terms and concepts involved in the analysis of corporate fitness programs; 3) examine the impact of corporate fitness programs, established in recent years; 4) examine the benefits of a corporate fitness program; 5) present interviews with directors of corporate fitness centers; and 6) present a summary of the literature reviewed.

Economics Involved in Health Care

Perhaps the most glaring reason that companies are finding it economically beneficial to spend millions of dollars to build and operate worksite programs is the rapid upward spiral of health insurance. Many corporations are seeking new ways to reduce the cost of employee related expenses to accompany an increasingly competitive market (Ettorre, 1992; Patton, Corry, Gettman, & Graff, 1986). One way in which an employer may control or reduce the cost of labor is to decrease its contribution towards health insurance, thereby increasing the employee's responsibility to finance health insurance premiums (Chollet, 1984; Rosko & Broyles, 1988). On average, an employer contributes approximately 67% of premium payments.

In addition to this practice, employers may offer a variety of arrangements by which premiums are financed. Of the employers that finance less than 100% of the premium, most pay a specified fraction of the insurance cost to avoid having the employee
finance an increasing portion as the premium rises. Rosko and Broyles (1988) concluded that when combined with favorable tax treatment, the above aspects of health care can induce employees to select plans with extensive coverage, reducing the cost consciousness of the health consumer, stimulating use, causing increased expenses, and ultimately resulting in higher premiums.

**Historical View of Health Care in Business**

Private health insurance became firmly established as a fringe benefit to workers during World War II as a means of attracting workers, along with discouraging existing workers from changing jobs. Since this time, private health insurance has become an acknowledged and accepted responsibility of business. The business community accepted the function of primary provider of the nonelderly population through the endorsement of insurance companies, government, and employees.

The insurance companies prefer employer groups because they reduce the risk of adverse selection and provide a way of reducing their marketing, enrollment, and premium collection costs (when compared to those costs encountered by selling to individuals). Government shows support for employer sponsored insurance plans by offering tax incentives. Basically, government tax rules treat monies spent on health care coverage as business expenses, which reduce the gross taxable income of the company. From a worker's point of view, the benefit also represents a nontaxable income, while at the same time, raising the effective wage rate of the employee. Lastly, the employee continues to consider health insurance benefits as a major factor in their decisions to change or remain on the job (Levit & Cowan, 1991).

**Current Conditions of the Health Care System**

Health care has been the world's most successful industry for the past quarter century (it has been especially rewarding in the U.S.). However, open-ended
commitments to the elderly and the practices employed during the expansive 1960's, (when dramatic growth and expansion were relatively easy to finance), have become increasingly difficult to cover in the last 15 years. Jencks and Schieber (1992) pointed out that neither the "regulatory" policies of the 1970's nor the "competitive" policies of the 1980's have slowed the growth of health care spending.

Over the past several years, medical benefit cost increases have been accompanied by increases in the total personal health care expenditures. This trend most likely reflects change in the economic environment of health care. Reports indicated that medical benefits and direct salary payments are rising in disproportionate increments, making medical benefits a much larger portion of total compensation. Some employers stated that significantly more than 10% of total compensations rose from medical benefits (Harris & Custer, 1991). In other words, workers are receiving more medical benefits and less salary increases.

Meanwhile, costs are sharply increasing in a marketplace heavily influenced by private commerce, yet still dominated (to a large extent) by an open-ended indemnity insurance and payment by piecework. The financial arrangements in such a system contribute to the provision of service with little regard for cost (Relman, 1991). For example, in terms of the average medical insurance premium paid by employers per worker, costs have increased 100% from 1984 to 1989 (Briggs, 1991). Analysis of the 1990 health insurance premium increases showed that 38% of small businesses had a 16 to 35% increase, 23% had a 36 to 60% increase, and 6% had a more than 60% increase. According to Briggs (1991) and Ettorre (1992), these types of increases are clearly incompatible with economic survival.

The fraction of gross domestic product (GDP) devoted to health care has sharply risen since the birth of Medicare and Medicaid. In 1965, the U.S. spent about 6% of its
GDP on health care, while in 1990 nearly 12.4%, or approximately $700 billion was spent (Ettorre, 1992; Jencks & Schieber, 1992; Levit, et al., 1991; McGarvey, 1992). This is not hard to comprehend since costs for medical care more than doubled, and prescription drug prices increased 150% within the last decade alone. Finally, to accompany these dramatic increases, and to add to this disturbing information, U.S. citizens' longevity was not greater, but less despite spending 41% more per-capita on health care than Canada, 61% more than Sweden, 85% more than France, 131% more than Japan, and 171% more than England (Briggs, 1991; McGarvey, 1992).

On a per-capita basis, nominal medical care expenditures rose from $180.73 in 1985 to $1,505.25 in 1985. Within this same time period, the percentage of payments for health care services also changed dramatically. In 1965, direct consumer payments accounted for 46% of the national health expenditures, while private and government expenditures combined to account for 48%. Twenty years later, in 1985, 21% of health expenditures were direct consumer spending, whereas private health insurance accounted for 32% and government accounted for 42% (Harris & Custer, 1991). With these types of increases, it is clear that action in the form of new policies and regulations must be taken.

Furthermore, the high cost of health care is believed responsible for the inability to provide adequate care for all citizens. For example, although the U.S. occupies the highest level of annual spending per person ($2,051), polls indicated that citizens have the lowest level of satisfaction in the current health care system (Briggs, 1991).

According to Ettorre (1992), unlike previous years, the climate is right for health care reform. The emphasis for health care reform comes strongest from the American worker. For the first time in U.S. history, the middle class is not guaranteed access to safe economical health care. Strikingly, Ettorre (1992) recalled that it seems the chronic 36 million uninsured Americans did not trouble the national consciousness until the
ordinary worker began to worry that health care for his or her family was not guaranteed in times of job cut backs and lay offs.

A multiyear, longitudinal survey conducted by International Survey Research Corporation and reported by the Alexander Consulting Group and the IRS, compiled the level of satisfaction towards benefits of 120,000 employees. Taken in a wide range of work settings and economic strata, the report revealed that satisfaction reached a high in 1984, when 88% rated their benefits as "good" or "very good". This percentage has dropped to 77% in 1986/87 and plummeted to 42% during 1989/90 (McGarvey, 1992).

McGarvey (1992) said this sharp drop in benefits satisfaction corresponded to a similar decline in employee morale, and may be attributed to the steep decline of several related factors. The most crucial of these factors refers to the "historic restructuring of medical benefits during the past decade" (p. 35). For example, in many cases insurance coverage is only good when holders of the policy use specified medical centers, and doctors. Employees tend to view these changes as a restriction of free choice and an alteration of the doctor-patient relationship.

Causes of Growth in the Health Care Market

Due to complexities involved in large scale economics, the forces that generated the growth in health care are difficult to disentangle. For the most part this is due to the unique features of the medical marketplace. In what may theoretically be established as a normal marketplace, the consumer demand (along with his/her ability to pay), largely determines what is produced and sold. The health care market sharply contrasts this type of system, since most payments are made by third parties, and most decisions are made by physicians and medical practitioners (Relman, 1991). However, a partial explanation for health care increases is comprehensible. In a chronically inflationary economy, health care costs are expected to rise, just as the price of everything else. In conjunction with
the inflationary rise in medical care, total costs (in terms of medical treatments) will also rise as the population ages.

Additionally, a variety of other factors directly influence the annual growth in health care. These include insurance coverage and premium subsidies, nonprice competition among providers, open ended payment systems, developments in technology, malpractice litigation, self-referral, costs of cost containment and competition, increasing physician supply, and upcoding (a code refers to the cost of an outpatient diagnostic service or inpatient hospital service. Upcoding results when providers apply more costly codes to report services that have not changed).

The combination of these factors creates an environment in which almost all forces lead to a demand for more services. Tax subsidies on premiums and limited cost sharing provide few restraints on demand, while comprehensive insurance coverage (for most of the population), open ended provider payment methods, and the threat of malpractice cases provide few restraints on supply. Further, consumer expectations, nonprice competition, profitability, and the ease of implementation encourage the rapid adoption of new technologies. Limited knowledge of effective medical treatment, along with the inability of the consumer to assess their own needs further undermine the health care market (Jencks & Schieber, 1992).

Health Care Management

As a result of becoming major payers of health care costs, through its role as principal provider of employee health insurance, corporations have become important players in the shaping of the health care system. The efforts to support a wide variety of health care coverage and the utilization of management schemes are directed at attempts to control the spiraling costs associated with health care (Wood, 1991).
Occupational health practice as a discipline is facing transitional times, and is struggling towards a blending of social and economic goals (McDonagh, 1984). According to Wood (1991), the most widely stated objective of business is to purchase the least expensive health care for its workers and their dependents, without sacrificing the quality of care. Yet the quality of health care is difficult to measure. Therefore, employers involved in the purchase of health care for workers have based their choices largely on price.

Wood (1991) described the results of the early efforts to establish a measure of health care based on the uncertainty of quality. This type of evaluation was derived from questionable interpretation of collected data, along with the inherent uncertainty of the clinical care process itself. Furthermore, quality assessment efforts are often slowed by questionable evidence regarding effectiveness of both current and emerging medical practices.

Most corporate physicians have access to one or more data bases to aid in the operation of their occupational medical practices, but generally do not have the specific information required for judging the value of the health care received by employees. Improvements in the ability to gather and interpret large amounts of data can likewise improve the possibility of understanding medical effectiveness. Major data bases now exist for cancer, cardiovascular disease, arthritis, stroke, and many other disorders. The desired situation would be a means of connecting the independent data bases to form a larger picture of medical knowledge.

Like physicians in private practice who are only able to compare care between patients, corporate physicians rarely are able to compare across patients, across practices, across communities, and across time. Hence, any advance in the ability to
communicate medical technologies would greatly improve the effectiveness of health care practices (Wood, 1991).

New Era in Medical Care

Relman (1991) first expressed concern for what he termed "the new medical-industrial complex" in 1980, at the Annual Discourse presented before the Massachusetts Medical Society. To Relman (1991), this type of medical system developed in response to the entrepreneurial opportunities afforded by the expansion of health insurance coverage.

A large percentage of health care consumers are offered indemnification through Medicare and employment-based plans. Accompanying the open-ended, piecework basis of third party payments was a trend for business ownership of a medical facility. This design guarantees a profit, provided that physicians used the facility and that services were limited to fully insured patients. In addition, with less government regulation, the opportunity for commercial exploitation is even more attractive. As support for his point, Relman (1991) offered the rapid growth of investor-owned medical facilities as an example.

