12-1998

A study of the effects of age and length of service on lost workdays due to recordable injuries and illnesses

Nadine White Bush

To the Graduate Council:

I am submitting herewith a thesis written by Nadine White Bush entitled "A study of the effects of age and length of service on lost workdays due to recordable injuries and illnesses." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Public Health.

Susan M. Smith, Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a thesis written by Nadine White Bush entitled "A Study of the Effects of Age and Length of Service on Lost Workdays Due to Recordable Injuries and Illnesses." We have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Safety Education and Services.

Susan M. Smith, Major Professor

We have read this thesis and
recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor and
Dean of The Graduate School

A STUDY OF THE EFFECTS OF AGE AND LENGTH OF SERVICE ON LOST WORKDAYS DUE TO RECORDABLE INJURIES AND ILLNESSES

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Nadine White Bush
December 1998

DEDICATION

This thesis is dedicated to my husband

Danny Elward Bush

for his encouragement, patience, and assistance
in my education pursuits and all my endeavors.

ACKNOWLEDGMENTS

Throughout my undergraduate and graduate education, many teachers inspired and encouraged me by being dedicated to their calling. And to several teachers who took a more personal interest in me, I am especially grateful. It is impossible to measure the positive impact they had on my life which helped me to arrive at this special plateau.

There are several people whose assistance in completing this thesis should be recognized. I am indebted to Cary Springer and Harry Davis for the essential information and assistance they provided in statistics and research data respectively.

Special acknowledgment must go to Dr. Susan Smith for all her time and guidance. Her expertise, insight, and tireless persistence enabled me to persevere.

Abstract

The purpose of this study was to compile and assess the recorded work-related injuries and illnesses from all twenty-one of The University of Tennessee campuses and locations for 1991 through 1996 to determine the effects of age and length of service on lost workdays due to recordable injuries and illnesses. This retrospective study utilized data that was previously recorded and maintained to meet OSHA requirements. Analysis of the data consisted of looking at frequencies within age group categories, types of injuries and illnesses which were documented for more than 10 % of the total recorded, length of service categories, and the number of lost workdays.

Findings included: (a) sprain/strain represented over 50 % of the injuries and illnesses recorded in each length of service category (less than 2 years, 2-10 years, and over 10 years); (b) the sprain/strain injury category was the most frequently recorded type of injuries and illnesses for all age categories; (c) employees between 31 and 40 years of age had significantly more recorded injuries/illnesses than the other age categories; (d) employees with 2-10 years of service recorded the highest number of lost workdays compared to employees with less than 2 years of service and those with over 10 years of service; and (e) the age category of 51-60 recorded higher than expected lost workdays.

As a result of this study, it can be concluded that the variation in length of service impacts the number of lost workdays due to recordable injuries and illnesses. It can also be concluded that the different age groups of workers impacts the type of injuries and illnesses as well as the number of injuries and illnesses recorded.

Based on the findings of this study, it is recommended that training and job task evaluation for occupational categories reporting high numbers of injuries and illnesses should be conducted for 1) all employees, focusing on sprain strains, 2) those in the 2-10 years of service category, and 3) employees in the age category of 31-40. Case-study follow-up of all injuries and illnesses should occur to determine when restricted or light duty work assignments can be utilized while workers continue to heal. Job categories with the highest number of recorded injuries and illnesses need to be studied more closely. Methods to assess employee injuries and illnesses should include the analysis of previous OSHA 200 forms and accident reports submitted in compliance with state and federal regulations. These reports can be analyzed to determine the most frequently reported injury and illness types, events associated with those injuries and illnesses, the age category of employees most likely to experience recorded injuries and illnesses, if length of employment is associated with reported injuries and illnesses; and if lost workdays are associated with injuries and illnesses recorded by employees within a specific age category or associated with length of employment.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Success in reducing work-related injuries and illnesses can be realized through strategically designed training programs. Companies have reduced injuries, lost workdays and cost by instituting targeted training programs in combination with other preventive measures (Boden, 1995, p. 192; Bruening, 1989, p. 46; Bryan, 1990, p. 102; Harshbarger & Rose, 1991, p. 143; Miller, 1997, p.13; Perry, 1993, p.70; Rosier, 1997, p. 33; Sheridan, 1989, p. 113; Weddle, 1996, p. 223). In order to establish effective training and incentive programs to reduce injuries and illnesses, it is important to first understand the characteristics of workers within a specific organization. Methods to assess employee injuries and illnesses should include the analysis of previous OSHA 200 forms required by The Occupational Safety and Health Act of 1970 and workers' compensation reports submitted to meet state and federal regulations. These reports can be analyzed to determine (1) the most frequently reported injury and illness types, (2) events associated with those injuries and illnesses, (3) the age category of employees most likely to experience recorded injuries and illnesses, (4) if length of employment is associated with recorded injuries and illnesses, and (5) if lost work days are associated with injuries and illnesses reported by employees within a specific age category or associated with length of employment.

Studies report the use of training programs and other preventive measures in a

variety of large private sector companies to reduce injuries. However, little published data can be found to indicate that in small businesses or institutions in the public sector, such as universities, have employed these methods for injury reduction (Harshbarger & Rose, 1991, p. 135-143; Weddle, 1996, p.218; Ringenbach & Jacobs, 1995, p. 175).

Statement of the Problem

This study sought to determine if there was a significant difference between the types of injuries/illnesses and the length of service categories of The University of Tennessee system employees at twenty-one unit/campus locations. The study also sought to determine if there was a significant difference between the age categories and the *types* of injuries/illnesses, as well as the age categories and the *number* of injuries/illnesses utilizing reports of work-related injuries/illnesses for the years of 1991 through 1996. The study further sought to determine if there was a significant difference between the number of lost workdays due to occupational injuries/illnesses and the length of service categories, and if there was a significant difference between the number of lost workdays and the age categories.

Research Questions

The study sought to address the following research questions listed within the specific categories analyzed:

Types of injuries and illnesses by length of service categories

1. What are the most frequent types of injuries and illnesses recorded for each

of the three categories for length of service (less than 2 years, 2-10 years, or over 10 years) within The University of Tennessee system between 1991 and 1996?

2. Is there a significant difference between the length of service category of The University of Tennessee system employees and the types of injuries and illnesses recorded for the years 1991 through 1996?

Types of injuries and illnesses by age categories

3. What are the most frequent types of injuries and illnesses recorded for The University of Tennessee system employees for each of the six age groups: category 1, under 21 years; category 2, 21 to 30 years; category 3, 31 to 40 years; category 4, 41 to 50 years; category 5, 51 to 60 years; and category 6, over 60 years?

4. Is there a significant difference between the age category of The University of Tennessee system employees and the types of injuries and illnesses recorded for the years 1991 through 1996?

Number of injuries and illnesses by age categories

5. Is there a significant difference between the age category of The University of Tennessee system employees and the number of injuries and illnesses recorded for the years 1991 through 1996, as required by The Occupational Safety and Health Act (OSHA) of 1970?

Lost workdays by length of service categories

6. Is there a significant difference between the length of service categories of

The University of Tennessee system employees and the number of lost workdays due to recorded injuries and illnesses for 1991 through 1996?

Lost workdays by age categories

7. Is there a significant difference between the age category of The University of Tennessee system employees and the number of lost workdays recorded for the years 1991 through 1996?

Need for the Study

Because of medical advances and the quality of life, the number of persons 65 years or older has steadily increased since 1900. The 65+ population in the United States is growing twice as fast as the general population. Safety professionals now and in the future will be challenged to address this growing work force, as the aging employee will be called upon to replace the shrinking youth work force in the future (Philson, 1990, p. 40). By the year 2000, 49 percent of the work force will be ages 35-54 (Johnson, 1988, p. 100).

Although several research studies indicate that older workers are injured less frequently than younger employees, most older workers require significantly longer recovery periods and suffer job-related fatalities at a significantly higher rate (Stalnaker, 1998, p.30). The National Institute for Occupational Safety and Health (NIOSH) reports that when nonfatal accident and injury rates at work are examined across the life span, adolescents typically represent the age group with the highest rate of risk (Frone, 1998, p. 565). Most of this data has been collected with a focus on private sector employment.

As older employees tend to have higher tenure, they are assigned greater responsibility at work which may place them at greater risk of injury. Similar to age and education, tenure has been argued to have a positive relationship with injury. Employees with higher tenure generally are assigned to jobs with greater skill requirements, responsibility and accident risk (Iverson and Erwin, 1997, p. 115). In contrast, Frone (p. 567), reports that some researchers argue that because experienced employees are less likely to injure themselves than inexperienced employees, job tenure should be inversely related to the occurrence of work injuries.

Age discrimination claims are becoming the fastest growing category of charges filed with the Equal Employment Opportunity Commission (Philson, 1990, p. 40). Factors that affect older workers include discrimination in job opportunities and compensation, social pressures to retire, and the need to learn new skills and technologies (Hansson, DeKoekkoek, Neece, & Patterson, 1997, p. 216). One primary reason for a lack of corporate response to older workers is the assumption of higher costs for older workers. Several studies indicate that there is the misconception that it is not cost effective to retrain older workers since the expense of compensation (as a result of seniority) is greater (Johnson, 1988, p. 100).

A national study of occupational injuries and illnesses done by the Bureau of Labor Statistics indicates that 48 percent of occupational injuries happened to workers in their first year of employment. The National Safety Council suggests that many young or new employees have not had the chance to develop an ability to sense a hazardous situation. Many young people are prone to taking unnecessary risks to prove that they are not afraid

of anything. Also they may lack the training or education to understand job instructions or safe procedures. Young or new employees may find it difficult to ask for help (Bryan, p. 101).

Little published data can be found to indicate that public sector groups have addressed the special safety concerns of new hires or those in younger or older age categories. In order to reduce occupational injury, small businesses or institutions in the public sector, such as universities, need to analyze records of injuries and illnesses. Additional study is needed in these areas. OSHA 200 forms required by The Occupational Safety and Health Act of 1970 and workers' compensation reports submitted to meet state and federal regulations can be analyzed to determine (1) the most frequently reported injury and illness types, (2) events associated with those injuries and illnesses, (3) the age category of employees most likely to experience reported injuries and illnesses, (4) if length of employment is associated with reported injury and illness, and (5) if lost work days are associated with injuries reported by employees within a specific age category or associated with length of employment. This study will provide additional knowledge to help safety managers and trainers build new programs to target these special populations.

Assumptions

The following statements were assumed to be true for this study:

a. The information provided on the OSHA 200 logs, the accident reports, and the Workers' Compensation forms was accurate.

b. The tools used to collect the data were valid and reliable.

c. The data derived from the forms is accurately recorded in the database.

Delimitations

This research study included the following delimitations:

1. The study was delimited to employees of The University of Tennessee system.
2. The period for the data collection was delimited to the calendar years 1991 through 1996.
3. The study involved only those employees who reported OSHA recordable injuries or illnesses to supervision.

Limitations

The major limitations of this study were:

1. Over the six-year period of data collection, some variations occurred in OSHA's criteria for recordable injuries and illnesses.
2. The OSHA 200 logs and accident report forms used to collect the data were completed by many different people at different campuses or locations of The University of Tennessee.
3. Numerical coding was used by three teams of two individuals each to identify the various data from the OSHA 200 logs and the accident reports. There may be inconsistencies among the teams in selecting appropriate codes.

Definition of Terms

The following definitions represent the operational definition of terms utilized in the reporting and the analysis of the results obtained from conducting this study.

Lost workdays. The number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness.

New hires. Employees of The University of Tennessee system for less than two years.

NIOSH. National Institute of Occupational Safety and Health as a federal agency. It conducts research on health and safety issues, tests, certifies respirators, and trains occupational safety and health professionals.

