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AN ANALYSIS OF THE WORK RELATED FATALITIES IN UTAH AS REPORTED TO THE UTAH INDUSTRIAL COMMISSION FOR THE YEARS 1976-1978

by

Dale A. Swiss

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Industrial and Technical Education

UTAH STATE UNIVERSITY
Logan, Utah

1979

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Dale A. Swiss

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

ABSTRACT

An Analysis of the Work Related Fatalities in Utah as Reported to the Utah Industrial Commission for the Years 1976-1978

by

Dale A. Swiss, Master of Science

Utah State University, 1979

Major Professor: Dr. Austin G. Loveless
Department: Industrial and Technical Education

It was the objective of this study to determine the common denominators involved with the work-related fatalities and their strengths.

An analysis using the X^2 statistic was conducted on all the work-related fatalities reported to the Utah Industrial Commission during the period January 1, 1976, through December 31, 1978.

It was determined that Age and Time on the Job were the two areas with the greatest significance difference as common denominators. It was concluded that there was a need for training programs to offset the effects of both age and time on the job.

(69 pages)

CHAPTER I

INTRODUCTION

The American way of life has evolved to such a state that people are constantly being subjected to the dangers of accidents.

Heinrich defines an accident as:

> . . . an unplanned and uncontrolled event in which the action or reaction of an object, substance, person, or radiation results in personal injury or the probability thereof.[1]

> In modern day, the fourth leading cause of death in this country is accidents. Only heart disease, cancer and stroke outrank accidents as the cause of death.[2]

The number of accidental deaths and disabling injuries for the year 1978 are listed in Figure 1 and are contrasted to the previous year of 1977 by the percentage of change.

The National Safety Council reported that in the United States alone there were 105,500 accidental deaths in 1978, an increase of 1 percent over 1977. Many of the deaths that are listed as accidental could have been avoided by accident prevention devices or an improved safety attitude.

For example, research into the cause of motor-vehicle accidents and fatalities has revealed that many could have been prevented by

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[1]H. W. Heinrich and others, Industrial Accident Prevention, A Scientific Approach. 4th Edition (New Gork: McGraw-Hill Co., 1959), p. 480.

[2]Howard C. Smith, An Experimental Study Involving Basic Automotive High School Students in Comparing Auto Shop Safety Habits As They Relate to Student GPA and to Classroom Safety Instruction. (M.S. Thesis, Brigham Young University, Industrial Education Department, 1975), pp. 13-14.

TYPE	DEATHS	CHANGE FROM 1977	DISABLING INJURIES
MOTOR-VEHICLE	51,900	+5%	2,000,000
WORK RELATED	13,300	+2%	2,300,000
HOME	23,500	-2%	3,500,000
PUBLIC	21,500	-2%	2,700,000
GRAND TOTAL	105,500*	+1%	10,700,000*

*Deaths and injuries above for the four separate classes total more than national figures due to rounding and because some deaths and injuries are included in more than one class.

Fig. 1. Accidental deaths and disabling injuries for 1978.[3]

doing some of the following: wearing protective seat and shoulder belts, taking frequent rest stops, driving within the speed limits, driving defensively, etc.[4]

Studies have shown that 58 percent of the highway fatalities were involved when the cars left the highway; 75 percent of those leaving the highway struck a fixed object.[5]

Additional research has brought about the designing of safety and accident prevention materials in an attempt to minimize the effect

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[3]National Safety Council, Accident Facts 1979 Edition, (Chicago: National Safety Council, 1979), p. 3.

[4]Ann Dear, "Lets Stop Building Killer Highways," Readers Digest June 1976, pp. 140-145.

[5]Ibid.

of a head-on collision with a fixed object and thus prevent further fatalities.

Some of these safety protection devices are: break-away light and sign poles, crash cushions, continuous guard rails, rough surfaces on the highways, Bott Dots, rumble strips, pavement grooving, etc.[6]

As an example of what can be done, California has been able to cut the number of highway accident fatalities by 58 percent by installing Bott Dots, break-away light and sign poles, and continuous guard rails along its highways.[7]

The success in reducing the number of highway deaths is due in part to research into the causes of those deaths and then taking steps to prevent further deaths.