Moreover, in the last decade, all but the most minor surgery was performed in hospitals, while today, at least half of all procedures can be safely performed on an outpatient basis. This provides a still greater opportunity for freestanding centers. Most of the freestanding centers are investor owned, with the referring physicians as limited partners. Furthermore, most in-hospital units are joint ventures between the hospital and their staff surgeons (Relman, 1991).

The Status of the Voluntary Hospital

This new era in health care has also caused dramatic changes in the voluntary hospital. According to Relman (1991), the growing transfer of diagnostic and therapeutic
procedures out of the hospital, the mounting cost control constraints imposed by third party payers (which reduce the hospitals' freedom to shift costs), and the general excess of hospital beds, (resulting from times of rapid and uncontrolled expansion) have combined to threaten economic viability of the voluntary hospital. Hospitals can no longer rely on charitable contributions to cover the costs of higher wages, and the expenses for supplies and equipment.

In the past, voluntary hospitals have always been tax-exempt, because they are not owned by investors and they do not distribute profits to their owners. But, along with the status of tax-exempt is the obligation to provide necessary community services, profitable or not, and care for uninsured patients. This presents a noticeable amount of strain on the budget of such hospitals, and may ultimately result in the shift away from the altruistic intentions of voluntary hospitals to a primary concern for the bottom line. In short, many voluntary hospitals now must view themselves as a business competing for paying patients in the health care market.

**Examining Health Care From the Employer's Point of View**

According to some estimates, health care spending accounted for 40 to 60% of business spending, as a percent of corporate profits in 1990. The trajectory of these numbers is even more alarming. Prediction for the nation's total health expenditures by the year 2000 anticipate the amount spent on medical care to account for 17% of GNP, and 70% of business spending (as a percent of profits) (McGarvey, 1992).

As discovered by many businesses, one way to combat the rising cost of health care is to emphasize prevention (Baun & Williams, 1985). By far the number one cause of mortality in the U.S. is coronary artery disease (AHA, 1991). An estimated 7 million people in the U.S. have some form of coronary artery disease, which claims 500,000 lives a year. Bypass surgery, a common procedure for alleviating coronary artery
disease, is performed on 284,000 persons annually, costing $30,000 per patient (Public Health Service, 1992). Coronary artery disease is associated with many life-style habits, including long-term exposure to diets high in saturated fats, cholesterol, and calories, sedentary living, increased emotional and mental stress, and cigarette smoking (Fardy, Yanowitz, & Wilson, 1988).

Due in part to the work done by these, and other researchers, government bodies are busy establishing health objectives and goals for the future. For example, national health objectives released in 1990 propose very specific goals to be attained by the year 2000. Among these are an increase in life expectancy to at least 78 years, a reduction in disability due to chronic conditions (to a prevalence of no more than 6% of all persons), and finally, an increase in the years of healthy life to at least 65 years. To reach these objectives requires a combination of increased efforts to plan, implement, monitor, and evaluate preventative services (such as those offered by a corporate sponsored wellness program).

To determine the economic strengths of a worksite fitness center, one must first understand the analysis of such a program. For example, when examining health care costs, the mean value does not truly represent the costs of a typical employee. Rather, the employees with the highest cost raise the mean of the distribution disproportionately. A study by Lynch, Teitelbaum, and Main (1992), found that the top 10% of the claimants accounted for 65% of the total costs. Therefore, it is more useful to know how many individuals within a group had high costs, rather than the average cost of that particular group. Accuracy is compromised when reporting health care costs as a group average, since one expensive case may cost 100 to 500 times as much as the typical employee. In addition, many analysts fail to use outliers because they do not fit more typical cases in the study. Other studies also noted an association between health risks and the likelihood
of having high medical expenses. High cost individuals are more likely to have potential harmful health habits (Yen, Edington, & Witting, 1991; Zook & Moore, 1980).

It must be remembered that the costs of health habits vary as a function of health risk and individual differences. For example, not every employee who smokes costs the average $265 more than every nonsmoker, and not all smokers develop cancer or emphysema. Rather, these characteristics have a greater likelihood to occur in smokers. In short, just as poor health habits place you at risk for health problems, so do they place you at risk for higher medical costs.

Studies of the relationship between medical claims costs and health related behavior have become the focus of major research in the field of health promotion and disease prevention. While many of these studies concluded that health risk reduction does indeed lower medical care costs, the validity of these conclusions has been questioned. Health behavior or health care cost data are often estimated based on theoretical relationships or inconsistent data (Oster & Epstein, 1986). Furthermore, the statistics used in many of these studies are sometimes questionable at best (Bly, Jones, & Richardson, 1986; Golazewski, Lynch, Clearie, & Vickery, 1989; Lynch et al., 1992).

Yen et al., (1991) sought to provide strong statistical evidence to a relationship between an employee's health-related measures and prospective medical claims cost. After stratifying the subjects according to level of risk, and examining various health related measures, Yen et al. found that regardless of age and sex, employees with positive health behaviors cost less in terms of medical claims costs. Additionally, Yen et al. reported employees' perceptions about their health, stress, job, and life were highly associated with medical claims costs in future years. Thus, a worksite health promotion program may provide a double benefit to business. It could help employees feel better about themselves and simultaneously reduce health care cost in future years.
Terms and Concepts in an Exercise Program

Corporations face increasing competition from developing nations, which offer cheap labor, cheap raw materials, and often a careless disregard for employee health and safety. This increasing competition from other world markets also contributes to the rise in research examining possible mechanisms to increase productivity, while decreasing the cost of production.

Analysis of Fitness Programs

Several terms and concepts not often associated with exercise and health are used for analysis of corporate fitness programs (Bernstein, 1986). Recent studies involving the economic analysis of fitness, sport, and recreation programs have been sponsored by a variety of groups, including government departments, health professionals, and independent consultants. These groups are all anxious to show the benefits of a health and fitness program, so examination of the results and methods should be closely scrutinized. Shephard (1989) suggests that either consciously or subconsciously, the groups mentioned often stress positive indicators of a fitness program, such as reduced absenteeism, lowered health care costs, and increased productivity, while failing to address the full economic cost of starting a corporate fitness program. Finally, as in most experimental questions, a positive finding has a greater chance of being published.

To evaluate the effectiveness of an exercise program economists employ several analysis techniques. These include, cost-containment, cost-effectiveness, and cost-benefit analysis.

Cost-containment. A major objective for an executive, or corporate fitness director, contemplating a health maintenance program is cost-containment. Cost-containment (in the arena of medical treatment) is the reduction of the level or rate of increase in health care. Though the definition of cost-containment is grammatically logical, there are several
issues in defining costs and analyzing reductions. These include, providers' cost versus payers' expenditures, effects of individual payers' expenditures on total expenditures, effects of cost-containment on the access, and quality of medical care (Jencks & Schieber, 1992).

The price of medical coverage has prompted many individual leaders to take a serious look at the value of a health and fitness program. Fardy (1987) argued that benefits gained from a fitness program are obvious. The question is not whether fitness and health activities are of value, but to what extent they should be included and how they are best implemented. Others are not as convinced (Bernacki, 1987; McDonagh, 1984).

The unanswered question in the field of health deals with the ethical interpretation of a crucial assumption. This assumption states that improvements in the overall health of a community can be improved through a physical fitness program, and ultimately result in containment of medical costs. Reductions in medical expenses would be generated (according to this theory) from a decreased number of hospital beds, a lessened demand for very costly high tech medical services, and the employment of a smaller team of physicians (Shephard, 1989). Nevertheless, recent literature showed that a major fraction of the costs are drawn from an exceedingly small percentage of the population (Lynch et al., 1992), and those that created medical demands seem least likely to participate in exercise-centered programs of prevention (Shephard, 1989).

Cost-effectiveness analysis. Another area of interest to directors of a fitness program is cost-effectiveness. This type of analysis involves tactics to compare medical care and industrial practice. It also may assess the overall accomplishments of current policies contained in a health and fitness program (Barry & DeFrieze, 1990; Shephard, 1989). The task of such comparisons is to rank alternative treatments on the basis of cost per unit output. In other words, cost-effectiveness analysis is based on the principle that
"even if we do not know the value of an objective, we do know that we want to achieve the objective in a way that will minimize cost" (Barry & DeFriese, 1990, p. 449).

Shephard (1986) stated that the tendency among health economists today is to use cost-effectiveness studies when observing a health program. This model of analysis allows decisions to be made based on short-term behavioral changes without lengthy longitudinal studies. Therefore, it is easier to use in health promotion program evaluation. The main drawback to the cost-effective analysis approach is that it does not allow for the comparison of programs with different outcomes.

Cost-benefit analysis. Closely related to the cost-effectiveness analysis is the cost-benefit analysis. This methodology attempts to attach a dollar value to all costs and benefits resulting from some sort of treatment. A cost-benefit analysis attempts to answer the question, "is it worth it?" The data are expressed as a yield on investment, usually in the form of a ratio of cost to benefit (Barry & DeFriese, 1990; Patton et al., 1986; Shephard, 1989).

Patton et al. (1986) described the major limiting factor of a cost-benefit model as the lack of standardized criteria, (for example, the dollar value of an individual with a high school education compared to one holding an advanced degree). In a comparison with a cost-effectiveness model, Kaman (1987) stated that a cost-benefit analysis can construct a ratio between cost and monetary benefit. This value may be compared to other programs, regardless of the desired results of the specific program. Analysis involving a cost-effectiveness strategy must use the same criteria for success (other than money), to determine if one program is more effective than another.

When used for decision making purposes, cost-benefit analysis compare monetary costs of programs with their expected benefits (also expressed in monetary units). While
this type of tool is useful in situations when both cost and benefits are easily quantifiable, the less tangible the program benefits, the harder it is to translate into monetary values.

Benefits of a health promotion program such as lives saved, avoided suffering, or reduced risk of heart attack are not easily defined in concrete terms. A classic example of an attempt to equate a monetary value on human life occurred in 1908. The city of Pittsburgh was considering the installment of a water purification system, in an attempt to reduce the number of deaths from typhoid fever. City officials quoted an expense of $7 million to construct such a system. They estimated that 400 lives could be saved yearly, with a value of $5,000 placed on each. According to their estimations, the water purification system is justified as both a sound, profitable economic investment as well as a humanitarian measure (Barry & DeFriese, 1990).

Risk of a Sedentary Life-Style

The U.S. is one of the richest country in the world, reflected by the amount we spend on medical care. Billions of dollars are spent annually on medical treatments for diseases that might be significantly decreased by easy to apply prevention methods. According to Park (1992), physical education in the public school, the one institution that touches the vast majority of lives in the U.S., has declined in quantity and quality since the mid 1950's. Of the funding given to interscholastic and intercollegiate sports programs, most is likely to be spent on the athletic teams, rather on the general student body.