Occupational illness. An abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or disease which may be caused by inhalation, absorption, ingestion, or direct contact.

Occupational injury. Any injury, such as a cut, fracture, sprain, amputation, and so forth, which results from a work accident or from exposure involving a single incident in the work environment.

Older worker. A person aged 51 years and older employed in an occupation.

OSHA. The Occupational Safety and Health Administration. Part of the U.S. Department of Labor.

OSH Act. The Occupational Safety and Health Act of 1970. Effective April 28, 1971. Public Law 91-596. Found at 29 CFR 1910, 1915, 1918, 1926. OSHA jurisdiction. The regulatory vehicle to ensure the safety and health of workers in

firms larger than 10 employees. Its goal is to set standards of safety that prevent injury and illness among the workers. Regulating employee exposure and informing employees of the dangers of materials are key factors.

Recordable occupational injuries and illnesses. (1) occupational deaths, regardless of the time between injury and death, or the length of the illness; or (2) nonfatal occupational illnesses; or (3) nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid).

Workers' Compensation. Insurance for employees in the event they are injured in and out of the course of employment.

Summary

Due to the increase in the number of workers aged 51 years and older, the purpose of this study was to evaluate the number of occupational injuries and illnesses recorded within various age groups to determine if there was a significant relationship between lost workdays and the ages of workers. In addition to the age of workers, length of employment within a particular place of employment or length of experience performing a particular task may impact on the potential for work-related injuries or illnesses. This study attempted to determine if there was a significant relationship between lost workdays and the length of employment of workers reporting OSHA recordable incidences. Understanding these factors may provide the stimulus for safety training of new workers and retraining to improve work habits and abilities of more experienced workers.

CHAPTER II

REVIEW OF LITERATURE

Introduction

According to the U.S. Bureau of Labor Statistics, the size of the workforce will increase to about 139 million people by the year 2000. By that time, 49 percent of the work force will be ages 35-54 (Johnson, 1988, p.100). Health and safety professionals may be dealing regularly with an older working population that tends to have poorer vision, slower reaction times, and general body frailty (LaBar, 1989, p. 53).

Some studies have determined that age and work experience significantly affected frequency and seriousness of accidents. A study of these two factors jointly shows that considerably higher rates of frequency and seriousness are found for the youngest and oldest subjects with low work experience. They also note that other studies revealed accidents occur less often as people get older and that beginners have a higher accident rate than do experienced workers (Cellier, Eyrolle & Bertrand, 1995, p. 931).

Work experience and accident frequency.

According to one study, inexperienced workers who had been less than one year in the same job make more knowledge-based errors than experienced victims. This hypothesis was confirmed for fatalities but not for serious injuries. The second hypothesis was that experienced victims make more rule-based errors. This hypothesis was confirmed, because the experienced victims of fatal accidents made more rule-based errors

than did inexperienced victims. The assumption was not confirmed for serious accidents (Salminen and Tallberg 1996, p. 984).

Cellier, et al record the following results: The beginning workers present a higher frequency rate (150.7) than the experienced workers (77.11) and the intermediate workers (72.11). For age groups, beginning workers show a higher accident frequency rate than intermediate workers. Significantly higher proportions are observed for the under 22-year-olds. For the same type of tasks to be accomplished, lower experience means not only increased frequency of accidents but also increased seriousness. After the age 53 years, experience may no longer compensate the decrease in biological and cognitive abilities (1995, p. 935-939).

New employees' behavior is shaped, in part, by the expectations and pressures communicated by people who depend upon the employee. Determining the organization's performance expectations is probably the most complex task confronting a new employee. (Pearson, 1982, p. 287). There is evidence that employees with low job tenure are more likely to be injured on the job than employees with more experience. One study found that workers with only one month of job experience are almost twice as likely to be injured on the job than employees with six months experience (Drost, 1988, p. 42).

Instead of finding a decreasing incidence rate with increasing work experience as reported in other studies, Keyseling (1983, p. 40) concluded that workers with the least experience and workers with the most experience had significantly fewer medical incidents than did workers with intermediate experience. A national study of occupational injuries and illnesses conducted by the Bureau of Labor Statistics indicates that new and young

workers are most at risk; 48 percent of the accidents happened to workers in their first year of employment and nearly 40 percent of the accidents happened to workers between 20 and 29 years of age (Bryan, 1990, p. 101). Some studies suggest that longer tenure is associated with job assignments that entail greater skill requirements and risk potential (Frone, 1998, p. 573).

The results of a study by Saari indicate that usually the sites of accidents are not the accustomed work areas. During the observation period 24 persons from the injury group were working in an unaccustomed area when the accident happened. There were no differences between the groups as to the workers' age or occupational experience, but the experience of the injured workers with the specific task was short: experience of less than 1 day for 51 of the injured vs. 29 of the uninjured (1976, p. 276).

Age of workers.

In their review of literature, Cellier, Eyrolle and Bertrand (1995) noted that age affects the accident rate (p. 931). Accidents occur less often as people get older. An increase in frequency rate with age can be considered as a consequence of reduced biological or cognitive abilities associated with aging (p. 932). There exists a high rate of accident frequency for the youngest workers, a much lower frequency rate for workers aged between 37 and 53 years and a rate between the two for workers aged between 23 and 36 years and the eldest workers (Cellier, et al, 1995, p. 935). Among people ages 20 to 64 years, one-third of all injuries and one-sixth of all deaths by injury occur on the job (Kingma, 1994, p. 1025).

Some studies focused on number of errors, not type of error, report that age

differences have not been found in the frequency of errors, but older people tend to report their errors less often than younger people (Salminen and Tallberg, 1996, p. 981). Results of a study by Laflame showed that regardless of accident type, accident ratios were generally higher among younger workers than older ones, though not for all accident types and time periods (1996, p. 259).

Unfortunately, the fatalistic conception that individual ability to cope with occupational demands may only diminish with age, as a result of the progressive weakening of physical and mental capacities, has negative and counter-productive implications for the conception, design, and implementation of work stations. By doing so, it hinders modes of production that might permit the effective employment of older workers (Laflamme, p. 239).

The study conducted by Laflamme investigated whether there were signs of age-related impairment in accident occurrence among male assemblers employed in the Swedish automobile industry. Contrary to expectation, younger assemblers (16-24 years) were the ones for whom consistently high accident ratios were recorded, in virtually all six accident situations and for all three time periods. As suggested by the findings of earlier studies of the automobile industry, the results of the current study point to the likelihood of the possessions of acquired compensatory ability on the part of older workers (aged 55-65) rather than to a deterioration in work capacity. This applies to the overall accident risk and to the risks related to most specific types of accidents (Laflamme, p. 265).

Work injuries represent a particularly important health outcome among adolescents. When nonfatal accident and injury rates at work are examined across the life

span, adolescents typically represent the age group with the highest rate of risk (Frone, 1998, p. 565). Personality has been implicated as a potentially important risk factor for work injuries among adolescents. It seems plausible that adolescents with certain personality characteristics have a higher risk for work injuries because they are more careless, reckless, or distractible. However, no research among adolescents has examined the relation between personality and work injuries (Frone, p. 566).

Injury and illness prevention

In theory, workers' compensation provides safety incentives to employers because it requires them to pay substantial benefits to injured workers. Because injuries and illnesses are more expensive with workers' compensation than without, employers benefit more from safety activities and, in theory, invest more in hazard reduction, decreasing the number of occupational injuries and illnesses (Boden, 1995, p. 192).

Effective investigation and documentation of accidents or incidents can be one of the most useful tools for managers charged with reducing workplace injuries and illnesses. The tools available to employers include near-miss incident reports, accident reports, workers' compensation forms, and OSHA's record keeping requirements. These resources, when used together, provide the manager a mechanism by which to identify root causes and establish trends (McNeese and Balden-Anslyn, 1997, p.1).

Safety issues.

Studies have shown that increasing knowledge may not always change risky behaviors. . . intellectual appreciation of risk does not necessarily translate into sustained behavior change. Primary prevention is the best strategy for promoting healthful behavior

practices. There are many issues associated with safety consciousness of an individual, for example, socioeconomic factors, culture belief systems, safety values, and personality characteristics (Nakornkhet, 1996, p. 30-32).

One approach [for assessing the likelihood of an accident at a specific workplace] emphasizes the worker's individual characteristics as the main contributing factor to the occurrence of accidents. Variables of the predictive model originating from this hypothesis are perceptual, cognitive and memory functions, motor control and coordination, personality traits, risk-taking behavior, experience, age, etc (Saari, 1977, p. 273).

Personal characteristics serve an additional role in stressor-strain relationships through their influence on coping and social support. Thus variations in the type of coping mechanism used by individuals have been found to be related to age, gender, organizational tenure, trait anxiety, mastery, self-esteem, social and autonomy needs, and Type A behavior pattern (Greenhaus & Parasuraman, 1986, p. 48).

Widespread discussions on expected growth in the older labor force (workers age 55 and older) have occurred for quite some time. As younger and more highly educated cohorts age and replace today's older population, the educational composition of the 55-and-older age group will inevitably change. The effect of this change on our future labor force has not been sufficiently explored, but is bound to have significant implications for both the quality and quantity of the future labor force (Besl & Kale, 1996, p. 18).

The common sequence of three psychological elements that is basic to all behavior, namely perception, information processing, and action represent what is conventionally referred to by psychologists as the S-O-R paradigm: stimulus-input, organismic-mediation,

and output-response. These three behavioral elements are the essence of most human activities in the sense that a *stimulus* acts upon an *organism* to effect a *response* (Park, 1987, p. 12-13).

Two demographic factors, the aging of the baby boomers and the decreased birth rates from the late 1960s through the 1970s, have irrevocably changed the profile of the US workforce. The result is an increase in the mean age of people at work. These two factors, coupled with the repeal of mandatory retirement laws and practices, have created a change in the age of our workforce now and into the future. As a result, older workers will create new opportunities and challenges for employers (Ringenbach & Jacobs, 1995, p. 169).

Workers' compensation costs

The average cost of a workers' compensation claim has more than tripled over the past 10 years, increasing at a rate 50 percent faster than the boom in overall health care costs. "Hidden costs usually come to five times the amount paid in bills," says Douglas F. Miller, president of Employers' Risk & Insurance Management:

First, you lose the expertise of an experienced employee when an accident occurs. You must assign a less skilled individual to perform the work, and that may involve overtime. Further, there is the administrative cost of filing paperwork and keeping up with the claim. Then there is the time required for following up with the employee and seeing how he is doing (Perry, 1993, p. 69).

Occupational safety in a university setting.

While much attention has been focused on occupational safety in industrial

settings, little attention has been directed toward occupational safety in non-industrial settings, such as a university. The wide variety of occupations found in the university environment presents the director of safety or workers' compensation a situation which is, if not unique, at least very challenging. In addition to instructors, administrators, and the supporting clerical staffs, a university typically employs a large number of employees who perform potentially hazardous duties. Particularly noteworthy are the research workers and technicians who frequently handle potentially unstable and dangerous chemicals and compounds; agricultural and field researchers who work around animals, with heavy equipment, or in rugged terrain; workers who maintain the buildings and grounds and work with toxic materials and mechanical equipment; and food service workers who are susceptible to cuts and burns. Thus, it is evident that the work environment at the university can present hazards to a large contingent of workers. Therefore, an analysis of occupational safety on campus would seem both appropriate and useful in assisting safety officers reduce the number of job-related injuries (Drost, 1988, p. 40).

The model program in occupational health places prevention as a priority rather than reaction. Protection of the total community, [the campus], is affected by identification and elimination of hazards, educational programs to develop awareness of safe procedures and substitution for materials or processes which may be hazardous (Hunt, 1982, p. 16).