The nation's highways were not the only place where accidental deaths occurred and by the same token research into the causes of deaths can be used in other areas as well. For this study the area of concern is "work related" fatalities.

There were 13,300 fatalities and 2,300,000 disabling injuries in the category of "work related" for 1978 listed in Figure 1.

> Work accidents are unintended occurrences [which arise] out of employment. These accidents fall into two general categories. The first includes accidents resulting in work injuries or deaths. The second type includes accidents that cause property damage.[8]

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[6] U.S. News & World Report, "On the Roads: Ideas That Are Saving Lives," February 1976, pp. 46-47.

[7] Ann Dear, "Let's Stop Building Killer Highways," p. 144.

[8] National Safety Council, Accident Prevention Manual, 4th edition (Chicago: National Safety Council), p. 9.

When an employee is injured or killed while at work in Utah, the employer is responsible to report and record the injury or death to the Industrial Commission of the state within six working days of the time he receives the report of the accident.[9]

At the end of each calendar year, the State Industrial Commission compiles the work related deaths and disabling injuries that have been reported to them and reports these state-wide figures to the Bureau of Labor Statistics, U.S. Department of Labor for the national totals.

> Work related fatalities and disabling injuries continue to be part of the workplace in Utah. Although these numbers have decreased in the past few years, occupational illness and injury continue to be a major threat, not only to the unfortunate victims but also to business and industry. Indirectly it affects all Utahns through lower productivity, increased workman's compensation and insurance rates, and ultimately, higher prices for goods and services.
>
> Statistics show that approximately 85 percent of all work-related injuries involve human error. So, if we are to significantly reduce these injuries, we must deal with human factors - make the worker aware of potential hazards which are associated with his or her employment.[10]

Often in the process of making the worker aware of the potential hazards there are areas missed because of a lack of knowledge of all areas of the danger. Hopefully, by studying past work related fatalities and disabling injuries, the possibility of bringing to light many of the missing areas of danger would be greatly increased.

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[9] U.S. Department of Labor: Bureau of Labor Statistics, What Every Employer Needs to Know about OSHA Recordkeeping, (Washington, D.C.: Government Printing Office, 1978), p. 4.

[10] Occupational Safety and Health Management Services, Training Programs and Audio-Visual Guide, (Logan: Utah State University; Extension and Continuing Education, 1979), p. v.

Statement of the problem

The existence of any common denominators involved in the work related fatalities in Utah as reported to the State Industrial Commission for the years 1976-1978 has not been determined.

Purpose

The purpose of this study was to determine if there were any common denominators and how they correlated to the work-related fatalities reported in Utah for the years 1976-1978.

Objectives

This study attempted to determine the following:

1. If there were common denominators involved with the work related fatalities in Utah for the years 1976-1978.

2. The statistical significance of the common denominators that were involved with the work related fatalities in Utah for the years 1976-1978.

3. The strength of the correlation between the common denominator and the ten Industrial Classifications as set forth by the State Industrial Commission.

4. The strength of the correlation between the common denominator and the eleven Occupational Groups as set forth by the State Industrial Commission.

5. The implications for training programs as related to the common denominators involved with the work related fatalities in Utah for the years 1976-1978.

Procedure

1. Obtain from the UOSHA division of the Utah State Industrial Commission the number of work related fatalities for the years 1976-1978.

2. Obtain copies of the "Employer's First Report of Injury" for each of the reported work related fatalities in Utah for the years 1976-1978.

3. Analyze the data from the "Employer's First Report of Injury" form to determine if there are any factors common to the accidents in the following areas: nature of injury, part of the body affected, source of injury, accident type, age of the victim, sex of the victim, marital status, length of time with the employer, time at the same position, time of day, hour of the shift, day of the week, wage scale, hours worked per day, and days worked per week for the ten Industrial Classifications and the eleven Occupational Groups as set forth by the State Industrial Commission; these would then be classified as common denominators.