In 1990, a project known as Healthy People 2000 was released by the U.S. Department of Health and Human Services (Public Health Service, 1990). Of the 22 priority areas listed in this document to improve the health of the American population, physical activity finds itself in the top position. Currently, the proportion of adults that regularly engage in some form of physical activity is 35% (regular exercise defined as light
to moderate physical activity at least 30 minutes per day). Objectives of Healthy People 2000 wish to see this figure increase to more than 60%.

The amount of money spent on the promotion of physical activity contributes to the health of everyone, because it has the ability to reduce directly the risk of several major chronic diseases, while at the same time catalyze positive changes with respect to other risk factors for disease. Sadly, the U.S. does not carry a strong tradition in this type of funding. Recently, physical activity data focused on health promotion revealed that the U.S. devoted considerably less per capita spending (0.06) to physical activity programs than do Canada (0.70), Australia (0.41), or England (0.31) (McGinnis, 1992).

Physical activity has been shown in some studies to possess many positive relationships with health status, over a varied assortment of both physiological and psychological areas. For example, regular activity has been linked with prevention of coronary heart disease, reduction of low density lipoprotein cholesterol and triglyceride levels, as well as a viable means of treating individuals suffering from anxiety or depression (Haskell et al., 1992).

One highly researched area in cardiovascular health stems from the proposed link between life-style and high blood pressure. Montoye, Metzner, Keller, Johnson, and Epstein (1972) were the first to report an inverse relationship between the degree of habitual activity and blood pressure. More recently, individuals at high risk of developing hypertension were examined by Stamler et al. (1989). Two hundred hypertensive prone men and women were randomly placed in two study categories, an intervention group and a monitored group. The intervention group received individualized counseling to achieve life-style changes, while the monitored group was seen every 6 months. The life-style changes involved modification in diet (American Heart Association type diet), reduction in daily sodium intake (1,800 mg or less), reduction in daily alcohol intake (26 g or less), and
an increase in moderate isotonic physical activity (70-75% of max heart rate based upon age).

The most intriguing finding involved the progression of the individuals over the 5 year testing period. One out of every five subjects in the control group moved from a status of hypertensive prone to a hypertensive, while only 1 in 11 persons involved in lifestyle modification did the same. Overall, results indicated that a modest intervention program with a nutritional basis to reduce weight, high salt intake, and high alcohol intake, accompanied with an increase in the amount of moderate exercise, can contribute to a decrease in hypertension.

Over the past half-century, scientific reports, varying on design, nature of subjects, measurement methods, types of activity, and statistical treatments, have sought to evaluate the relationship between physical activity, physical fitness, and cardiovascular health. Although these diverse studies contributed substantially to the knowledge of both the short and long term effects physical activity has on cardiovascular performance and capacity, a casual link between habitual physical exercise and the clinical manifestation of various cardiovascular disorders is difficult to establish (Haskell et al., 1992).

Health Based on Socioeconomic Position

In 1967, investigators sought to identify a relationship between social position and mortality due to disease. The research, which used civil servants in the British government and became known as the Whitehall study, showed a steep inverse association between social class and mortality from a wide range of diseases. Twenty years later, another investigation sought to determine possible explanations for the previous findings, and to provide current data. The authors attempted to expand on the previous study by examining the degree and causes of the gradient in morbidity, the additional factors related to the gradient of mortality, and to include women. Among the
results reported in the second Whitehall study were an inverse relationship between employment grade and the prevalence of angina, electrocardiogram evidence of ischemia, and symptoms of chronic bronchitis. Overall, the relative differences between clerical officers and administrators appears to be greater than those found in the first Whitehall study (Marmot et al., 1991).

Marmot et al. (1991) proposed potential explanations by examining what they labeled biological, behavioral, and psychosocial risk factors. One significant finding related to the biological and behavioral risk factors was obesity (measured body-mass index greater than 30). Obesity was more prevalent in employees with lower status jobs, especially in clerical positions. Indeed, moderate or vigorous exercise was less common among subjects of lower status jobs, while higher status jobs also showed a greater consumption of skimmed and semiskimmed milk, wholemeal bread, and fresh fruits and vegetables. Overall, the risk factor differing the most between employment categories was smoking. The higher employment grades had the greatest percent of current smokers (Marmot et al., 1991).

When examining the psychosocial characteristics of the subjects, fewer workers in the lower status jobs reported feeling control over their work lives. In general, this group was not satisfied with their work situation. Additionally, fewer people in lower grade jobs were involved in hobbies, and the men in these jobs were less likely to report a confidante in whom they could entrust their problems, or receive practical support. Furthermore, this group reported the most negative reactions from the people close to them.

Surprisingly, individuals in higher status jobs recorded a lower rate of heart disease, despite the greater percentage of type A behavior. The type A behavior pattern (TABP) was originally defined by Friedman and Roseman (1974) as, "an action-emotion
complex, that can be observed in any person who is aggressively involved in a chronic, incessant struggle to achieve more and more in less and less time” (p. 26).

Attempts to explain the lower rate of heart disease in high status jobs revolved around the theory that hostility may be the major component of type A behavior and the link to heart disease. In support of this belief, Marmot et al. (1991) found that subjects in higher status jobs had lower scores on the Cook-Medley hostility scale. Another possible reason for the lower rate of heart disease in higher status jobs could be education. Lower levels of education (which often occupy lower status jobs) are correlated with higher levels of risk factors associated with major diseases. Less educated men and women tend to smoke more, have higher total cholesterol and blood pressure levels, are more likely to be obese, and are less physically active than higher educated men and women. The profound effects of education level on risk may also stem from the likelihood of higher educated men and women to use health services, report symptoms, change behaviors, and seek treatments (Marmot et al., 1991). Brill, Kohl, Rodgers, Collingwood, Sterling, and Blair (1991) devised a health promotion program to be utilized by an entire school district (teachers, administrators, and support staff). The purpose was to determine the relationship of sociodemographic characteristics in individuals with access to a worksite health promotion program. The health program included a 30-minute health education class (once a week) and exercise classes held Monday through Friday.

Results showed that while recruitment rates by gender were not significantly different, lower recruitment rates were seen for Blacks and for employees 35 years or younger. In addition, significant differences were seen according to amount of education (nondegree, bachelor degree, advanced degree). Those individuals with the most education had the higher recruitment rates.
In another study, the percentage of adults who exercise regularly were also likely to be Caucasian and from the middle to upper socioeconomic strata (Blair, Piserchia, Wilbur, & Crowder, 1986). Nonparticipation in a worksite medical surveillance program offered by Dow Chemical was highest among Hispanics and African Americans, those under 25, and salary nonexempt employees (Bond, Lipps, Stafford, & Cook, 1991). These findings supported those of Marmot et al. (1991).

When assessing the potential success of a worksite health promotion program, sociodemographic characteristics seem to be an important consideration. Perhaps the most basic information required to describe a target population is the standard demographic data of gender, age, education, and ethnicity (Brill et al., 1991).

The Impact of a Corporate Fitness Program

Corporations exist (in the U.S. and other industrial societies) to generate capital and provide a product to the public. The science of economics manages expenditures gained from business, while both maximizing profits and minimizing the costs of production. Consequently, when corporations began to suspect a substantial financial return from investment in a health promotion program, many businesses installed some type of on site health and fitness program.

Among 618 employers surveyed by Hewitt Associates, a Lincolnshire, Illinois based benefits consulting firm, 76% attempted to manage employee health through some type of sponsored activity. Promoters of health and wellness programs within the corporate sector claim that healthy employees will be absent less frequently, will be less likely to injure themselves on the job, will file fewer and less costly insurance claims, and will be more effective and productive on the job. Robert Kaman, president of the Association for Fitness in Business, agreed, saying the economic benefits that should
result from an effective wellness program include reduced health care and disability cost, reduced absenteeism and turnover, and increased productivity (Mason, 1992).

Mason (1992) explained that although many companies remain skeptical about the professed cost savings and increased productivity resulting from health promotion or wellness programs, its promoters saw the problem as obvious. Along with common sense, research also illustrated that corporations can expect less illness and absenteeism, reduced accidents, lower health care costs and premiums, and a reduction in job turnover (Baun et al., 1986; Shephard, 1989).

Any skepticism stems from the difficulties encountered when interpreting collected data in this area. Bly et al. (1986) stated that the integral problem in assessing medical cost benefits revolved around the question of what is reasonable to expect in a given time period. Regardless of claims that healthier life-styles can yield more immediate economic benefits, decreases in medical cost often require a substantial time period. Bly et al. (1986) suggested that evaluation be continued for an extended testing period to capture long term effects.

As indicated earlier, the primary goal of all wellness programs should be prevention. Attention to the importance of good health in the workplace has been spurred by the growing recognition of the adverse impact of preventable or controllable risk factors. This information is usually represented in disability costs and poor employee productivity (Fielding, 1991). According to Fielding (1991), there are four essential functions provided by the corporate occupational physician with respect to prevention activities: 1) assure that employees, retirees, and their dependents receive appropriate preventive services under the employer-sponsored health benefit plan; 2) incorporate appropriate preventive services into services provided by, or through the corporation; 3) incorporate preventive concepts into corporate sponsored nonmedical programs that are designed to improve and maintain
health; and 4) use results of the health surveillance of the employed population to formulate and evaluate the effectiveness of preventive strategies.

However, while many health economists feel fitness programs are a cost saving element in a company’s employee package, it remains clear that these areas are the first cut in hard economic times. Kaman (1987) cited two reasons for this vulnerability. First, employee fitness programs do not directly contribute to profitability, rather they are an element of cost. Secondly, health promotion directors sometimes fail to provide scientific data to support the claims that corporate fitness provides a true reduction in health care costs.

**Benefits of a Corporate Fitness Program**

The areas most investigated to determine the impact of fitness and health education programs include, absenteeism, job turnover, corporate image/recruitment, participation rates, and medical costs.

**Absenteeism**

Results obtained from Baun et al. (1986) indicated a trend for exercisers to have fewer sick hours than nonexercisers. Using a sample of 517 workers, a comparison was made of the hours absent from the job, before and after the initiation of a fitness facility at the Tenneco Corporation plant located in Houston, Texas. Baun et al. (1986) found approximately a 1 day difference in male exercisers (36 hours) and nonexercisers (45 hours), but a more significant difference between female exercisers and nonexercisers. Rates for females absenteeism equated to a 3 day deviation between groups (47 hours for exercisers vs. 69 hours for nonexercisers).

The Coors Wellness Program (based in Golden, Colorado) reported that salaried employees recorded 2.25 sick leave absences per year, while hourly workers exhibited 4.1 leaves. Estimates by Terborg (1988) indicated an employee with elevated health risk will
have 63% more absences due to illness or injury than the average employee who is not a risk. Costs associated with sick leaves were calculated by dividing the average annual wage (salary plus benefits) by the constant 245 (the constant represents the number of scheduled work days in a year). Through this simple equation, the daily dollar value for salary plus benefits is obtained and used to determine the cost of absenteeism. Research at Coors predicts the wellness program to reduce the sick leave absences by 10 to 19%, and that full beneficial effects will occur over a 2 year period (Terborg, 1988).