CHAPTER III

METHODOLOGY

Introduction

This study compiled and assessed the recorded work-related injuries and illnesses from all twenty-one of The University of Tennessee campuses/locations for 1991 through 1996. Table 1 in Appendix A provides a listing of the number of employees by each campus/unit for this time period. Review of the research data provided a means of comparing the average age of employees having recordable injuries and illnesses with figures provided by The University of Tennessee system human resources database of the average age of employees in each job category at each campus/location for any one year. The age distribution of all the people employed by The University of Tennessee system during 1991-1996 was used to calculate the expected age distribution of the sample for the Chi-Square analysis. These were compared with the number of recorded injuries and illnesses by each age category utilizing the Pearson Chi-Square method. It was found that a significant difference between recorded injury and illness categories and age categories existed.

Table 2 in Appendix A is a list of the age categories per year from 1991-1996. Review of the research data also provided a means of comparing the average length of employment with The University of Tennessee system employees having recordable injuries and illnesses with figures in the university system's database of the average length of employment in each job category at each campus/location for any one year. Table 3 in

Appendix A is a listing of the average length of employment per year from 1991-1996.

The researcher sought to determine the most frequent types of injuries and illnesses for new hires within The University of Tennessee system. The researcher also sought to determine the most frequent types of injuries and illnesses for University of Tennessee system employees reporting a length of service exceeding two years between 1991 and 1996. The researcher further sought to determine the most frequent types of injuries and illnesses recorded for The University of Tennessee system employees for each of the six age categories. The study sought to determine if there is a significant difference between the age category of The University of Tennessee system employees and the number of recorded injuries and illnesses. The study also sought to determine if there is a significant difference between the age category of The University of Tennessee system employees and the number of lost workdays recorded. The study further sought to determine if there is a significant difference in the number of recorded injuries and illnesses between those University of Tennessee system employees considered to be new hires and those reporting a length of service exceeding two years. Another goal of the study was to determine if there is a significance between the age category of The University of Tennessee system employees and the types of injuries and illnesses recorded. And finally the study sought to determine if there is a significant difference in types of recorded injuries and illnesses between those University of Tennessee system employees considered to be new hires and those reporting a length of service exceeding two years.

The methodology presented in this chapter includes research design, subjects, instrumentation, data management, data collection, data analysis, and summary.

Research Design

This study was a retrospective study, utilizing data that was previously recorded and maintained to meet OSHA requirements. Quantitative data were extracted from OSHA 200 logs and workers' compensation reports, completed by individual employees, their supervisors, or staff in The University of Tennessee Office of Risk Management.

Three teams of two graduate students each entered the data into the spreadsheet. Most of the data was numerical or yes/no which was considered objective in nature. The numerical data included birth dates and hire dates of the employees recording injuries and illnesses. Entries requiring coding consisted of subjective descriptions. The baseline retrospective study was designed to analyze the number and type of injuries and illnesses recorded by the job category of each employee, types of injuries, and injury events. The statistical analysis applied to determine if there were any significant differences was the Pearson Chi-Square test. An adjusted residual of more than +2.0 is considered significant. The analysis included types of injuries and illnesses which were documented for more than 10 percent of the total recorded.

Subjects

The population of this study consisted of the employees of The University of Tennessee system who recorded injuries or illnesses during the 1991-1996 time period. There were 4,670 injuries or illnesses recorded, however, some of the subjects had more than one recordable incidence during the time period of the study. Recordable injuries and illnesses on the OSHA 200 logs ranged from 700 to 1200 cases per year from 1991-1996.

Instrumentation

The instruments used to collect the data were the OSHA 200 log forms (See Figure 1, Appendix B), accident report forms (Figure 2, Appendix B), and workers' compensation used to report lost workdays. It should be noted that information was sometimes omitted from the reports. Proper and correct completion of the reports was dependent upon the injured or ill employees, their supervisors, and the staff of The University of Tennessee Office of Risk Management who compile the OSHA 200 log sheets. The data in this study is limited to those employees with recorded injuries/illnesses whose accident report included the date of birth and date of hire. Those records without this information were excluded from this analysis.

The data from the OSHA 200 log sheets, the workers' compensation forms, and the accident reports were entered into a Microsoft Excel database for each year from 1991 through 1996. The spreadsheet was designed with a layout similar to the OSHA 200 log sheet to eliminate confusion and to insure more accurate data entry. The spreadsheet also provided space to code and categorize data. The spreadsheet was initially designed and tested with a small sample, then modified. The evaluation improved construct validity and enhanced efficiency (Gann, W. L., 1998, p. 30).

A separate data file was created for each of the six years. The recorded cases were entered into the spreadsheet and coded with numeric codes. All the data from 1991-1996 was then merged into one data file. Careful consideration was taken in the coding of information and title entries in the spreadsheet for compatibility with The Statistical Program for Social Sciences (SPSS). Analysis was performed using SPSS.

Data Management

The documents and disks containing the recorded data were stored in a secured office on The University of Tennessee, Knoxville campus. The data were entered into a computer in the same secured office. After the data entry was completed, the records were returned to the Risk Management Office on The University of Tennessee, Knoxville campus. There were no names or identifying numbers, such as Social Security numbers, on the merged file for the years 1991-1996 utilized for analysis in the research project. All information in the merged file was in numeric form. Descriptive data such as sentences describing the injury/illness were available in the individual year data files, but only codes representing the type of injury/illness was imported into the merge file (Gann, p. 31).

Data Collection and Analysis

The narrative data was selected from official accident reports. This information was entered and coded in an SPSS data file to facilitate the statistical analysis. Possibility of variation in the entries included coding classifications, accident types, events and number of persons entering data. The time required for all the entries to be completed in a timely manner prohibited one person or even one team of two people from entering all the data. Entries for many variables were coded allowing analysis with SPSS. Some coded variables included job titles, injury types, injury location, event surround the injury or illness, and yes/no entries. A written description of each injury/illness was included on the individual-year spreadsheets, not for analysis, but for quick reference in the event of a question.

The codes for Job Category, Campus/Unit, Injury Type, Body Part, and Event (Appendix C: Tables 1-5) were selected by a panel of experts after review of others used in commercially available injury/illness databases. The coding ultimately decided upon were thought out carefully based on those needed for the specific population and projected analysis. A listing of all the questions on the spreadsheet along with the appropriate answers is found in Table 6, Appendix C.

Summary

Analysis of the data consisted of looking at frequencies within age group categories, types of injuries and illnesses which were documented for more than 10 percent of the total recorded, length of service categories, and the number of lost workdays. The statistical treatment applied to determine if there were any significant differences was the Pearson Chi-Square test. An adjusted residual of more than +2.0 is considered to be significant. The age distribution of all the people employed by The University of Tennessee system during 1991-1996 was used to calculate the expected age distribution of the sample for the Chi-Square analysis. These were compared with the number of recorded injuries and illnesses by each age category utilizing the Pearson Chi-Square method. It was found that a significant difference between recorded injury and illness categories and age categories existed.

CHAPTER IV

ANALYSIS OF DATA AND RESULTS

Introduction

Data from OSHA 200 log sheets, workers' compensation forms, and accident reports submitted by employees of The University of Tennessee system for the years of 1991 through 1996 were entered into a computer database. There were no names or identifying numbers, such as Social Security numbers on the merged file utilized for analysis in the research project. There were 4,670 injuries or illnesses recorded. However, some of the subjects had more than one recordable incidence during the time period of the study. The number of recordable injuries and illnesses on the OSHA 200 logs ranged from 700 to 1200 cases per year from 1991-1996.

This chapter has been divided into the following sections: (1) Introduction, (2) Population Description and Demographics, (3) Analysis of Data Related to Research Questions, and (4) Data Summary.

Population Description and Demographics

The average number of employees for The University of Tennessee system for 1991 through 1996 was 23,787 per year. The average number of employees per year for each of the twenty-one campuses/locations was as follows: University of Tennessee at Knoxville, 8915 or 37.0 percent; University of Tennessee Space Institute, 290 or1.2

percent; University of Tennessee at Chattanooga, 1954 or 8.2 percent; University of Tennessee at Martin, 1642 or 6.9 percent; University at Memphis, 3478 or 14.6 percent; Clinical Education Center at Knoxville, 166 or 0.7 percent; Clinical Education Center at Chattanooga; University of Tennessee Memorial Research Center, 46 or 0.3 percent; University of Tennessee Agricultural Experiment Station, 810 or 3.4 percent; University of Tennessee Agricultural Extension Service, 840 or 3.5 percent; University of Tennessee Institute for Public Service, 114 or 0.5 percent; Municipal Technical Advisory Service, 44 or 0.2 percent; County Technical Assistance Service, 28 or 0.1 percent; University of Tennessee Continuing Education, 51 or 0.3 percent; University-Wide Administration, 531 or 2.2 percent; University of Tennessee College of Veterinary Medicine, 378 or 1.6 percent; University of Tennessee Memorial Hospital, 3763 or 16 percent; University of Tennessee Family Practice in Knoxville, 59 or 0.2 percent; University of Tennessee Family Practice in Jackson, 49 or 0.2 percent; University of Tennessee Family Practice in Memphis, 87 or 0.4 percent; and William F. Bowld Hospital, 462 or 1.9 percent. This information has been listed in Table 4.1.

The actual number of injuries and illnesses recorded by employees of The University of Tennessee system during the period between 1991 and 1996 was 4,670. In 1991, the number of injuries and illnesses recorded by employees was 887. In 1992, the number of injuries and illnesses recorded by employees was 783. In 1993, the number of injuries and illnesses recorded by employees was 806. In 1994, the number of injuries and illnesses recorded by employees was 766. In 1995, the number of injuries and illnesses recorded by employees was 743. In 1996, the number of injuries and illnesses recorded by

Table 4.1 Average Number of The University of Tennessee System Employees Per Year by Campus/Location for 1991-1996

Campus/Location	Number	Percent
University of Tennessee, Knoxville	8915	37.0
University of Tennessee Space Institute	290	1.2
University of Tennessee, Chattaanooga	1954	8.2
University of Tennessee, Martin	1642	6.9
University of Tennessee, Memphis	3478	14.6
Clinical Education Center, Knoxville	166	0.7
Clinical Education Center, Chattanooga	83	0.3
University of Tennessee Memorial Research Center	46	0.2
University of Tennessee Agricultural Experiment Station	810	3.4
University of Tennessee Agricultural Extension Service	840	3.5
University of Tennessee Institute for Public Service	114	0.5
Municipal Technical Advisory Service	44	0.2
County Technical Assistance Service	28	0.1
University of Tennessee Continuing Education	51	0.3
University-Wide Administration	531	2.2
University of Tennessee College of Veterinary Medicine	378	1.6
University of Tennessee Memorial Hospital	3763	16.0
University of Tennessee Family Practice, Knoxville	59	0.2
University of Tennessee Family Practice, Jackson	49	0.2
University of Tennessee Family Practice, Memphis	87	0.4
William F. Bowld Hospital	462	1.9
Total	23790	100.0

Table 4.2 Actual Number of Injuries and Illnesses Recorded by Employees of The University of Tennessee System Per Year from 1991-1996

Year	Number	Percent	Cumulative Percent
1991	887	19.0	19.0
1992	783	16.8	35.8
1993	806	17.3	53.0
1994	766	16.4	69.4
1995	743	15.9	85.3
1996	685	14.7	100.0
Total	4670	100.0	100.0

employees was 685. Table 4.2 and Figure 4.1 summarized the total number of injuries and illnesses for each year.