Researchers for the Du Pont Company, Wilmington, Delaware, found employees at health promotion sites (offering smoking cessation, fitness, weight control, lipid control, stress management, and healthy back) showed a drop in disability days of 14.0% by the end of a 2 year study, while nonprogram sites only dropped 5.8% over the same test period (Bertera, 1990). The difference represented 0.4 disability days per hourly employee, resulting in a savings of 11,726 fewer disability days at program sites compared to nonprogram sites. This saving equated to 49 person years of effort that could have been spent to produce goods and services. Bertera (1990) stated that his results indicated that workplace health promotion programs can return $1.45 in lower hospital costs and another $1.42 in lower disability wage cost for every dollar invested in health promotion.

Another study examined the effect of membership in a worksite fitness center (The Traveler’s Taking Care Center, in Hartford, Connecticut) and employee absenteeism (Lynch, Golazewski, Clearie, Snow, & Vickery, 1990). Members and nonmembers experienced different trends in absenteeism during a testing period of 3 years. By the end of the testing period, Taking Care Center members experienced 1.2 fewer days absent (due to illness) than nonmembers. In addition, there was a reliable negative correlation between rate of participation at the Taking Care Center and the number of absences from
Lynch et al., (1990) stated that regardless of age, sex, or previous absence history, members of the fitness center took fewer sick day absences at the end of the 3 year test period, while nonmembers reported the same number of absences.

**Job Turnover**

The economic importance of turnover can be very substantial, and may be one of the major benefits of a worksite fitness program. The extent of turnover cost depends upon the availability of labor and the costs associated with training new employees (Shephard, 1986). While the technology and complexity required in the workplace increases, human capital tends to replace dollar capital as a strategic resource. In this system, certain employees are entrusted with a great deal of responsibility. Consequently, they often demand higher pay and incentives, while at the same time, becoming harder to replace. In a survey of U.S. corporations, many of the senior managers are valued at $500,000 and more (Shephard, 1989).

The turnover rates for the Toronto Life Insurance Company showed substantial improvements in a 6 month study. The study included a sample of 1,281 workers to examine the effects of high and low adherents to an employee health promotion program. Analysis revealed that job turnover was 1.5% for individuals who were high adherents to the fitness center, while individuals who were low adherents exhibited a 15% turnover rate. Estimates indicated that the total cost of the program was $192,000 and that savings gained from a reduction in both absenteeism and job turnover amounted to $660,000 (Hoeger, 1987).

While there are advantages to a low job turnover rate, Tsai, Baun, and Bernacki (1987) reported that it may be a handicap. In essence, the probability of a greater percentage of unproductive and unhappy employees is likely if turnover is extremely low.
Corporate Image and Recruitment

Some corporations, especially those selling life insurance, have considered wellness programs as a means of developing a health and fitness related image (Shephard, 1989). Many authorities argue that the type of person recruited into a company with a substantial investment in fitness and health promotion is a high achiever, with outstanding productivity and little tendency to absenteeism from illness or other causes (Baun et al., 1986).

Often recruiters will bring potential employees on a tour of the corporation's fitness and wellness center. This sends the message to potential workers that management cares about their health, and is providing them with the tools and facilities to make positive behavioral choices. However, the value of a health and fitness programs in developing corporate image is highly theoretical. Furthermore, the installment of other unrelated incentives, such as offering higher salaries or providing day-care facilities may be equally effective in attracting first rate workers (Shephard, 1989).

Participation Rates

A substantial problem limiting the effectiveness of most exercise programs is the disproportional number of healthy people joining. Within this scenario minimal beneficial health responses are reported, since many of the individuals are relatively healthy to begin with. Shephard (1989) feared that observed benefits may understate the case for wider participation.

An interesting study examined participation of entire industrial complexes in a health promotion program. Holzbach et al. (1990) studied the effects of the Live for Life (LFL) health promotion program established at Johnson and Johnson worksites, to a similar Johnson and Johnson worksite without LFL facilities or classes. At the time of this study the LFL program was comprised of highly structured stress management, weight
control, and smoking cessation classes. While not everyone within a worksite location used the program, the entire plant showed benefits over a 2 year period. Findings revealed that both participants and nonparticipants benefitted from an established LFL program. These worksites had significantly more positive attitude change scores (compared with baseline) than worksites offered only a health screening once a year. Holzbach et al. (1990) suggested that such sustained effects over a broad range of attitude measures reflected dramatic changes in the organizational environment. Thus, the changes may have affected the underlying values within the LFL companies and ultimately their cultures. Although the LFL program may be a catalyst for change, it cannot be viewed as the only reason for improvements. Holzbach et al. (1990) found that one site offering the LFL program did not exhibit an improvement in employee attitudes over the 2 year period. This suggests the equally important effect of business conditions and management’s support on the success of change.

Lastly, financial incentives are sometimes applied to increase participation. Mesa Petroleum claimed a participation rate of 63% when cash incentives for exercise were offered (Gettman, 1986). Another tactic was used by Campbell’s Soup. Employees were offered a progressive reduction in participant fees after 2 years of good attendance (reports from the company indicated a participation rate of 40% qualified as good). This percentage was derived from participants involved in the program more than twice per week (Collis, 1988).

Medical Costs and Health Related Improvements

The costs involved with employee health benefits are quite compelling. In 1989, the cost of health care benefits accounted for 5.6% of wages, surpassing the cost of retirement (4.7%). Employee concern for health coverage was conveyed in a 1990 survey conducted by Gallop and the Employee Benefits Research Institute. Close to 61% of
employees rated their health benefits as the single most important one (pensions were rated first by 17% of the employees, while disability programs drew 5%). To understand the magnitude of health insurance policies, one only has to be present at negotiations between management and labor. In recent years a series of bitter labor strikes saw efforts on the part of management to alter health benefits (McGarvey, 1992).

In general, research conducted in the area of corporate fitness programs suggested that involvement is associated with substantial reduction in medical costs. Studies of the relationship between medical claims costs and health related behaviors have become the focus of major occupational studies. While many of these studies concluded that health risk reduction does indeed lower medical care costs, the validity of these conclusions has been questioned by some. Researchers claimed that health behavior and the health care cost information were often estimated based on theoretical relationships and inconsistent data (Bly et al., 1986; Golazewski et al., 1989; Oster & Epstein, 1986).

Yen et al. (1991) sought to provide strong statistical evidence of a relationship between employee health-related measures and prospective medical claims cost. After stratifying the subject's according to level of risk, and examining each of the 18 health-related measures as well as the total number of high risk classifications, Yen et al. (1991) found that regardless of age and sex, employees with positive health behaviors cost less in terms of medical claims. Moreover, these authors reported that employee's perceptions about their health, stress, job, and life were highly associated with medical expenditures in future years. Thus, a worksite health promotion program may provide a double benefit to the businesses. It may help employees feel better about themselves and simultaneously facilitate savings in health care cost in future years.
In cooperation with Tenneco Inc., Baun et al. (1986) noted that exercisers submitted a larger number of claims for medical care, when compared to nonexercisers. Among the men in the study, 41.2% of the exercisers presented claims, while 39% of the nonexercisers did so. Women exercisers recorded 25.5%, with nonexercisers at 22.8%. However, total medical costs in the exercisers group were lower, along with a significant advantage in nonhospital medical costs ($427 vs. $752/year). Exercise status significantly \((p < .05)\) influenced the average cost of reimbursement, when nonhospital costs were separated from total health costs. The average nonhospital cost for a nonexerciser was $596, whereas the average cost of an exerciser was $399. This trend was seen across all age and gender categories, with the exceptions of males less than 35 years of age and males 55 years and older.

The principal goals of Johnson and Johnson's LFL program are to provide the necessary facilities for their employees "to become the healthiest in the world" and to control the illness and accident costs of the corporation (Wilibur, 1983, p. 673). The program involves highly standardized components including a basic health screening, a life-style seminar (that introduces employees to their health promotion program), and several life-style improvement courses (i.e., smoking cessation, weight control, stress management, nutrition education, fitness, and blood pressure intervention). These programs are offered to employees without charge, and usually conducted on site (Bly et al., 1986).

As of 1986, 50 Johnson and Johnson companies offered LFL programs. At the time, each plant offering LFL activities was aided by a corporate staff member, who provided consultation and assistance. Member companies were responsible for developing local leadership and for the selection, promotion, recruitment, and scheduling of employees in the life-style improvement classes. This resulted in one program being
considerably different from another. According to Bly et al., (1986), existing variation did not diminish the basic strategy of the program, which was to offer a combination of lifestyle improvement programs that attracts high participation and help to refine the social environment of the workplace.

From a review of literature, Bly et al., (1986) theorized that self-selection is a significant problem in interpreting data comparing medical cost. They answered this problem by calculating the medical costs for entire factories, and varying their data for differences of initial medical expenses at predetermined worksites. Working with Johnson and Johnson and their LFL program, Bly et al. (1986) examined three subgroups of Johnson and Johnson companies. The subjects in each group were obtained from three different locations. Group 1 (n = 5,192) included sites with exercise programs that were operational for more than 30 months, group 2 (n = 3,259) included programs sites that were operational for 18 to 30 months, and group 3 (n = 2,955) sites had no programs.

Analyses of medical claims found that LFL participants experienced lesser rates of increase in medical costs and utilization when compared to nonLFL groups. Costs, expressed in 1979 dollars, doubled over a 5 year period for members of the program, while nonusers increased four fold over the same time period. Furthermore, the groups that participated in the LFL program (group 1 and group 2) were discovered to require less inpatient services, amounting to annual cost increases of only $43 and $42, respectively. Meanwhile, the nonparticipant groups increased $76 (Bly et al., 1986) (values based on trend lines for hospital costs in 1979 constant dollars).

Another study involving the Johnson and Johnson's health promotion program was conducted to evaluate the sustained effect of a public health intervention model over a two year period (Blair et al., 1986). Employees at four companies (n = 2,600) were offered a health promotion program, while employees at three comparison companies (n = 1,700)
were given only an annual health screening. At the time of baseline examination, 992 participants reported that they did not regularly perform vigorous exercise. After 2 years, almost 20% of the women and 30% of the men involved in the health promotion program began regular vigorous activity, compared to 7 and 19% in the groups only offered an annual health screen. Results also showed a dramatic increase in VO$_2$ max for the health promotion group. Compared to their baseline examination, VO$_2$ max increased 8.4% after one year, and climbed to 10.5% after two years. During the same time period, the health screen subjects increased 1.5% after the first year, and reached 4.7% in the second.

Statistics revealed that total daily energy expenditure in vigorous activity increased 100% among employees at the health promotion program companies, while only 33% among employees exposed to the health screening (Blair et al., 1986). The most favorable result of this study demonstrated that a company wide exercise program can significantly increase the number of employees who exercise regularly.

Johnson and Johnson was one of the first corporations to make comprehensive examination of the cost and benefits of a wellness program. This company has tracked medical costs and productivity and found that during the first year, the wellness program cost more than it saved, in the second year, the company broke even, by the third year it saved enough money to pay back the losses during the first year.

Due to the tremendous success of the LFL program, Johnson and Johnson began marketing it to other companies in 1986. As of 1990 Johnson and Johnson Health Management Inc. provided varying levels of services to about 60 companies with a total of more than 850,000 employees (Templín, 1990).

**Interviews With Directors of Corporate Fitness Programs**

Mason (1992) interviewed several individuals involved in corporate health promotion to establish and organize their feelings and expectations of an employee fitness
program. Peter H. Soderberg, president of Johnson and Johnson Health Management Inc. (JJHMI), said the first observation in a comprehensive wellness program is a change in morale and attitude. The shift in employee characteristics and habits stemmed from the change in culture, which tilted the paradigm toward one of better employee health. The next observation was a building of participation. "Participation is the key process indicator," states Soderberg, "if you are not involving 50 to 75% of the site population in activities of some form, you really are not likely to see economic benefits" (p. 34). Along this same line, Edward J. Bemacki, vice president of Tenneco Inc., emphasized that while he believed that wellness programs saved money over the long run, such reasons should not be the primary reason for starting one. "I think that it kind of cheapens a program," says Bemacki, "to say we're doing it because there's a gain for the company" (Templin, 1990).

Soderberg recommended that small companies or companies currently establishing a wellness program start with a health risk assessment of the employee population. This accomplishes two important objectives. First, a health assessment can be a powerful catalyst for employees to reassess their life-styles, and secondly, it allows management to obtain baseline information for future evaluation of the program.

The next step to establishing an exercise program may be to sponsor a low cost activity, such as a walking program at lunch or an exercise competition on the weekend. Afterwards a company can work towards a subsidy in community fitness centers. In addition, annual health fairs and health education information are important in starting a more advanced wellness programs. Curtis S. Wilbur, an executive of Johnson and Johnson and contributor to the studies of the LFL program, suggested that a means of changing the health of an entire population is to get the population to make small changes in a lot of areas (Templin, 1990).
Finally, Soderberg advised adding some type of incentive component to encourage participation. At Johnson and Johnson, employees earn dollars by taking part in certain activities. These dollars can be used to purchase fitness and health related products from a catalog. Other companies, including Sony Corporation of America, offer flex credit (dollars that can be applied toward benefits programs) to those employees who submit to certain preventive screenings, such as pap smears, mammograms, and blood screenings.

Mason (1992) also interviewed Cindy Chambers, director of the Travelers Corporation's Taking Care Program, Hartford, Connecticut. Chambers stated that communication is the key in getting a wellness program started. She cited that establishing a communication base allowed for raising awareness and educating employees when the program was in its infancy. The travelers Corporation also includes family members in their program, because according to Chambers, 60 to 70% of health care claims come from the employees' dependents.

At Texas Instruments (TI) headquarters in Dallas, Texas, the philosophy behind its wellness program is that the responsibility for good health lies primarily with the individual. The company, in turn, will do all it can to support employees in their endeavors. Texas Instruments' program has incentives for employees to take more personal responsibility in their health care practices. Jenny Brock, director of corporate health promotion, said that the goal of reducing the need for medical services may be accomplished by achieving a level of excellence in an individual's personal health. For example, smokers employed by TI must pay $10 a month for their health care plans, while nonsmokers pay nothing. Brock, along with management, felt that since clear evidence links smokers with higher health care costs, smoking employees should bear some of these costs. However, when the smoker premium was implemented, a number of smoking cessation classes were offered.
The first employees to join the fitness program were healthier to begin with, so costs were not altered as much. Even so, after a 12 month period declines became evident. Among the population of nonparticipants, Brock noted a steady increase in cost, reflective of the inflationary rate of health care. The problem is not with the program itself, but TI continues to look for ways to attract people to participate in programs. Currently, TI offers some premium based incentives, but it is moving towards incentive based programs built into health plan benefits, such as the flex credit offered by Sony Corporation of America. Brock felt this plan is attractive to employees because, "it puts them in the driver's seat and gives them control over their own costs" (Mason, 1992, p.37).

**Summary**

The competitive nature of today's economy requires the most productive and cost effective means of boosting profits. Spurred by the positive findings in exercise and lifestyle maintenance, many corporations are implementing health and fitness centers for their workers (Baun et al., 1986; Bernacki, 1987; Collis, 1988; Kaman, 1987; Shephard, 1986). Their hope is for decreased illness and reduced absenteeism, along with increased productivity and lower health care premiums.

Excluding the elderly, most private insurance coverage is provided through employment related group policies. Premiums paid by individuals or nongroup policy holders amount to about 10% of the total payments, while the corporate sector contributes approximately 67% (Chollet, 1984; Rosko & Broyles, 1988). Due to the large sums of money spent on health care, corporations are seeking new ways to reduce and/or control spending in this area (Ettorre, 1992; Patton et al., 1986).

Data from the past several years indicate a disproportionate rise in medical and direct salary payments, making medical payments a larger percentage of total compensation (Harris & Custer, 1991). Financial arrangements in the present system
contribute to increasing premium payments by allowing the provision of services with little regard for cost (Briggs, 1991; Relman, 1991).

In 1990, nearly $708 billion (or 12.4% GDP) was used for health care (Ettorre, 1992; Jencks & Schieber, 1992; Levit et al., 1991; McGarvey, 1992). Ironically, Americans report the lowest level of satisfaction in the current health care system, despite spending more than any other country (Briggs, 1991).

Administration of occupational health struggles in today's market to blend social and economic goals (McDonagh, 1984). Employer sponsored health insurance has a history that reaches back to the World War II era. Since this time, private health care insurance has become a fringe benefit and a responsibility of business (Levit & Cowan, 1991). When purchasing health care for its employees, the objective of the employer involves receiving the highest quality care, while not spending a vast sum of money (Fielding, 1991; Wood, 1991). Difficulties evaluating the quality of care causes problems, but may improve with the ability to gather and interpret medical data (Wood, 1991).

Jencks and Schieber (1992) provided an explanation of the dramatic increase in health care. Relman (1991) expressed concern for the direction of what he termed "the new industrial complex." In doing so, he discussed recent changes in the voluntary hospital. The voluntary hospitals of today are having a hard time surviving, when free services must be provided to the public and nonpaying patients.

Research in the areas of fitness program implementation suggests that medical costs decrease as a result of participation (when observed over a substantial period of time) (Baun et al., 1986; Bly et al., 1986; Shephard, 1989). Using a computer model, the Coors Company sees potential return of $1.24 to $8.33 for every dollar invested (Terborg, 1988).
More and more, prevention is viewed as a means of combating rising health care costs (Fardy et al., 1988). Recognizing the vast number of health problems associated with heart disease, and the amount of money spent on treatment, corporations hope to reduce medical expenses by altering employee life-styles (AHA, 1991; Baun & Williams, 1985; Public Health Service, 1992).

When examining health care cost, special care must be given to evaluate obtained information. Recent literature indicates that most medical expenses paid by a business are generated by a smaller percentage of the employee population (Lynch et al., 1992). This is largely explained by the findings of Zook and Moore (1980) and Yen et al. (1991). These studies point out that high cost individuals are most likely to have harmful health habits. Besides the problem of high cost individual cases, the validity of such studies is often questioned. These claims are based on largely theoretical relationships, inconsistent data, and questionable statistics (Bly et al., 1986; Golazewski et al., 1989; Oster & Epstein, 1986).

Economists employ several techniques to evaluate the effectiveness of an exercise and health program (Bernstein, 1986). These include cost-containment, cost-effectiveness, and cost-benefit analysis. Cost-effectiveness appears to be the mechanism of analysis when observing a health program (Barry & DeFriese, 1990; Shephard, 1986; Shephard, 1989), while cost-benefit analysis attempts to attach a dollar value to all costs and benefits resulting from exercise (Patton et al., 1986; Shephard, 1989). Fardy (1987) argues that benefits from fitness programs are obvious; only the extent and the proper implementation are of question, while others are not convinced (Bernacki, 1987; McDonagh, 1984).

Thousands of corporations across the U.S. now offer health promotion programs to their employees due to both economic and personal reasons (Baun & Williams, 1985;
McGarvey, 1992). However, with all the support given to the importance of these types of programs, health promotion areas are the first cut in hard economic times (Kaman, 1987).

Many studies have contributed to the proposed link between habitual physical activity and the prevention of various cardiovascular disorders (Haskell et al., 1992; Park, 1992). A sedentary life-style is likely to lead to a variety of health problems (McGinnis, 1992; Public Health Service, 1990). One area physical activity is said to have a positive health effect on is the reduction of blood pressure. Life-style and blood pressure seem to have an inverse relationship (Montoye et al., 1972; Stamler et al., 1989).

A hallmark study investigating the factors associated with participation in exercise found significant differences between clerical officers and administrators (Marmot et al., 1991). This study examined the degree and causes of the gradient in morbidity, the additional factors related to the gradient of mortality, and included women. Among their findings was a higher percentage of exercisers in the higher status jobs. Marmot et al. (1991) also supported the relationship of hostility to an increase risk of heart disease (Friedman & Roseman, 1974). The results of Marmot et al. (1991) agree with similar studies in this area (Blair et al., 1986; Bond et al., 1991; Brill et al., 1991).

Increased research in recent years has examined the effects of a corporate wellness program (Bly et al., 1986; Fielding, 1991; Kaman, 1987). Among the characteristics examined are absenteeism, turnover rates, corporate image, participation, and medical costs. Absenteeism is a major concern to many corporations. Several studies suggested that health and fitness programs increased the employees' desire to come to work, while reducing the number of sick days (Baun et al., 1986; Bertera, 1990; Lynch et al., 1990; Terborg, 1988). The economic importance of job turnover is also substantial to corporations. Turnover rates were significantly lower in adherents to an employee health promotion program at the Toronto Life Insurance Company (Hoeger,
1987), though Tsai et al., (1987) state that if turnover is too low, the chance of unhappy and unproductive workers is likely. Perhaps closely associated with turnover rates is corporate image. The value of a health and fitness program in developing corporate image is highly theoretical and difficult to quantify (Baun et al., 1986; Shephard, 1989).