Table 4.3 and Figure 4.2 exhibited the average number of employees of The University of Tennessee system by age categories for the time period from 1991 through 1996. The average number of employees in the age category of under 21 was 2032. The average number of employees in the age category of 21-30 was 7129. The average number of employees in the age category of 31-40 was 5924. The average number of employees in the age category of 41-50 was 4904. The average number of employees in the age category of 51-60 was 2839. The average number of employees in the age category of over 60 was 959.

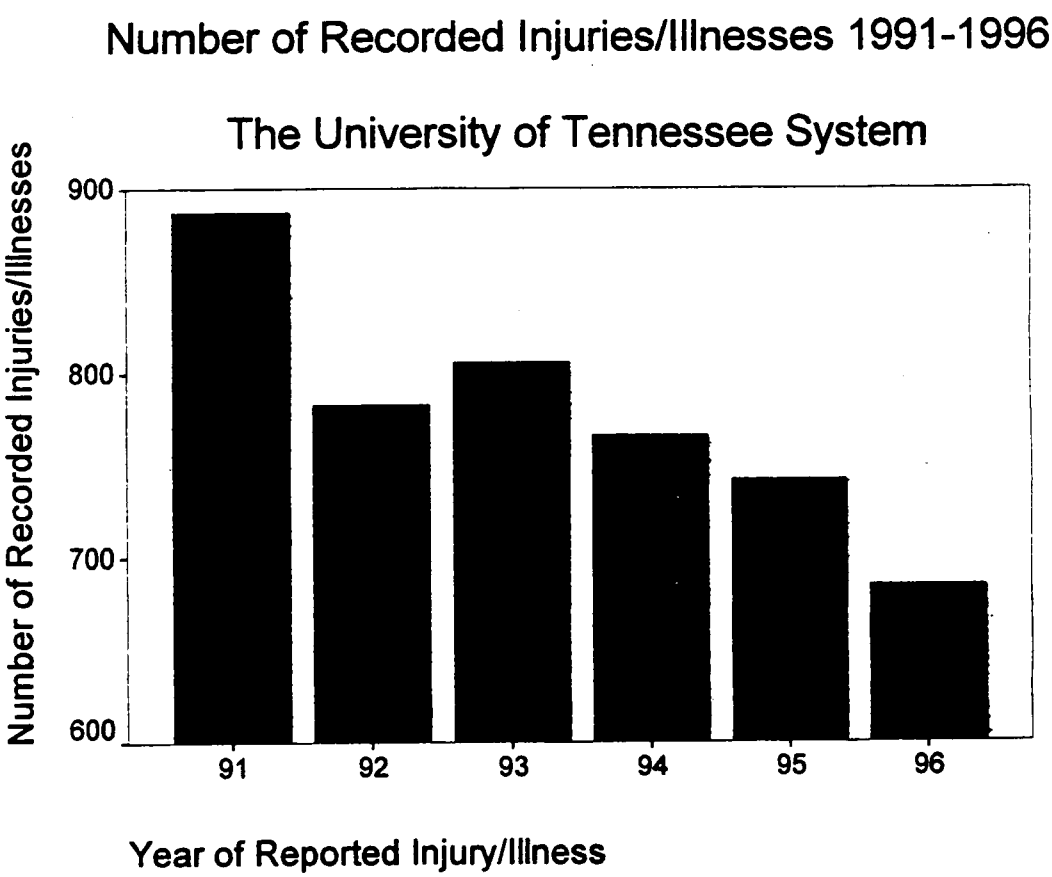

Figure 4.1 Number of Recorded Injuries and Illnesses 1991-1996
The University of Tennessee System

Table 4.3 Average Number of The University of Tennessee System Employees by Age Categories for 1991-1996

Age	Average Number	Percent	Cumulative Percent
Under 21	2032	0.09	0.09
21-30	7129	0.30	0.39
31-40	5924	0.25	0.64
41-50	4904	0.21	0.85
51-60	2839	0.12	0.97
Over 60	959	0.04	1.00
Total	23787	1.00	

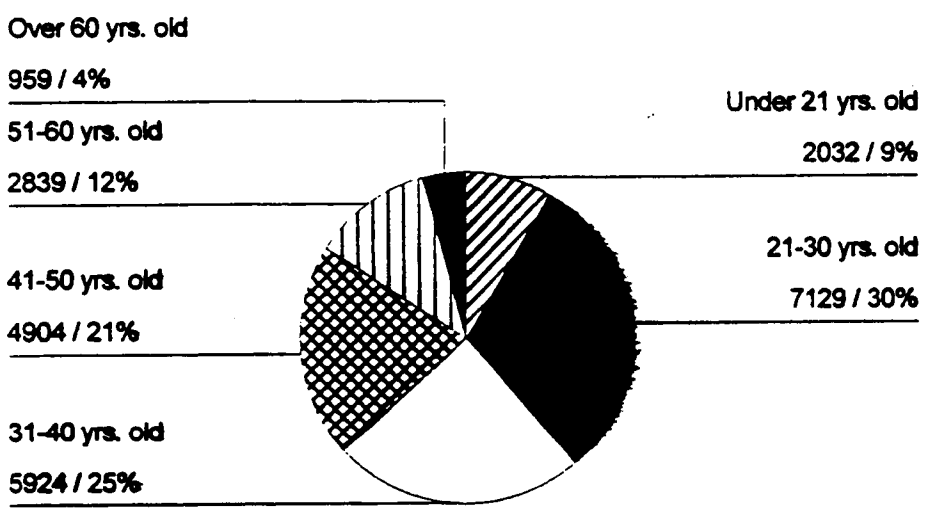

Figure 4.2 Age Categories of The University of Tennessee System Employees for 1991-1996

Analysis Related to Research Questions

Analysis of the data related to the research questions consisted of determining frequencies of recorded injuries and illnesses to evaluate differences in age categories, length of service categories, and the number of lost workdays.

1. Injuries and Illnesses

Approximately 4670 injuries and illnesses were recorded by employees of The University of Tennessee system from 1991-1996. For the purposes of this study, nineteen types of injuries and illnesses were coded: amputation, asphyxia, burn, concussion, dermatitis, electric shock, foreign body, fracture, hearing loss, hernia/rupture, hypertension, inhalation, laceration, multiple, puncture, sprain/strain, contusion/avulsion, carpal tunnel, and other. Table 4.4 listed the frequency with which each of these types of injuries and illnesses were recorded by employees for the 1991-1996 time period.

Types of injuries and illnesses by length of service categories

Employees of The University of Tennessee system with recordable injuries and illnesses were grouped in the following categories by length of service: fewer than 2 years, 2-10 years, and over 10 years. Figure 4.3 and Table 4.5 listed the total number of injuries and illnesses recorded by length of service categories (Chi-Square=71.232, df=36, p-value <.001). A total of 1,461 or 31.3 percent recorded injuries/illnesses with an employment history with The University of Tennessee system of less than 2 years; a total of 1,759 or 37.7 percent recorded injuries/illnesses with an employment history with the university system of from 2-10 years; a total of 1,021 or 21.9 percent recorded injuries/illnesses with an employment history with the university system of more than 10 years;

Table 4.4 Total Number of Types of Injuries and Illnesses by Employees of The University of Tennessee System from 1991-1996

Type of Injury/Illness	Number	Percent	Cumulative Percent
Amputation	5	0.1	0.1
Asphyxia	4	0.1	0.2
Burn	142	3.0	3.2
Concussion	7	0.1	3.4
Dermatitis	153	3.3	6.7
Electric Shock	1	0.0	6.7
Foreign Body	177	3.8	10.5
Fracture	209	4.6	15.0
Hearing Loss	1	0.0	15.0
Hernia/Rupture	14	0.3	15.3
Hypertension	5	0.1	15.4
Laceration	631	13.5	28.9
Multiple	10	0.2	29.2
Puncture	256	5.5	34.6
Sprain/Strain	1961	42.0	76.7
Contusion/Avulsion	694	14.9	91.6
Other	247	5.3	96.9
Inhalation	113	2.4	99.3
Carpal Tunnel	31	0.7	100.0
Missing in System	9	0.2	100.0
Total	4670	100.0	

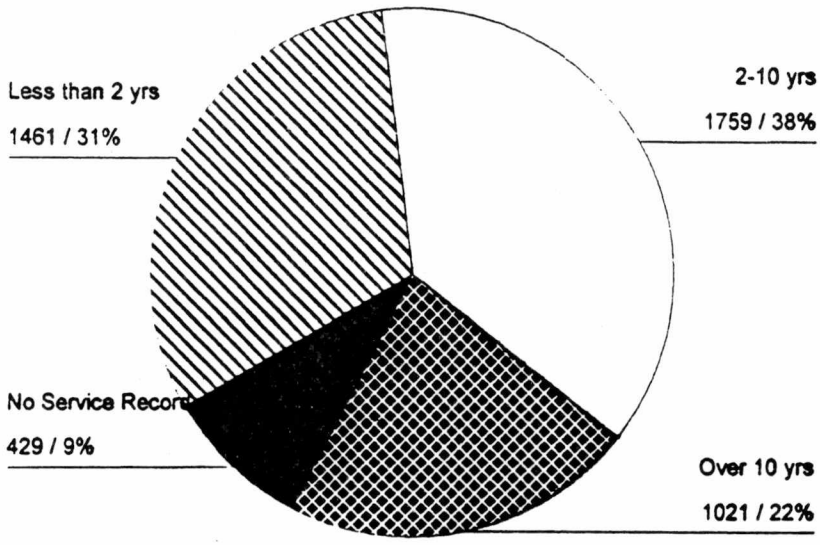

Figure 4.3 Length of Service of Employees with Recordable Injuries/Illnesses The University of Tennessee System 1991-1996

Table 4.5 Total Number of Injuries and Illnesses Recorded by Employees of The University of Tennessee System From 1991-1996 According to Length of Service

Length of Service	Total No. Injuries/Illnesses	Percent	Cumulative Percent
Less than 2 years	1461	31.3	31.3
2-10 years	1759	37.7	69.0
Over 10 years	1021	21.9	90.9
Missing in System	429	9.2	100.0
Total	4670	100.0	

Chi-Square = 71.232, df = 36, p-value <.001
23 cells (40.4% have expected count less than 5. The minimum expected count is .24.

and 429 or 9.2 percent with recorded injuries/illnesses did not report a hire date with The University of Tennessee system.

Research question one: What are the most frequent types of injuries and illnesses recorded for each of the three categories for length of service (less than 2 years, 2-10 years, or over 10 years) within The University of Tennessee system between 1991 and 1996?

Employees in all three length of service categories recorded more sprain/strain injuries than other types of injuries and illnesses. The three most frequently recorded injuries and illnesses for all employees were listed as follows: sprain/strain totaled 1,865 or 59.7 percent; contusion/avulsion totaled 657 or 21.0 percent; and lacerations totaled 602 or 19.3 percent. Table 4.6 listed this information.

Research question two: Is there a significant difference between the length of service category of The University of Tennessee system employees and the types of injuries and illnesses recorded for the years1991 through 1996?