Shephard (1989) suggests that health response, as a result of participation, may underestimate the case for wider participation. Holzbach et al., (1990) examined participation of a company on employee attitude. Findings revealed an overall increase in employee attitude, regardless of participation. This suggests the importance of management involvement and the workplace environment on success. A variety of tactics may be used to attempt improvement in participation rates (Collis, 1988; Gettman, 1986). Perhaps the most interesting aspect of a worksite fitness center is the effect on medical costs. Several investigations reported lower health care cost in exercisers when compared to nonexercisers (Baun et al., 1986; Blair et al., 1986; Bly et al., 1986; Wilbur, 1983).

Finally, Mason (1992) and Templin (1990) conducted several interviews with directors of corporate sponsored health promotion programs. Directors spoke of their companies philosophy of health and benefits measured in their employees. Many stress the importance of high participation rates to the success of a corporate sponsored wellness program, and ways to motivate workers into joining. In addition, the directors commented on the positive effects they have noticed since establishing their programs.
CHAPTER III

METHODS AND PROCEDURES

Introduction

Apple Computer is headquartered in Cupertino, California, and employs approximately 14,000 workers worldwide. This corporation holds a strong commitment to fitness, and offers five separate facilities to its employees in the U.S. (3 in California, 1 in Colorado, and 1 in Texas).

Total health care costs and participation in a corporate fitness center were examined in this study with Apple Computer. Subjects were compared within gender and age groups to locate differences between users and nonusers.

This chapter will describe the methods used in: 1) selection of the subjects; 2) development of the data base; 3) data collection; 4) analysis of the data base; and 5) statistical treatment of the collected data.

Subject Selection

The sample in this study was selected from the population of workers employed in the bay area of California, during the 11 month period of data collection (February 1991 to December 1991). The subject selection contained 3,974 employees of Apple Computer, all with access to the three fitness facilities offered to workers in the bay area.

Apple Computer's employment in the bay area presented a unique situation, since a significant number of workers are considered "pretransitional" (employment may be for only a few months, before a transfer to a different job location). For this reason, subjects were required to be employed continuously throughout the testing period. This requirement was used for two reasons: 1) the longer the time period, the better the
chances of a consistent medical utilization pattern for each individual, and 2) the likelihood of a persistent effect of baseline health behaviors on medical claim costs over a prolonged testing period.

**Development of the Data Base**

All information regarding each subject was entered into a data base. Development of the data base required information from preexisting data, held by both the insurance carrier of Apple Computer (Aetna), and from the Apple Health and Fitness Program. For example, information regarding health care costs and the number of medical claims was obtained from Aetna, while frequency of use was determined by the "check in" system utilized by the Apple Health and Fitness Program.

Four usage categories were used in this study, which included the headings: "no use", "low use", "moderate use", and "high use". Definitions for the usage groups were based on the total number of sessions completed during the 11 month study. These definitions equated to per week averages based on a 4 week month. For example, high use entailed averaging 2 or more exercise sessions per week.

Subjects were also placed in categories according to age and gender. Age groups were 30 years old and younger, 31 to 40 years old, and 41 years and older. No adjustment for age was made at the end of testing.

In all, the labels used in the data base included the employee identification number, the gender of the subject, the age of the subject, the total number of medical claims for each subject, the total number of fitness sessions for each subject, and the amount of medical care (expressed in dollars) for each subject.

**Data Collection**

The data base containing the health care cost information on the employees was compiled by Apple Computer and entered onto a 3 1/2 inch computer disk. This disk was
sent to the researcher at the La Crosse Exercise and Health Program at the University of Wisconsin-La Crosse. Once in La Crosse, the disk was taken to the Academic Computing Center of the University of Wisconsin-La Crosse, where file conversion allowed the information to be used on the university's computer system. The Biomedical Data Preparation (BMDP) program was used for statistical manipulation of the information, and proper interpretation of the results.

**Analyzing the Data Base**

The health care costs examined were all reimbursements paid to Aetna for each subject, excluding out-of-pocket expenses, deductibles, employee's pregnancy costs, and claims by spouses and dependents, copayments and other medical expenses, as well as administrative fees charged by the insurer. In addition, to account for employees who might be covered under another family member's insurance plan, workers who did not report "single" marital status and had no family and individual medical claims during the testing period were excluded from the study. Thus, all subjects in the study were covered by the companies traditional medical insurance plan and unlikely to have other medical coverage during the testing period. Ultimately, all health care claims represented medical treatments to the employee of Apple Computer, and not family members that might be included on the insurance policy. Establishment of these criteria were accomplished by consulting with administrative personnel at Apple Computer, researchers in the field, and faculty from the University of Wisconsin-La Crosse.

Finally, since all information regarding health care expenses and number of claims made by subjects was gained from Aetna, and a computerized check-in system was used to monitor the use of the Apple Health and Fitness Center, no direct interaction of subjects and the data collector was ever necessary.
Statistical Treatment

Demographic information describing gender and age (including mean and standard deviation), along with the number of subjects in each age category and the number of subjects in each usage category were presented on various tables. In addition to basic demographic information, the number of claims, fitness sessions, and amount spent on health care was determined for each gender and the corresponding age and usage subgroups.

Summary tables, including calculations of skewness and kurtosis, were used to indicate the normality of the sample. Since the distribution of the sample was not normal, nonparametric chi-square statistical tests were used. After the proper statistical tests were performed, the significance in health care spending was assessed, dependent on usage patterns in corresponding age group and gender subgroups. All these assessments were based on a significance level of .05.
CHAPTER IV
RESULTS

Introduction

In recent years, research has examined the effects of worksite fitness and corporate sponsored exercise centers on a variety of employee characteristics. Perhaps the most compelling work examines the effects of physical activity on the reduction of dollars spent on health care. This is due to the link of regular activity with prevention of coronary heart disease, as well as a viable means of treating individuals with anxiety or depression (Haskell et al., 1992).

The purpose of this study was to determine the effects of participation in the Apple Health and Fitness Program on the amount spent on medical payments (according to age and gender). This chapter will discuss the results of the study, and specifically, the following: 1) demographic characteristics of the sample; 2) results; and 3) discussion of the results.

Sample Characteristics

Information on gender, age, number of claims, frequency of fitness center use, and health care data was obtained for each subject. While the greatest concern was medical cost and frequency of use data, the remainder of variables were also compiled and reported.

Demographics of the Sample

All subjects in the study were employed by Apple Computer and resided in the bay area of California. Of the 3,974 subjects examined, 2,088 (52.5%) were male and 1,886 (47.5%) were female. The mean age for males was 34.5 years with a range of 48 years
(21-69), and a standard deviation of 7.6. The mean age for females was 34.7 years with a range of 49 years (21-70), and a standard deviation of 7.6 (see Table 1).

Table 1. Summary of age demographics

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency</th>
<th>Mean age (years)</th>
<th>Standard deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2,088</td>
<td>34.5</td>
<td>7.6</td>
<td>21 - 69</td>
</tr>
<tr>
<td>Female</td>
<td>1,886</td>
<td>34.7</td>
<td>7.6</td>
<td>21 - 70</td>
</tr>
<tr>
<td>Total subjects</td>
<td>3,974</td>
<td>34.6</td>
<td>7.6</td>
<td>21 - 70</td>
</tr>
</tbody>
</table>

The mean for the number of claims in the 11 month testing period for the 2,088 males was 5.9, while the mean for 1,886 females was 9.7. The mean for the amount spent on health care in the 11 month period for males was $1,053.8 (standard deviation of $3,755.5). Health care spending for females was higher, with a mean of $1,420.0 (standard deviation of $4,168.1). Finally, the mean number of exercise sessions for males was 8.5 (standard deviation of 23.0), while the mean number of exercise sessions for females was 7.4 (standard deviation of 20.8). When considering all subjects, the mean number of claims was 7.7 (standard deviation of 8.7), the mean value spent on health care was $1,227.6 (standard deviation of $3,935.9), and the mean number of exercise sessions over the 11 month period was 7.9 (standard deviation of 22.0) (see Table 2).
Table 2. Demographic characteristics of subjects

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of claims</th>
<th>Health Care (Dollars)</th>
<th>Exercise sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>5.9*</td>
<td>1,053.8</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>7.7**</td>
<td>3,705.5</td>
<td>23.0</td>
</tr>
<tr>
<td>Female</td>
<td>9.7</td>
<td>1,420.0</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>9.4</td>
<td>4,168.1</td>
<td>20.8</td>
</tr>
<tr>
<td>Total subjects</td>
<td>7.7</td>
<td>1,227.6</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>8.7</td>
<td>3,935.9</td>
<td>22.0</td>
</tr>
</tbody>
</table>

Note: * = Mean, ** = Standard Deviation

Health Care Statistics Among Age and Gender Subgroups

Within the 3 male age groups, calculations for the mean, median, standard error of the mean, and measures of normality (skewness and kurtosis) were determined for health care costs. The normality measures were obtained to indicate the distribution among employees. A positive skew value reflects data not symmetric about the mean, while a positive kurtosis indicates a sharp peak in the distribution. As seen in Table 3, both normality measures were positive, meaning the data were not normally distributed among male subjects of any group.

Table 3. Distribution of medical costs (in dollars) per male employee, according to age.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>Standard deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤30</td>
<td>723</td>
<td>843.5</td>
<td>195.3</td>
<td>2,669.4</td>
<td>15.6</td>
<td>319.0</td>
</tr>
<tr>
<td>31 - 40</td>
<td>965</td>
<td>1,028.8</td>
<td>258.7</td>
<td>2,087.6</td>
<td>18.6</td>
<td>456.5</td>
</tr>
<tr>
<td>≥41</td>
<td>400</td>
<td>1,403.9</td>
<td>320.9</td>
<td>3,035.2</td>
<td>6.5</td>
<td>51.3</td>
</tr>
</tbody>
</table>
Calculations of the mean, median, standard deviation, and measures of normality were determined in health care costs for females in the same manner as those reported for males (see Table 4). As in the males, the normality measures indicated a distribution that was not normal for females in 3 age categories.

Table 4. Distribution of medical costs (in dollars) per female employee, according to age.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>Standard deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤30</td>
<td>618</td>
<td>1,128.7</td>
<td>459.3</td>
<td>1,575.5</td>
<td>4.3</td>
<td>24.5</td>
</tr>
<tr>
<td>31-40</td>
<td>879</td>
<td>1,356.0</td>
<td>531.8</td>
<td>2,299.9</td>
<td>6.6</td>
<td>71.5</td>
</tr>
<tr>
<td>≥41</td>
<td>389</td>
<td>2,027.4</td>
<td>704.0</td>
<td>3,657.4</td>
<td>16.0</td>
<td>285.5</td>
</tr>
</tbody>
</table>

Table 5 depicts the distribution of medical cost for all male subjects in the subject (n = 2,088) and all the females in the study (n = 1,886), along with means, medians, standard deviations, and normality measures for the sample (N = 3,974). Once again the normality measures were positive, reflecting a nonnormal distribution.

Table 5. Distribution of medical costs (in dollars) per employee, according to age and sex.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency</th>
<th>Mean</th>
<th>Median</th>
<th>Standard deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>All subjects</td>
<td>3,974</td>
<td>1,227.6</td>
<td>363.5</td>
<td>2,554.0</td>
<td>19.6</td>
<td>586.0</td>
</tr>
</tbody>
</table>
Both male and female age groups were subdivided into 4 frequency of use categories (no use, low use, moderate use, and high use). Besides the mean and standard deviation for each subgroup, the percentage of subjects in a particular frequency of use category was indicated.

In both males and females the vast majority in each age group category were contained in the "no use" heading. The highest frequency groups contained the smallest percentage of the age category. This percent then gets larger as it approaches the no use category (see Tables 6 and 7).

Table 6. Distribution of medical costs (in dollars) per male employee, according to age and frequency of use.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of use</th>
<th>Number of employees</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Percentage of age group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Use</td>
<td>429</td>
<td>821.2</td>
<td>2,243.2</td>
<td>59.3%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>206</td>
<td>1,123.4</td>
<td>5,632.5</td>
<td>28.5%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>66</td>
<td>576.5</td>
<td>1,014.0</td>
<td>9.1%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>22</td>
<td>1,101.1</td>
<td>1,787.9</td>
<td>3.0%</td>
</tr>
<tr>
<td>&lt;=30</td>
<td>No Use</td>
<td>762</td>
<td>1,072.6</td>
<td>4,115.7</td>
<td>79.0%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>152</td>
<td>854.0</td>
<td>1,688.2</td>
<td>15.8%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>32</td>
<td>1,081.3</td>
<td>1,910.7</td>
<td>3.3%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>19</td>
<td>580.1</td>
<td>635.9</td>
<td>2.0%</td>
</tr>
<tr>
<td>31 - 40</td>
<td>No Use</td>
<td>762</td>
<td>1,072.6</td>
<td>4,115.7</td>
<td>79.0%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>152</td>
<td>854.0</td>
<td>1,688.2</td>
<td>15.8%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>32</td>
<td>1,081.3</td>
<td>1,910.7</td>
<td>3.3%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>19</td>
<td>580.1</td>
<td>635.9</td>
<td>2.0%</td>
</tr>
<tr>
<td>41&gt;</td>
<td>No Use</td>
<td>338</td>
<td>1,299.1</td>
<td>3,528.9</td>
<td>84.5%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>45</td>
<td>2,450.9</td>
<td>6,833.4</td>
<td>11.3%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>11</td>
<td>500.4</td>
<td>709.4</td>
<td>2.8%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>6</td>
<td>1,111.1</td>
<td>1,069.2</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Common to Tables 3, 4, and 5 were the large differences between the mean and median in all age groups and a substantial standard deviation. The median, in all cases, was several hundred dollars below the mean. Median, by definition, represents the middle value when all health care costs are ordered from least to most.
Table 7. Distribution of medical costs (in dollars) per female employee, according to age and frequency of use.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of use</th>
<th>Number of employees</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Percentage of age group</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤30</td>
<td>No Use</td>
<td>350</td>
<td>1,242.1</td>
<td>2,263.4</td>
<td>56.6%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>204</td>
<td>1,006.5</td>
<td>1,635.2</td>
<td>33.0%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>40</td>
<td>980.1</td>
<td>1,596.4</td>
<td>6.5%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>24</td>
<td>759.2</td>
<td>807.1</td>
<td>3.9%</td>
</tr>
<tr>
<td>31 - 40</td>
<td>No Use</td>
<td>695</td>
<td>1,264.9</td>
<td>2,327.9</td>
<td>79.1%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>143</td>
<td>1,872.0</td>
<td>4,110.2</td>
<td>16.3%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>27</td>
<td>1,062.9</td>
<td>1,174.8</td>
<td>3.1%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>14</td>
<td>1,174.8</td>
<td>1,586.8</td>
<td>1.6%</td>
</tr>
<tr>
<td>≥41</td>
<td>No Use</td>
<td>338</td>
<td>2,155.7</td>
<td>8,367.4</td>
<td>86.9%</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>45</td>
<td>1,213.7</td>
<td>2,066.0</td>
<td>11.6%</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>6</td>
<td>900.9</td>
<td>538.9</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

In other words, this value divides the set of ordered observations into 2 approximately equal parts (the median has a percentile rank in the vicinity of 50) (White, 1989).

By examination of the median it became apparent in all cases of gender and age group distribution that extreme values in health care cost greatly affected the mean. Likewise, the large standard deviations indicated a number of extreme values in health care costs.

The skewed data were transformed to categorical scales of high cost and low cost in relation to the mean. The mean of each age category was used as a cut-point to assign cost status. For example, if a subject’s health care cost was above the mean for his or her age group, the case was given "high cost" status and classified accordingly.

The skewed data also made a nonparametric statistical tool necessary. After all subjects were classified, chi-square tests were performed to examine relationships...
between the frequency of use and cost status inside each age group. Tables 8 and 9 show the results for male and female subjects divided into the 4 frequency of use subgroups.

Table 8. Comparison of health care cost among the usage categories for males.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of use</th>
<th>n</th>
<th>Mean</th>
<th>Cost Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High Cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(18.6%)</td>
</tr>
<tr>
<td>≤30</td>
<td>No Use</td>
<td>429</td>
<td>821.2</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>206</td>
<td>1,123.4</td>
<td>41 (19.9%)</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>66</td>
<td>576.5</td>
<td>13 (19.7%)</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>22</td>
<td>1,101.1</td>
<td>6 (27.3%)</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>723</td>
<td>893.5*</td>
<td>140 (19.4%)</td>
</tr>
<tr>
<td>31 - 40</td>
<td>No Use</td>
<td>762</td>
<td>1,072.6</td>
<td>160 (21.0%)</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>152</td>
<td>854.0</td>
<td>34 (22.4%)</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>32</td>
<td>1,081.3</td>
<td>8 (25.0%)</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>19</td>
<td>580.1</td>
<td>4 (21.1%)</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>965</td>
<td>1,028.8</td>
<td>206 (21.35)</td>
</tr>
<tr>
<td>≥41</td>
<td>No Use</td>
<td>338</td>
<td>1,299.1</td>
<td>60 (18.8%)</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>45</td>
<td>2,450.9</td>
<td>11 (24.4%)</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>11</td>
<td>500.4</td>
<td>1 (9.1%)</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>6</td>
<td>1,111.1</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>400</td>
<td>1,403.9</td>
<td>74 (18.5%)</td>
</tr>
</tbody>
</table>

Note. * = age group mean used as a cut-point to assign cost status.

Finally, the frequency of use variable was divided into only 2 headings, user or nonuser. The same age group means for health care were used as the cut-point between high and low costs for males and females (see Tables 10 and 11).

No significant (p > .05) differences were detected in male or female subjects, of any age group, when divided into the 4 usage categories (no use, low use, moderate use, and high use). This was calculated using a 2 X 4 chi-square contingency table with a critical value of 7.81 (3 degrees of freedom). However, when both gender classifications were divided into either user or nonuser subgroup, a 2 X 2 chi-square test with a critical
value of 3.84 (1 degree of freedom) found significant (p < .05) differences in 2 age categories for females (see Table 11).

Table 9. Comparison of health care cost among usage categories for females.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of use</th>
<th>n</th>
<th>Mean</th>
<th>Cost Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High Cost</td>
</tr>
<tr>
<td>≤30</td>
<td>No Use</td>
<td>350</td>
<td>1,242.1</td>
<td>98 (28.0%)</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>204</td>
<td>1,006.5</td>
<td>50 (24.5%)</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>40</td>
<td>980.1</td>
<td>11 (27.5%)</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>24</td>
<td>759.2</td>
<td>4 (16.7%)</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>618</td>
<td>1,128.7</td>
<td>*163 (26.4%)</td>
</tr>
<tr>
<td>31-40</td>
<td>No Use</td>
<td>695</td>
<td>1,264.9</td>
<td>164 (23.6%)</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>143</td>
<td>1,872.0</td>
<td>48 (33.6%)</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>27</td>
<td>1,062.9</td>
<td>8 (29.6%)</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>14</td>
<td>1,174.8</td>
<td>3 (21.4%)</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>879</td>
<td>1,356.8</td>
<td>*223 (25.4%)</td>
</tr>
<tr>
<td>≥41</td>
<td>No Use</td>
<td>338</td>
<td>2,155.7</td>
<td>75 (22.2%)</td>
</tr>
<tr>
<td></td>
<td>Low Use</td>
<td>45</td>
<td>1,213.7</td>
<td>5 (11.1%)</td>
</tr>
<tr>
<td></td>
<td>Mod. Use</td>
<td>6</td>
<td>901.0</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td></td>
<td>High Use</td>
<td>0</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>389</td>
<td>2,027.4*</td>
<td>80 (20.6%)</td>
</tr>
</tbody>
</table>

Note. * = age group mean used as a cut-point to assign cost status.

The first difference was seen in women 31 to 40 years of age. For nonusers, 23.6% incurred high medical costs when compared to the mean for female employees 31 to 40 years old. Meanwhile, 32.1% of the users in the same age group had medical costs above the mean. This indicates that the female users incurred significantly higher health care costs than the nonusers in this age group (on a percentage basis). The second significant difference was detected in females 41 years of age and older. In this age group the users recorded 9.8% high medical cost, while 22.2% of nonusers had high costs. In this case, the opposite of the younger female age group was true. Users had the significantly smaller percentage of high cost cases.
Table 10. Comparison of health care costs for male users vs. nonusers.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of use</th>
<th>Number of employees</th>
<th>Cost Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>High Cost</td>
</tr>
<tr>
<td>≤30</td>
<td>Nonusers</td>
<td>429</td>
<td>80 (18.6%)</td>
</tr>
<tr>
<td></td>
<td>Users</td>
<td>294</td>
<td>60 (20.4%)</td>
</tr>
<tr>
<td>31 - 40</td>
<td>Nonusers</td>
<td>762</td>
<td>160 (21.0%)</td>
</tr>
<tr>
<td></td>
<td>Users</td>
<td>203</td>
<td>46 (22.7%)</td>
</tr>
<tr>
<td>≥41</td>
<td>Nonusers</td>
<td>338</td>
<td>60 (17.8%)</td>
</tr>
<tr>
<td></td>
<td>Users</td>
<td>62</td>
<td>14 (22.6%)</td>
</tr>
</tbody>
</table>

Table 11. Comparison of health care costs for female users vs. nonusers.