A Pearson Chi-Square statistical analysis determined that there was a significant difference at the .05 level between the length of service and the types of injuries and illnesses (Chi-Square = 11.840, df = 4, p-value = .019). Table 4.6 lists most frequently recorded types of injuries and illnesses for employees of The University of Tennessee system for 1991-1996 according each of the three length of service categories. Employees with fewer than 2 years of service recorded a total of 1,461 (31.3 percent) injuries and illnesses from 1991-1996. Employees with 2-10 years of service recorded a total of 1,759 (37.7 percent) injuries and illnesses. Employees with over 10 years of service recorded a

Table 4.6

Top Three Types of Injuries/Illnesses Recorded by Employees of The University of Tennessee System for 1991-1996 According to Length of Service Categories

Length of Service Categories		Types of Injuries/Illnesses			Total
		Laceration	Sprain/Strain	Contusion/ Avulsion	
Less than 2 years	Count	216	591	223	1030
	Expected Count	198.5	614.9	216.6	
	Adjusted Residual	1.7	-1.9	.6	
	% within service length	21.0%	57.4%	21.7%	100.0%
2-10 years	Count	248	829	250	1327
	Expected Count	255.7	792.2	279.1	
	Adjusted Residual	-.7	2.7	-2.6	
	% within service length	18.7%	62.5%	18.8%	100.0%
Over 10 years	Count	138	445	184	767
	Expected Count	147.8	457.9	161.3	
	Adjusted Residual	-1.0	-1.1	2.3	
	% within service length	18.0%	58.0%	24.0%	100.0%
Total	Count	602	1865	657	3124
	% within service length	19.3%	59.7%	21.0%	100.0%

Chi-Square = 11.840, df = 4, p-value = .019

total of 1,021 (21.9 percent) injuries and illnesses. A total of 429 (9.2 percent) of the reports omitted length of service information.

For employees in the less than 2 years length of service category, the three most frequently recorded injuries and illnesses were sprain/strain (40.5 percent), contusion/avulsion (15.3 percent), and laceration (14.8 percent). These three types of injuries and illnesses were 70.6 percent of the total injuries and illnesses listed for employees in the length of service category of fewer than 2 years (see Table 4.6)

For employees in the length of service category of 2-10 years, the three types of injuries and illnesses most frequently recorded were sprain/strain (47.1 percent), contusion/avulsion (14.2 percent), and laceration (14.1 percent). These three types of injuries and illnesses were 75.4 percent of all injuries and illnesses recorded for employees in the length of service category of from 2-10 years (see Table 4.6)

For employees in the length of service category of more than 10 years, the three types of injuries and illnesses most frequently recorded were sprain/strain (43.6 percent), contusion/avulsion (43.6 percent), and laceration (13.5 percent). These three types of injuries and illnesses totaled 75.1 percent of the overall total number of injuries for employees in the over 10 years length of service category (see Table 4.6)

Types of injuries and illnesses by age categories

Research question three: What are the most frequent types of injuries and illnesses recorded for The University of Tennessee system employees for each of the six age groups: category 1, under 21 years; category 2, 21 to 30 years; category 3, 31 to 40 years; category 4, 41 to 50 years; category 5, 51 to 60 years; and category 6,

over 60 years?

Table 4.7 listed the most frequent types of injuries and illnesses recorded by employees of The University of Tennessee system for 1991-1996 according to age categories. The most frequently recorded types of injuries and illnesses when analyzed by age categories were as follows: workers in the under 21 years of age category recorded 26 (32.9 percent) lacerations and 22 (27.8 percent) sprain/strains; the age 21-30 category recorded 405 (51.7 percent) sprain/strains, 160 (20.4 percent) lacerations, and 151 (19.3 percent) contusion/avulsions; the age 31-40 age category recorded 625 (57.8 percent) sprain/strains, 186 (17.2 percent) contusion/avulsions, and 173 (16 percent) lacerations; the 41-50 age category recorded 438 (58.1 percent) sprain/strains, 137 (18.2 percent) contusion/avulsions, and 107 (14.2 percent) lacerations; the 51-60 age category recorded 207 (48.6 percent) sprain/strains, 97 (22.8 percent) contusion/avulsions, and 71 (16.7 percent) lacerations; and the over 60 age category recorded 39 (41.5 percent) sprain/strains and 25 (26.6 percent) contusion/avulsions.

Research question four: Is there a significant difference between the age category of The University of Tennessee system employees and the type of injuries and illnesses recorded for the years 1991 through 1996?

The Chi-Square test and analysis was run with the following 5 injuries and illnesses: burn, fracture, laceration, sprain/strain, and contusion/avulsion. The statistical analysis also revealed a significant difference at the .05 level between types of recorded injuries and illnesses and age categories (Chi-Square = 113.520, df = 20, p-value <.001).

Table 4.7

Top Five Types of Injuries/Illnesses Recorded by
Employees of the University of Tennessee System for 1991-1996
According to Age Categories

Age Categories		Types of Injuries and Illnesses					
		Burn	Fracture	Laceration	Sprain/Strain	Contusion/ Avulsion	Total
Under 21	Count	14	3	26	22	14	79
	Expected Count	3.1	4.7	13.6	42.6	15.0	
	Adjusted Residual	6.3	-.8	3.7	-4.7	-.3	
	% within age group	17.7%	3.8%	32.9%	27.8%	17.7%	100.0%
21-30	Count	38	29	160	405	151	783
	Expected Count	31.2	46.2	134.6	422.5	148.5	
	Adjusted Residual	1.4	-3.0	2.8	-1.4	.3	
	% within age group	4.9%	3.7%	20.4%	51.7%	19.3%	100.0%
31-40	Count	36	61	173	625	186	1081
	Expected Count	43.0	63.8	185.8	583.3	205.0	
	Adjusted Residual	-1.3	-.5	-1.3	3.1	-1.8	
	% within age group	3.3%	5.6%	16.0%	57.8%	17.2%	100.0%
41-50	Count	24	48	107	438	137	754
	Expected Count	30.0	44.5	129.6	406.9	143.0	
	Adjusted Residual	-1.3	.6	-2.5	2.6	-.6	
	% within age group	3.2%	6.4%	14.2%	58.1%	18.2%	100.0%
51-60	Count	14	37	71	207	97	426
	Expected Count	16.9	25.2	43.2	229.9	80.8	
	Adjusted Residual	-.8	2.6	-.3	-2.4	2.2	
	% within age group	3.3%	8.7%	16.7%	48.6%	22.8%	100.0%
Over 60	Count	2	12	16	39	25	94
	Expected Count	3.7	5.6	16.2	50.7	17.8	
	Adjusted Residual	-.9	2.9	.0	-2.5	1.9	
	% within age group	2.1%	12.8%	17.0%	41.5%	26.6%	100.0%
Total	Count	128	190	553	1736	610	3217
	% within age group	4.0%	5.9%	17.2%	54.0%	19.0%	100.0%

Chi-Square = 113.520, df = 20, p-value <.001

Table 4.7 exhibited the most frequent types of injuries and illnesses recorded for each age group of employees. The most frequently recorded injuries for all age categories were sprain/strain, contusion/avulsion, and laceration. However, employees under 21 years of age recorded the highest percentage of burns. Employees over age 60 had the highest percentage of fractures among all age groups.

For the under age 21 category, the recorded number of burns (14 or 17.7 percent) and lacerations (26 or 32.9 percent) was higher than expected. For the 21-30 age category, the recorded number of lacerations (160 or 20.4 percent) was higher than expected. For the 31-40 age category, the recorded number of sprain/strains (625 or 57.8 percent) was higher than expected. For the 41-50 age category, the recorded number of sprain/strains (438 or 58.1 percent) was also higher than expected. The expected number of fractures for the 51-60 and the over 60 age categories were 25.2 (8.7 percent) and 5.6 (12.8 percent) respectively (see Table 4.7).

Number of injuries and illnesses by age categories

Research question five: Is there a significant difference between the age category of The University of Tennessee system employees and the number of injuries and illnesses recorded for the years 1991 through 1996, as required by The Occupational Safety and Health Act (OSHA) if 1970?

A Chi-Square analysis shows that a significant difference at the .05 level was found between the age category and the number of injuries (Chi-Square = 340.755, df = 5, p-value <.001). Table 4.8 listed the number of injuries and illnesses by age categories.

Fewer injuries were found than would be expected for those 30 years of age and younger. This study revealed that there were far more injuries than expected for employees between 31 and 40 years of age (see Table 4.8).

The number of injuries and illnesses recorded by age categories was as follows: the under age 21 category recorded 99 or 2.1 percent; the age 21-30 category recorded 990 or 21.2 percent; the age 31-40 category recorded 1,317 or 28.2 percent; the age 41-50 category recorded 907 or 19.4 percent; the age 51-60 category recorded 505 or 10.8 percent; and the over age 60 recorded 111 or 2.4 percent. A total of 741 or 15.9 percent of recorded injuries and illnesses did not specify an age category (see Table 4.8).

Table 4.8 The Number of Injuries and Illnesses Recorded by Employees of The University of Tennessee System by Age Categories for 1991-1996

Age	Number Injuries/Illnesses	Percent
Under 21	99	2.1
21-30	990	21.2
31-40	1317	28.2
41-50	907	19.4
51-60	505	10.8
Over 60	111	2.4
Missing in the system	741	15.9
Total	4670	100.0

Chi-Square = 340.755, df = 5, p-value <.001

2. Lost Workdays

Lost workdays by length of service categories

Research question six: Is there a significant difference between the length of service categories of The University of Tennessee system employees and the number of lost workdays due to recorded injuries and illnesses for 1991 through 1996?

A Pearson Chi-Square statistical analysis determined that there was a significant difference at the .05 level between the length of service of the employees and lost workdays categories: 0 days, 1 day, 2-5 days, 6-10 days, 11-20 days, 21-30 days, and over 30 days. The Chi-Square value = 27.609, df =12, p-value .006. Table 4.9 demonstrates the cross-tabulation of the lost workdays categories and the length of service categories.

As shown in Table 4.9, the total number of recorded injuries and illnesses for 1991 through 1996 with no lost workdays is listed for each length of service category:

1. The number of employees in the less than 2 years of service category who recorded no lost workdays was 771 or 52.8 percent.
2. The number of employees in the 2 -10 years of service category who recorded no lost workdays was 826 or 47.1 percent.
3. The number of employees in the over10 years of service category who recorded no lost workdays was 447 or 43.9 percent.

Table 4.9

Lost Workdays Recorded by Employees of
The University of Tennessee System
According to Length of Service Categories
For 1991-1996

Lost Workdays Categories	Length of Service			Total
	Less than 2 Years	2-10 Years	Over 10 years	
0 days Count	771	826	447	2044
Expected Count	705.2	846.7	492.2	
Adjusted Residual	4.3	-1.3	-3.2	
% of Total	52.8%	47.1%	43.9%	48.3%
1 day Count	163	192	129	484
Expected Count	167.0	200.5	116.5	
Adjusted Residual	-.4	-.8	1.4	
% of Total	7.4%	8.8%	5.9%	22.1%
2-5 days Count	310	446	264	1020
Expected Count	351.9	422.5	245.6	
Adjusted Residual	-3.2	1.7	1.5	
% of Total	14.2%	20.4%	12.1%	46.6%
6-10 days Count	81	111	72	264
Expected Count	91.1	109.4	63.6	
Adjusted Residual	-1.3	.2	1.3	
% of Total	3.7%	5.1%	3.3%	12.1%
11-20 days Count	59	71	47	177
Expected Count	61.1	73.3	42.6	
Adjusted Residual	-.3	-.4	.8	
% of Total	2.7%	3.2%	2.1%	8.1%
21-30 days Count	29	33	14	76
Expected Count	26.2	31.5	18.3	
Adjusted Residual	.7	.4	-1.2	
% of Total	1.3%	1.5%	0.6%	3.5%
Over 30 days Count	47	74	46	167
Expected Count	57.6	69.2	40.2	
Adjusted Residual	-1.8	.8	1.1	
% of Total	2.1%	3.4%	2.1%	7.6%
Total	1460	1753	1019	4232

Chi-Square = 27.609, df = 12, p-value .006

Table 4.9 also listed the total number of recorded lost workdays from 1 day to over 30 days for 1991 through 1996 listed for each length of service category:

1. The number of employees in the less than 2 years of service category who recorded from 1 to over 30 lost workdays was 689 or 31.5 percent.
2. The number of employees in the 2 -10 years of service category who recorded from 1 to over 30 lost workdays was 927 or 42.4 percent.
3. The number of employees in the over10 years of service category who recorded from 1 to over 30 lost workdays was 572 or 26.1 percent.

Lost workdays by age categories

Research question seven: Is there a significant difference between the age category of The University of Tennessee system employees and the number of lost workdays recorded for the years 1991 through 1996?

A Pearson Chi-Square statistical analysis determined that there was a significant difference at the .05 level between age categories and lost workdays (Chi-Square = 40.083, df = 25, p-value .029). Table 4.10 listed the lost workdays recorded for each age group.

The lost workdays category of 1 day off due to recorded injuries and illnesses are categorized by age as follows: under 21 years of age, 9 (.4 percent); ages 21-30, 116 (5.7 percent); ages 31-40, 152 (7.5 percent); ages of 41-50, 103 (5.1 percent); ages 51-60, 66 (3.3 percent); over 60 years of age, 14 (.7 percent). The 1 day category total was 460 (22.8 percent). This information was listed in Table 4.10.

Table 4.10

Total Lost Workdays Recorded by
Employees of The University of Tennessee System for 1991-1996
According to Age Categories

	Age Categories						
Lost Workdays	Under 21	21-30	31-40	41-50	51-60	Over 60	Total
0 days Count	64	542	622	430	198	46	1902
Expected Count	48	480	637	437	245	53.4	
Adjusted Residual	3.3	4.5	-1.1	-.6	-4.5	-1.4	
% of total	1.6%	13.8%	15.9%	10.9%	5.1%	1.2%	48.5%
1 day Count	9	116	152	103	66	14	460
Expected Count	8	102	158	108	70	14.6	
Adjusted Residual	-.8	.0	-.2	-.3	1.0	.3	
% of total	0.2%	2.9%	3.9%	2.6%	1.7%	0.4%	11.7%
2-5 days Count	16	217	315	222	123	33	926
Expected Count	16.1	206	318	217	141	29.4	
Adjusted Residual	-1.6	-1.6	.4	.8	.4	1.6	
% of total	0.4%	5.5%	8.1%	5.7%	3.1%	0.8%	23.6%
6-10 days Count	6	46	100	47	33	8	240
Expected Count	4.2	53	82	56	37	7.6	
Adjusted Residual	.0	-2.2	2.8	-1.3	.4	.5	
% of total	0.2%	1.2%	2.5%	1.2%	0.8%	0.2%	6.1%
11-20 days Count	1	28	61	34	37	4	165
Expected Count	2.9	36.6	56.6	38.6	25.1	5.2	
Adjusted Residual	-1.6	-2.6	1.0	-.7	3.7	-.3	
% of total	0.0%	0.7%	1.6%	0.9%	0.9%	0.1%	4.2%
21-30 days Count	1	17	20	21	14	0	73
Expected Count	1.3	16.2	25.1	17.1	11.1	2.3	
Adjusted Residual	-.6	-.4	-1.1	1.2	1.6	-1.5	
% of total	0.0%	0.4%	0.5%	0.5%	0.4%	0.0%	1.9%
Over 30 days Count	2	24	45	45	34	5	155
Expected Count	2.7	34.4	53.2	36.2	23.6	4.9	
Adjusted Residual	-1.0	-2.9	-1.2	1.8	3.4	.3	
% of total	0.1%	0.6%	1.2%	1.2%	0.8%	0.2%	3.9%
Total	99	990	1315	902	505	110	3921
	2.5%	25.2%	33.5%	23.0%	12.9%	2.8%	100.0%

Chi-Square = 40.083, df = 25, p-value .029

The lost workdays category of 2-5 days due to recorded injuries and illnesses are categorized by age follows: under 21 years of age, 16 (.8 percent); ages 21-30, 217 (10.7 percent); ages 31-40, 315 (15.6 percent); ages 41-50, 222 (11.0 percent); ages 51-60, 123 (6.1 percent); over 60 years of age, 33 (1.6 percent). The 2-5 days category total was 926 (45.9 percent). This information was listed in Table 4.10.

The lost workdays category of 6-10 days due to recorded injuries and illnesses are categorized by age follows: under 21 years of age, 6 (.3 percent); ages 21-30, 46 (2.3 percent); ages 31-40, 100 (5.0 percent); ages 41-50, 47 (2.3 percent); ages 51-60, 33 (1.6 percent); over 60 years of age, 8 (.4 percent). The 6-10 days category total was 240 (11.9 percent). This information was listed in Table 4.10.

The lost workdays category of 11-20 days due to recorded injuries and illnesses are categorized by age follows: under 21 years of age, 1 (.0 percent); ages 21-30, 28 (1.4 percent); ages 31-40, 61 (3.0 percent); ages 41-50, 34 (1.7 percent); ages 51-60, 37 (1.8 percent); over 60 years of age, 4 (.2 percent). The 11-20 days category total was 165 (8.2 percent). This information was listed in Table 4.10.

The lost workdays category of 21-30 days due to recorded injuries and illnesses are categorized by age follows: under 21 years of age, 1 (.0 percent); ages 21-30, 17 (.8 percent); ages 31-40, 20 (1.0 percent); ages 41-50, 21 (1.0 percent); ages 51-60, 14 (.7 percent); over 60 years of age, 0 (.0 percent). The 21-30 days category total was 73 (3.6 percent). This information was listed in Table 4.10.

The lost workdays category of over 30 days due to recorded injuries and illnesses are categorized by age follows: under 21 years of age, 2 (.1 percent); ages 21-30, 24 (1.2

percent); ages 31-40, 45 (2.2 percent); ages 41-50, 45 (2.2 percent); ages 51-60, 34 (1.7 percent); over 60 years of age, 5 (.2 percent). The over 30 days category total was 155 (7.7 percent). This information was listed in Table 4.10.

The total lost workdays for employees in the category of under 21 years of age was 35. The total lost workdays for those in the age 21-30 category was 448. Employees in the age 31-40 category recorded a total of 693 lost workdays. Workers in the age 41-50 category had 472 lost workdays, and workers in the 51-60 age category had 307 lost workdays. Those in the over 60 age category had a total of 64 lost workdays. Table 4.10 listed the lost workdays recorded for each age group.

Data Summary

This chapter presented the analysis and interpretation of data. These data were generated from OSHA 200 log sheets, workers' compensation forms, and accident reports submitted by employees of The University of Tennessee system for 1991-1996. Data were coded and entered into a Microsoft Excel database and analyzed using The Statistical Program for Social Sciences (SPSS). To test the significance of difference, the Pearson Chi-Square test was used, and the .05 level of significance was used to govern the statistical tests.

All comparisons were significant at the .05 level. The statistical analysis revealed a significant difference between the types of injuries/illnesses and the length of service categories. A significant difference was also found between the types of injuries/illnesses and the age categories. Through the application of the Chi-Square test and analysis, a

significant difference was found between the number of injuries/illnesses and the age categories. Significant differences were found utilizing the Chi-Square test between the lost workdays categories and the length of service categories. A significant difference was also found between the lost workdays categories and the age categories. Table 4.11 has summarized the results of the analysis of cross tabulations of data.

Table 4.11 Summary of Cross Tabulations of Employees of The University of Tennessee System Having OSHA Recordable Injuries and Illnesses From 1991 Through 1996

Variables	Significant at the .05 level Probabilities
Types of Injuries/Illnesses compared to Length of Service Categories	0.019
Types of Injuries/Illnesses compared to Age Categories	<.001
Number of Injuries/Illnesses compared to Age Categories	<.001
Lost Workdays compared to Length of Service Categories	0.006
Lost Workdays compared to Age Categories	0.029

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of the study was to determine if there was a significant difference between the types of injuries/illnesses and the length of service categories of The University of Tennessee system employees. The study also sought to determine if there was a significant difference between the age categories and the *types* of injuries/illnesses, as well as the *number* of injuries/illnesses for the years of 1991 through 1996. The study further sought to determine if there was a significant difference between the number of lost workdays and the length of service categories, and if there was a significant difference between the number of lost workdays and the age categories.

Findings related to these questions are important because the work force will be made up of a greater number of older workers by the year 2000 (Johnson, 1988, p. 100), and health and safety professionals must be aware of the potential for injury/illness risk when working with an older working population. (LaBar, 1989, P. 53). Previous studies by Cellier, et al (1996, p.931) also found that the frequency and seriousness of accidents are higher for the youngest and oldest subjects with low work experience. Therefore, issues of length of employment and age are both important issues for investigation.

In this retrospective study, quantitative data were extracted from OSHA 200 logs and workers' compensation reports recorded from 1991-1996 for all twenty-one of The University of Tennessee campuses/locations. The number of recordable injuries and

illnesses ranged from 700 to 1200 cases per year. There were no names or identifying numbers, such as Social Security numbers, on the merged file for the years 1991-1996 utilized for analysis in the research project. Analysis of the data consisted of looking at frequencies within age group categories, type of injury and illness categories, length of service categories, and the number of lost workdays. The statistical treatment applied to determine if there were any significant differences was the Pearson Chi-Square test.

Findings

The following section lists the major findings. These findings were based on an analysis of the injury and illness data recorded by employees of The University of Tennessee system during the time period from 1991 through 1996.

Types of injuries and illnesses by length of service categories

1. The sprain/strain category was the highest number recorded of types of injuries/illnesses for all 3 categories of length of service: less than 2 years, 2-10 years, and over 10 years. Over 50 percent of recorded incidents in each length of service category were sprains/strains.
2. A significant difference was found between the length of service categories (less than 2 years, 2-10 years, and over 10 years) and categories of types of injuries and illnesses when Chi-Square was applied at the .05 level of significance. The 2-10 years category had the highest number of sprain/strains. Workers with less than 2 years of service was next in the number of sprain/strains, and workers with over 10 years of service had the least number of sprain/strains.

Types of injuries and illnesses by age categories

3. A significant difference was found at the .05 level of significance between types of injury/illness categories and the age categories of employees. The most frequently recorded injuries for all age categories were sprain/strain, contusion/avulsion, and laceration. Sprain/strains were the highest, contusion/avulsion was next, and laceration were third.

4. Burn injuries were recorded more frequently than expected for workers under 21 years of age.

5. Workers in both the 51-60 and the over 60 age categories recorded more fractures than expected.

Number of injuries and illnesses by age categories

6. A significant difference at the .05 level was found between the age category and the number of injuries. Employees between 31 and 40 years of age recorded 1317 injuries/illnesses or 28.2 percent. This age group had significantly more recorded injuries/illnesses than the other age categories. The 21-30 age category had 990 injuries/illnesses or 21.2 percent, while the 41-50 age category had 907 injuries/illnesses or 19.4 percent.

Lost workdays by length of service categories

7. It was determined that there was a significant difference at the .05 level between lost workdays categories and length of service categories. Employees with 2-10 years of service had 927 lost workdays. Workers with less than 2 years of service recorded 689 lost workdays and workers with over 10 years of service recorded

572 lost workdays.

8. When the "No Lost Days" category was not factored into the Chi-Square analysis, it was determined that there is not a significant difference at the .05 level between length of service and the number of lost workdays (Chi-Square = 6.776, df = 10, p-value .746).

Lost workdays by age categories

9. There was found to be a significant difference between the number of lost workdays and the age categories of employees. The age category of 51-60 had higher than expected lost workdays in both the 11-20 days category and the over 30 days category. The 31-40 age category had higher than expected lost workdays in the 6-10 days category.