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of use</th>
<th>Number of employees</th>
<th>Cost Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>High Cost</td>
</tr>
<tr>
<td>≤30</td>
<td>Nonusers</td>
<td>350</td>
<td>98 (28.0%)</td>
</tr>
<tr>
<td></td>
<td>Users</td>
<td>268</td>
<td>65 (24.3%)</td>
</tr>
<tr>
<td>31 - 40</td>
<td>Nonusers</td>
<td>695</td>
<td>164 (23.6%)</td>
</tr>
<tr>
<td></td>
<td>Users</td>
<td>184</td>
<td>59 (32.1%)</td>
</tr>
<tr>
<td>≥41</td>
<td>Nonusers</td>
<td>338</td>
<td>75 (22.2%)</td>
</tr>
<tr>
<td></td>
<td>Users</td>
<td>51</td>
<td>5 (9.8%)</td>
</tr>
</tbody>
</table>

Note. * Indicates statistical significance at .05 level.

Discussion of Results

Worksite health promotion studies can never "prove" that an intervention caused an effect, since validity is viewed as a matter of degree. Like all hypotheses, evidence is gathered to support or refute assertions of causal connection. When the information obtained does not support the hypothesis in question, examination of the methods and factors that make a study unique becomes necessary.
The original plan of this thesis project was to examine medical cost information over a 2 or 3 year period. As it turned out, only 11 months (44 weeks) were examined. One reason a longer testing period would be desired is that trends would have a better chance to establish. Bly et al. (1986) suggested that a corporate fitness program be continued over an extended period of time to capture long term effects and trends. For example, even if a sedentary person does not show higher than average medical costs over a period of months, it is likely that over a period of years this individual will encounter illnesses or injuries and establish a high cost health care trend. Likewise, an individual leading a healthy life-style may on occasion experience an unusual event that temporarily makes him or her a high cost case. Both these examples support the use of a substantially longer research period.

Lynch et al. (1992) states that a large sample size (such as the one in this study) allows for a number of high cost cases of $50,000 and over. Subjects with the highest cost raise the mean of the distribution disproportionately. Their study, which closely examined the high cost cases, found that the mean cost was actually greater than the cost of 80% of the employees. Likewise, Yen et al. (1991) reported that the upper 10% of employees in terms of medical costs accounted for 64% of total expenditures. Using this information, along with well documented age and sex differences in regards to medical cost trends, it was decided that health care costs should be examined inside groups according to age and gender (Conrad, Conrad, & Walcott-McQuigg, 1991). To account for this, 3 age groups for each gender were independently examined, using means and other information of exclusively the age group, rather than the entire sample.

Care was also taken to perform the appropriate statistical tests. Yen et al. (1991) caution that few studies use the proper statistical treatment when examining the effects of a worksite fitness program. This study found that the distribution of the health care cost
data did not follow a normal distribution. When the sample is not normally distributed, parametric statistics, such as T-tests, are not appropriate. The skewness and kurtosis measures reported in this investigation formally establish a nonnormal distribution. Therefore, the nonparametric chi-square tests were chosen to find significance.

In retrospect, there are several possible reasons why the null hypothesis (the hypothesis of no change) was supported in almost all cases. First, the subjects may not be exercising enough to significantly effect their health. The American College of Sports Medicine (ACSM) (1991) recommends 3 to 5 exercise sessions per week according to the needs, interest, and functional capacity of the individual. Typically, participants with capacities of more than 5 METs should exercise at least 3 times per week on alternate days. Odds favor that a sample size with an average age of 34.6 years would generally possess a MET capacity of over 5 METs. Therefore, it is likely that the subjects in this study were capable of exercising 3 times per week. In fact, the high use subgroup is defined as an individual using the Apple Fitness Program two or more sessions per week.

It is possible that the subjects exercised at other locations, but the finding may reflect a fairly sedentary population. Approximately 40% of Americans are completely sedentary, while another 40% are active at a level unlikely to reduce risk. This level is defined as exercising less than 2 times per week, engaging in seasonal activity or very low level activity. Finally, only 7 - 20% report exercise at a level approximating recommended levels for cardiovascular fitness (McGinnis, 1992).

Multiple cohort studies have shown a strong association between physical activity and reduced risk for several medical conditions as well as over all mortality. Evidence is strongest regarding coronary heart disease in men, and hypertension, obesity, and osteoporosis in postmenopausal women (Marmot et al., 1991; Paffenbarger et al., 1991).
The means for health care costs were comparable to those reported by Baun et al. (1986) and Terborg (1988), and consistent to the trends of Yen et al. (1991) and Bly et al. (1986). Males in the Apple Computer study had a mean health care cost of $1,053.8 ± $3,705.5, while mean female costs were $1,420.0 ± $4,168.1. The data had a wide range of variance as in the data reported by Yen et al. (1991) and Baun et al. (1986).

In the study by Baun et al. (1986), the mean medical cost for males was $1,003 ± $2,756 and mean cost for females was $1,535 ± $2,436. Using total dollar differences between exercisers and nonexercisers, Baun et al. (1986) found no significant difference. Small cell size and large variance were claimed to be the reason for finding none of the observed differences statistically significant. This study was composed of 116 males and 58 females categorized as "exercisers" or "nonexercisers" in 3 age groups. The study of the Apple Health and Fitness Program was comprised of 2,088 males and 1,886 females also grouped into 3 age groups, according to participation in a fitness program. Given the similarities in group means and standard deviations, the contention of the need for a larger cell size remains unsupported. In addition, Baun et al. (1986) used parametric statistics on a seemingly nonnormal sample.

Several different ways of observing changes in medical costs upon participation in a worksite fitness program were reviewed. These studies do not compare dollar value to dollar value, but trends in spending can.

Johnson and Johnson's Live for Life Program measured health care costs by examining changes in mean annual inpatient cost increases for groups offered a fitness program and groups without a fitness program. Mean annual cost increases were $42.5 for Live for Life groups, while non-Live for Life groups increased $76 over a 5 year period (Bly et al., 1986).
Finally, Yen et al. (1991) compared employee cost status in relation to age and gender subgroups. Medical claims cost data were used in comparisons, rather than total annual health care costs. These medical claims cost were distributed to low cost and high cost status groups as in the Apple Computer study. The main difference was that the cut-point assigned to categorize employees cost status was the total gender mean, rather than the age group mean. Since the age and gender differences in medical costs are well documented, it would seem more accurate to use the mean of the age group and corresponding gender category.
CHAPTER V

Summary and Conclusions

The primary purpose of this study was to examine the effects of participation in a fitness program on health care costs. Each subject was categorized based on age, gender, and the degree of participation in the fitness center. Three age groups were devised, while participation was measured according to the number of sessions logged at the fitness facility over an 11 month testing period.

Depending on the medical cost incurred over the 11 month testing period, subjects were placed in either a high cost or low cost status category (the mean health care cost for each age and gender category was used as the cut-point). The statistical analyses took the form of chi-square tests, due to a nonnormal distribution of the sample. These tests were performed on each age and gender group independently. The first battery of tests were performed on the data when expressed in 4 frequency of use subgroups (no use, low use, moderate use, and high use), while the second was performed on the data expressed as nonuser or user. In all cases the level of significance was set at .05. Information regarding the number of claims was also obtained, but only reported in a description of the sample.

Results showed that the level of use in the Apple Health and Fitness Program had no effect on the amount of health care dollars spent, when expressed in 4 frequency of use subgroups. This was consistent for both males and females of all corresponding age groups. When categorized as either nonuser or user, there was a significant difference in medical cost for women 31 to 40 years old and for women 41 and over (p < .05). For women 31 to 40, 695 were nonusers, while 184 were users. Of the nonusers, 164
incurred high cost status while 573 were classified as low cost cases. Of the users, 59 were in the high cost range and 125 were of low cost status. This shows that the nonusers had significantly lower medical cost when compared to the females who participated in the health and fitness center. Meanwhile, the females over 41 showed just the opposite. Of 338 nonusers, 75 had high costs and 263 had low costs. Of the 51 users, 5 had high costs and 46 had low costs. These results indicated that the females who used the fitness center had significantly lower health care costs. Findings for the youngest female age group and all male groups were insignificant ($p > .05$).

**Conclusions**

Based on the statistical analyses of the data the following conclusions were reached:

1. When each gender and age group was divided into 4 frequency of use categories, there was no significant difference in the health care cost incurred by employees of Apple Computer.

2. When each gender and age group was divided into user or nonuser categories, the only significant differences in health care costs were found in females 31 to 40 and females 41 and older (a user was a subject with $\geq 1$ recorded sessions in the Apple Health and Fitness Program, while nonusers recorded no sessions in the 11 month testing period).

**Recommendations**

Based on the results of this investigation, the following recommendations for future study were made:

1. Compare the overall health care costs of employees at work locations with access to fitness centers with locations having no fitness center.
2. Compare the health care cost of individuals in a supervised adult fitness program to individuals involved in the Apple Health and Fitness program.

3. Devise a survey to determine the energy expenditure of the workouts accomplished by individuals in the Apple Health and Fitness Program and evaluate the beneficial cardiovascular effects.

4. Use the present study as a model for another examining a longer testing period (2 to 5 years).

5. Compare health care information of past years at Apple Computer to data in this study and/or data from the present time.

6. Use a randomized sample of Apple Computer employees to conduct a detailed study (interview and/or survey) of physical activity behaviors. Compare these results to a study of activity behaviors to participants in the Apple Health and Fitness Program.

7. Devise and determine the effectiveness of strategies to increase the attendance and recruitment of employees to the Apple Health and Fitness Program.
REFERENCES


corporate fitness program on absenteeism and health care costs. Journal of
Occupational Medicine, 28, 18-22.

Review, pp. 51-53.

health promotion programs. American Journal of Health Promotion, 4, 448-452.

Bernacki, E. J. (1987). Can corporate fitness programs be justified? Fitness in Business, 1,
173-174.

Bernstein, R. (1986). Health promotion programs: Weighing the benefits. Interchange,
2(5), 6.

Bertera, R. L. (1990). The effects of workplace health promotion on absenteeism and
employment costs in a large industrial population. American Journal of Public Health,
80, 1101-1105.

intervention model for work-site health promotion. Journal of the American Medical
Association, 255, 921-926.

Bly, J. L., Jones, R. C., & Richardson, J. E. (1986). Impact of worksite health promotion on
health care costs and utilization: Evaluation of Johnson & Johnson's Live for Life

specific mortality among participants and nonparticipants in a work-site medical

301.

(1991). The relationship between sociodemographic characteristics and recruitment,
retention, and health improvements in a worksite health promotion program. American
Journal of Health Promotion, 5, 215-221.