Conclusions

Within the limited scope of this study and the analysis of the data and findings, the following conclusions are presented:

1. Workers with a length of service of 2-10 years are more likely to have more work-related injuries and illnesses, while employees with over 10 years of service are more likely to have the least number of injuries and illnesses.
2. Employees in the 31- 40 age category were more likely to have injuries/illnesses in the specific population assessed than younger and older workers. Employees in different age categories demonstrated a significant difference in the number of injuries recorded.

3. Employees in the age category of 51-60 had higher than expected lost workdays in both the 11-20 day category and the over 30 day category, while 31-40 year old workers had greater than expected lost workdays in the 6-10 days category.
4. The variation in length of service impacts the number of lost workdays. Employees with less than 2 years of service who have work-related injuries and illnesses are likely to have fewer lost workdays than other workers.
5. When specific injury types were assessed by age categories, burns were found to be more frequent for workers under age 21 while fractures were more frequent than expected for workers over 50.

Recommendations

The following recommendations are suggested for The University of Tennessee system and other universities, public sector employers operating similar programs, and other businesses involved in the service industry, including educational and medical institutions:

1. Due to the high number of recorded sprain/strain injuries and illnesses, more studies and action plans should be implemented in various job categories, including clerical jobs, food service, construction/maintenance, housekeeping/custodian, and nursing in order to determine causation and prevention of sprain/strain related injuries/illnesses for specific work-related situations.
2. Training and job task evaluation for occupational categories reporting high numbers of injuries and illnesses should be conducted for:

a. All employees, focusing on sprain/strains

b. Those in the 2-10 years of service category

c. Employees in the age category of 31-40

3. The findings of this study reveal a higher number of recorded injuries/illnesses and lost workdays among employees of The University of Tennessee system between the ages of 31 and 40. Further studies of the types of occupations in which workers of this age group are engaged may provide safety professionals with information necessary to implement engineering and administrative controls as well as safety training.

4. Management should implement case-study follow-up of all injuries and illnesses to determine when restricted or light duty work assignments can be utilized while workers continue to heal in order to reduce lost workdays. Job categories with the highest number of recorded injuries and illnesses and those associated with the highest number of lost workdays should receive priority focus.

5. Future prevention actions including job analysis and training should focus on categories of workers recording higher than expected numbers of specific types of injuries/illnesses, such as burns among younger workers and fractures among older workers, to develop appropriate prevention and reduction strategies.

6. Because workers age 51-60 had higher than expected lost workdays, special strategies such as wellness programs, fracture prevention, and expansion of light duty opportunities should be utilized by The University of Tennessee system with attention to these age categories to reduce costs associated with lost workdays.

REFERENCES

REFERENCES

Besl, J. R. (1996). Older workers in the 21st century: Active and educated, a case study. Monthly Labor Review, v119 (6), 18-28.

Boden, L. I. (1995). Workers' compensation in the United States: High costs, low benefits. Annual Review of Public Health, v16, 189-218.

Bruening, J. C. (1989). Pizzagalli Construction: Performance-oriented safety pays off. Occupational Hazards, June 1989, p. 46-49.

Bryan, L. A. (1990). An ounce of prevention for workplace accidents. Training and Development Journal, v44 (7), 101-102.

Cellier, J., Eyrolle, H. & Bertrand, A. (1995). Effects of age and level of work experience on occurrence of accidents. Perceptual and Motor Skills, v80, 931-940.

Drost, D. A. (1988). Planning a safe environment: Occupational safety in a university setting. College and University Personnel Association Journal, (Summer, 1988), 40-44.

Frone, M. R. (1998). Predictors of work injuries among employed adolescents. Journal of Applied Psychology, v83, (4), 565-576.

Gann, W. L. (1998). An analysis of the most frequent employee injuries/illnesses reported by The University of Tennessee campuses for the years 1991-1996. Unpublished.

Greenhaus, J. H. & Parasuraman, S. (1986). A work-nonwork interactive perspective of stress and its consequences. Journal of Organizational Behavior Management, v8 (2), 37-60.

Hansson, R. O., DeKoekkoek, P. E., Neece, W. M. & Patterson, D. W. (1997). Successful aging at work: Annual review, 1992-1996: The older worker and transitions to retirement. Journal of Vocational Behavior, v51, 202-233)

Harshbarger, D. & Rose, T. (1991). New possibilities in safety performance and the control of workers' compensation costs. Journal of Occupational Rehabilitation, v1 (2), 133-143.

Hunt, R. E. (1982). The campus as a total community. U. S. Department of Health, Education & Welfare. National Institute of Education, (ED182282), 1-28.

Iverson, R. D., & Erwin, P. J.(1997). Predicting occupational injury: The role of affectivity. Journal of Occupational and Organizational Psychology, June, 1997, 113-128.

Johnson, H. E. (1988). Older workers help meet employment needs. Personnel Journal, v67 (5), 100-105.

Keyserling, W. M. (1983). Occupational injuries and work experience. Journal of Safety Research, v14, 37-42.

Kingma, J. (1994). Causes of occupational injuries. Perceptual and Motor Skills, v79, 1025-1026.

LaBar, G. (1989). The 1990's: What challenges await safety and health professionals? Occupational Hazards, v51 (2), 53-56.

Laflamme, L. (1996). Age-related accident risks among assembly workers: A longitudinal study of male workers employed in the Swedish automobile industry. Journal of Safety Research, v27 (4), 259-267.

McNeese, K. & Balden-Anslyn, R. (1997). Beyond OSHA 200. Occupational Health and Safety Magazine, (February, 1988),1-3.

Miller, T. R. (1997). Estimating the costs of injury to U. S. employers. Journal of Safety Research, v28 (1), 1-13.

Nakornkhet, N. (1996). Contemporary issues in safety promotion. The Health Education Monograph Series, v14 (3), 30-33.

Park, K. S. (1987). Human Reliability: Analysis, Prediction, and Prevention of Human Errors. New York: Elsevier.

Pearson, J. M. (1982). The transition into a new job: Tasks, problems, and outcomes. Personnel Journal, v61 (4), 286-290.

Perry, P. M. (1993). 12 ways to cut workers compensation costs. NARD Journal, v99, (National Association of Retail Druggists), 69-72.

Philson, C. S. (1990). Graying work force: Safety concerns of the aging employee. Professional Safety, v35 (4), 40-43.

Ringenbach, K. L. & Jacobs, R. R. (1995). Injuries and aging workers. Journal of Safety Research, v26 (3), 169-176.

Rosier, G. A. (1997). OSHA statistics and safety performance measurement: A case for change. Professional Safety, September 1997, 32-34.

Saari, J. (1977). Characteristics of tasks associated with the occurrence of accidents. Journal of Occupational Accidents, v1, 273-279.

Salminen, S. & Tallberg, T. (1996). Human errors in fatal and serious occupational accidents in Finland. Ergonomics, v39 (39), 980-988.

Sheridan, P. J. (1989). The resurgence of the older worker. Occupational Hazards, October 1989, 108-112.

Stalnaker, C. K. (1998). Safety of older workers in the 21st century. Professional Safety, v43 (6), 28-31.

Weddle, M. G. (1996). Reporting occupational injuries: The first step. Journal of Safety Research, v27 (4), 217-223.

APPENDICES

APPENDIX A

THE UNIVERSITY OF TENNESSEE SYSTEM EMPLOYEE DATA

FOR 1991-1996

Table A.1

Number of The University of Tennessee System Employees
Per Year by Campus/Location for 1991-1996

Campus/Location	1991	1992	1993	1994	1995	1996
University of Tennessee, Knoxville	8366	8417	8553	9058	8880	10214
University of Tennessee Space Institute	348	359	350	257	215	210
University of Tennessee, Chattaanooga	1990	1846	1784	1861	1942	2302
University of Tennessee, Martin	1499	1488	1688	1687	1668	1819
University of Tennessee, Memphis	3281	3335	3537	3604	3559	3551
Clinical Education Center, Knoxville	150	164	160	181	171	171
Clinical Education Center, Chattanooga	74	76	82	85	89	94
University of Tennessee Memorial Research Center	46	50	50	51	40	39
University of Tennessee Agricultural Experiment Station	774	778	776	809	858	863
University of Tennessee Agricultural Extension Service	804	831	863	843	825	875
University of Tennessee Institute for Public Service	98	105	103	117	124	134
Municipal Technical Advisory Service	39	41	45	43	48	48
County Technical Assistance Service	27	29	28	27	26	28
University of Tennessee Continuing Education	50	52	53	51	51	51
University-Wide Administration	490	519	531	551	541	551
University of Tennessee College of Veterinary Medicine	373	358	374	383	382	398
University of Tennessee Memorial Hospital	3778	3866	3701	3879	3731	3623
University of Tennessee Family Practice, Knoxville	60	61	54	51	58	67
University of Tennessee Family Practice, Jackson	38	41	48	49	56	60
University of Tennessee Family Practice, Memphis	63	75	81	112	136	56
William F. Bowld Hospital	433	428	438	464	463	544
Total	22781	22919	23299	24163	23861	25698

Table A.2

Number of The University of Tennessee System Employees
Per Year by Age Categories for 1991-1996

Age	1991		1992		1993		1994		19 95		1996	
Categories	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Under 21	2084	0.09	2029	0.09	1935	0.08	1920	0.08	1977	0.08	2245	0.09
21-30	7167	0.31	7015	0.31	6942	0.30	7277	0.30	6804	0.29	7571	0.29
31-40	5817	0.26	5816	0.25	5942	0.26	6068	0.25	5910	0.25	5992	0.23
41-50	4320	0.19	4533	0.20	4786	0.21	5045	0.21	5188	0.22	5549	0.22
51-60	2541	0.11	2621	0.11	2745	0.12	2890	0.12	3008	0.13	3231	0.13
Over 60	852	0.04	905	0.04	949	0.04	963	0.04	974	0.04	1110	0.04
Total	22781	1.00	22919	1.00	23299	1.00	24163	1.00	23861	1.00	25698	1.00

Table A.3 Total University of Tennessee System Employees Per Year and Average Length of Service for 1991-1996

Year	Total Employees	Average Length of Service
1991	22781	6.25
1992	22919	6.45
1993	23299	6.61
1994	24163	6.59
1995	23861	6.83
1996	25698	6.49
Average	23787	6.54

APPENDIX B

INSTRUMENTS USED TO COLLECT DATA

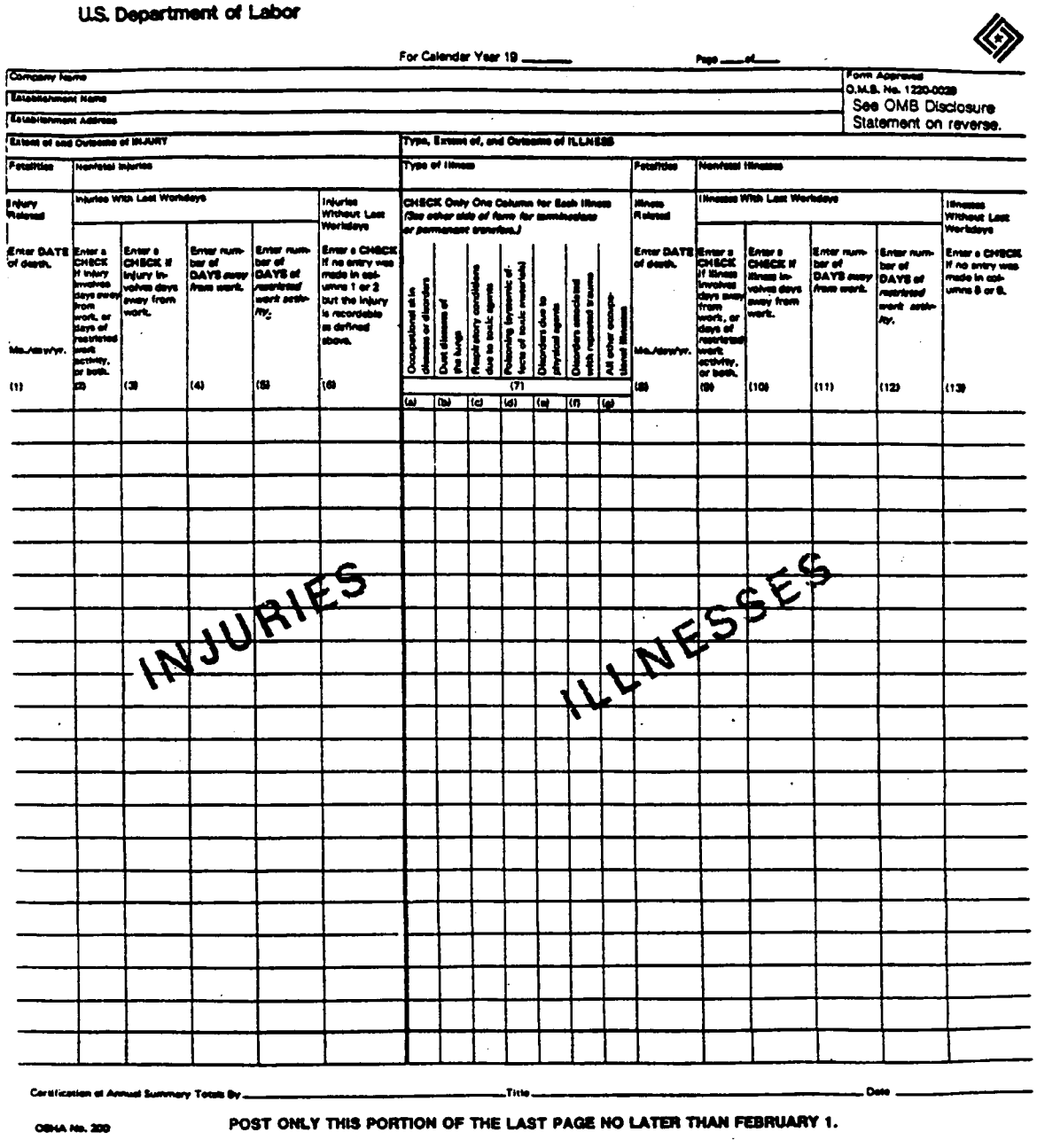

Figure B.1 Example of an instrument to collect data: OSHA 200 Log.

Bureau of Labor Statistics
Log and Summary of Occupational
Injuries and Illnesses

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. (See posting requirements on the other side of form.)			RECORDABLE CASES: You are required to record information about every occupational death; every nonfatal occupational illness; and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). (See definitions on the other side of form.)		
Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo./day.	Enter first name or initial, middle initial, last name.	Enter regular job title, not activity employee was performing when injured or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned, even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution—body.
(A)	(B)	(C)	(D)	(E)	(F)

OSHA No. 200

Figure B.1: (continued)

Example of an instrument to collect data: OSHA 200, page 2.

ACCIDENT REPORT
STATE OF TENNESSEE
DIVISION OF CLAIMS ADMINISTRATION
9TH FLOOR ANDREW JACKSON BUILDING
NASHVILLE, TN 37219-6066
(615) 741-2734

State Agency _____
Budget Code # _____
Location # _____

This form must be used exclusively by all state employees in presenting claims for workers' compensation. All questions must be answered.

TO BE COMPLETED BY EMPLOYEE: Social Security # _____ - _____ - _____

1. Employee's name _____ (First) (M.I.) (Last)
2. Birthdate _____ (Mo. Day Year) Sex _____ Job Title _____
3. Home Address _____ City _____
   State _____ Zip _____ Home Phone (_____) _____
4. Supervisor _____ State Agency Univ. of TN Campus(_____)
5. Office Address _____ City _____ Zip _____ Work Phone # _____
6. Date Employed by State _____
7. Exact location of project where injury occurred _____
   _____ County _____
8. Do duties of employee require being at this location? _____
9. Did employee leave work on day of injury? _____ If not, when did incapacity begin? _____
10. Date of Accident _____

DESCRIPTION OF THE INJURY:

1. State name of machine, tool, or other appliance with which injury occurred _____
2. Describe the injury in detail and state how it occurred _____
   _____
   _____
3. What part of person was injured? _____
4. Probable length of disability _____
5. Did employee lose time from work? _____ How much time? _____
6. Physician's name _____ Address _____
   City _____ State _____ Zip _____ Phone # (_____) _____
7. Date of first visit _____
8. Who authorized visit to physician? _____
9. Was employee hospitalized? _____ Where? _____

Figure B.2 Example of an instrument to collect data: State of Tennessee Accident Report

TO BE COMPLETED BY SUPERVISOR:

1. What position did employee hold when injured? _____

2. Was injury caused by (a) employee's willful misconduct? _____
   (b) intentional self-inflicted injury? _____
   (c) intoxication? _____
   (d) failure or refusal to use safety appliance furnished him? _____
   (e) failure to perform a duty required by law? _____

3. When was first notice of injury given to employer? Date _____ Time _____
   To Whom? _____ Position _____

4. Monthly salary on date of injury $_____ Biweekly employee hourly rate _____

5. If disabled, will employee be on leave without pay during disability? _____

6. Relate any knowledge you may have of injury or what the employee reported to you _____

_____

_____

_____

_____

We, the undersigned, certify that all statements contained herein and on any attachments hereto are true and that the injuries reported were actually incurred. We also acknowledge that it is a misdemeanor to file a false claim with the Division of Claims Administration.

_____ _____
Claimant Date

_____ _____
Supervisor Date

TR-0231 (Rev. 2-94) RDA 1178

Figure B.2: (continued)

Example of an instrument to collect data: State of Tennessee Accident Report, page 2.

APPENDIX C

CODES AND NARRATIVE INFORMATION USED FOR DATA ENTRY

Table C.1 The University of Tennessee
Job Category Codes

Job Categories	Codes
Administration	01
Agricultural Extension	02
Agricultural	03
Athletics	04
Child Care	05
Clerical	06
Computer	07
Construction/Maintenance	08
Doctor/Medical	09
Faculty	10
Food Service	11
Graduate Assistant	12
Housekeeping	13
Lab-Tech	14
Laundry	15
Med-Tech	16
Nursing	17
Paint	18
Pharmacy	19
Physical Therapy	20
Research	22
Veterinarian	23
Police/Security	24

Table C.2 The University of Tennessee
Campus/Location Codes

Campus/Location	Codes
University of Tennessee, Knoxville	01
University of Tennessee Space Institute	02
University of Tennessee, Chattaanooga	04
University of Tennessee, Martin	05
University of Tennessee, Memphis	07
Clinical Education Center, Knoxville	08
Clinical Education Center, Chattanooga	09
University of Tennessee Memorial Research Center	10
University of Tennessee Agricultural Experiment Station	11
University of Tennessee Agricultural Extension Service	12
University of Tennessee Institute for Public Service	13
Municipal Technical Advisory Service	14
County Technical Assistance Service	15
University of Tennessee Continuing Education	16
University-Wide Administration	17
University of Tennessee College of Veterinary Medicine	18
University of Tennessee Memorial Hospital	20
University of Tennessee Family Practice, Knoxville	21
University of Tennessee Family Practice, Jackson	23
University of Tennessee Family Practice, Memphis	24
William F. Bowld Hospital	25

Table C.3 The University of Tennessee
Injury Type Codes

Injury Type	Codes
Amputation	01
Asphyxia	02
Burn	03
Concussion	04
Dermatitis	05
Electric Shock	06
Foreign Body	07
Fracture	08
Hearing Loss	09
Hernia/Rupture	10
Hypertension	11
Inhalation	18
Laceration	12
Multiple	13
Puncture	14
Sprain/Strain	15
Contusion/Avulsion	16
Other	17
Carpal Tunnel	19

Table C.4 The University of Tennessee
Body Part Codes

Body Parts	Codes
Abdomen	30
Ankle	51
Arm	31
Back	32
Chest	33
Eye	34
Face	35
Fingers	36
Foot	37
Groin	38
Leg	41
Multiple	42
Neck	43
Nervous System	44
Respiratory System	50
Shoulder	45
Thigh	46
Toes	47
Trunk	48
Wrist	52

Table C.5 The University of Tennessee
Event Codes

Events	Codes
Bodily Reaction	01
Caught In/On/Un/Between	02
Contact With	03
Slip/Trip/Fall (Elevation)	04
Slip/Trip/Fall (Same Elevation)	05
Overexertion	06
Overexposure	07
Struck Against	08
Struck By	09
Other	10

Table C.6 Questions Answered on Spreadsheet

Question	Appropriate Answer
ID Number	Year of report and row number in the spreadsheet (i.e., 914)
Adjustments denoted by X	Changes to initial entry of lost workdays
Report month and year	Date of OSHA report
Company Code	1 (All University of Tennessee entries)
Injury month, day, and year	Entered numerically
Name	Employee's name from reports
Occupation	Narrative description on reports
Occupation Code	Numerical code (See Table C-1)
Campus Code	3 digit numerical code from reports
Department Code	6 digit numerical code from reports
Injury/Illness Type	Narrative description on reports
Injury/Illness Code	Numerical code (See Table C-3)
Body Part	Narrative description from reports
Body Part Code	Numerical code (See Table C-4)
Fatalities	
Month, day, and year injury related death	Numerical entries
Nonfatal Injuries with Lost Workdays	
Does injury involve days away from work, days of restricted work activity, or both?	0 = No 1 = Yes
Does injury involve days away from work?	0 = No or 1 = Yes
Enter number of days away from work.	Numerical entry
Enter number of days of restricted work.	Numerical entry
Was injury without lost workdays recordable?	0 = No 1 = Yes

Table C.6 (continued)

Question	Appropriate Answer
Nonfatal Illnesses	
Occupational skin disorders?	0 = No or 1 = Yes
Dust diseases of the lungs?	0 = No or 1 = Yes
Respiratory conditions due to toxins?	0 = No or 1 = Yes
Poisoning (systemic effects of toxins)?	0 = No or 1 = Yes
Disorders due to physical agents?	0 = No or 1 = Yes
Disorders due to repeated trauma?	0 = No or 1 = Yes
All other occupational illnesses?	0 = No or 1 = Yes
Illness related fatalities	Enter date of death
Does illness involve days away from work, days of restricted work activity, or both?	0 = No 1 = Yes
Does illness involve days away from work?	0 = No or 1 = Yes
Enter number of days away from work.	Numerical entry
Enter number of days of restricted work.	Numerical entry
Was illness without lost workdays?	0 = No or 1 = Yes
Date of birth	Enter month and year numerically
Date of employment	Enter month and year numerically
Workers' Compensation	0 = No or 1 = Yes
Injury cause or event description	Narrative description
Injury cause or event code	Numerical code (See Table C.5)
Notes	Notes pertaining to analysis

VITA

Nadine White Bush, daughter of Erskine Oren and Veola Blanton White, was born in Cleveland County, North Carolina on July 14, 1939. She grew up in Kings Mountain, North Carolina where she attended public schools and graduated from Kings College in Charlotte, North Carolina in 1959 with a Diploma in General Business. Her professional duties have included accounting supervisor, quality assurance officer, and project manager. In 1995, she graduated Magna Cum Laude with an Associate of Science degree from Pellissippi State Technical Community College and was inducted in the Phi Theta Kappa honor society. She graduated Magna Cum Laude in 1996 from Tusculum College with a Bachelor of Science in Applied Organizational Management. In 1997, she began work toward completion of the requirements for a Master of Science degree in Safety Education and Service.