4. Determine the statistical significance of the common denominators involved with the work related fatalities for the years 1976-1978.

5. Determine the strength of the correlation between the common denominators and the ten Industrial Classifications.

6. Determine the strength of the correlation between the common denominators and the eleven Occupational Groups.

7. Determine the implications for training programs as related to the common denominators involved with the work related fatalities in Utah for the years 1976-1978.

Delimitations

This study will deal only with the work related fatalities that were reported to the Utah State Industrial Commission for the years 1976-1978.

Limitations

The State Industrial Commission has been using the "Employers First Report of Injury," form for the years 1976-1978. Because of the lack of data before the year 1976 and the different style of recording work related fatalities, it would be impossible to obtain the proper data to include the years before 1976.

Definition of terms used

Accident type. Identifies the event which directly resulted in the injury.

Bureau of Labor Statistics. The division of the Bureau of Labor that is responsible for obtaining from each state their work-related accident statistics at the end of each year.

First Report of Injury form. The form that is filled out by the employer and filed with the Utah State Industrial Commission whenever there is a serious work-related accident, illness, or death.

Nature of injury. Classifies injuries in terms of their principal physical characteristic.

Occupational group (11). As set up by the United States Census Bureau, Professional/Technical/Kindred Workers, Managers/Administrators (except farm), Sales Workers, Clerical/Kindred Workers, Craftsmen/ Kindred Workers, Operatives (except Transport), Transport Operatives,

Laborers (except farm), Farmers and Farm Managers, Service Workers, and Protective Service Workers.

OSHA. The Occupational Safety and Health Administration.

OSHAct. The Occupational Safety and Health Act of 1970, commonly known as the Williams-Steiger Act.

Part of the body affected. Identifies the part of the injured person's body directly affected by the injury identified in "Nature of Injury."

Source of injury. Identifies the object, substance, exposure, or bodily motion which directly produced or inflicted the injury identified in "Nature of Injury."

Standard Industrial Classification (10). As set up by the Office of Management and Budget of the State Industrial Commission, Agriculture, Mining, Construction, Manufacturing, Transportation/ Public Utilities, Wholesale Trade, Retail Trade, Finance/Insurance/ Real Estate, Services, and Public Administration (Federal employees excluded).

UOSHA. The Utah Occupational Safety and Health Administration.

CHAPTER II

REVIEW OF LITERATURE

Introduction

In reviewing literature for a study of work-related fatalities it is necessary to examine two major areas. The first area to be reviewed is that of responsibility in reporting and recording, and the second area is that of past studies in work-related fatalities.

The Occupational Safety and Health Act

On December 29, 1970, President Richard M. Nixon signed the bill which put into law the Occupational Safety and Health Act of 1970, commonly known as the Williams-Steiger Act (OSHAct).

> The Congress of the United States declared that the purpose of this piece of legislation is "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources."[1]

When the OSHAct took effect on April 28, 1971, there also came a set of new rules and regulations for the employers. Except for specific exclusions, every employer with one or more employees, who is engaged in a business affecting commerce, is under the OSHAct regulations.

The duties of the employer became as follows:

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[1]National Safety Council, Handbook of Occupational Safety and Health, (Chicago: National Safety Council, 1975), p. 22.

1. To furnish each of his employees employment and a place of employment which is free from recognized hazards that are causing or likely to cause death or serious physical harm (this is commonly known as the "general duty clause").

2. To comply with safety and health standards promulgated under the act.

The duties of the employees became as follows:

1. To comply with the safety and health standards and all rules, regulations and orders which are applicable to his own actions and conduct on the job.

The Rights of the employee became as follows:

1. The rights with respect to the standards--the employee has the right to begin proceedings for either adoption or revoking of a standard; he or she may file objection to a standard; he or she may participate in OSHA hearings for a employers' variance of a standard.

2. The rights with respect to information--the employee has the right to all information regarding protection and obligations, all hazardous materials, their medical history and exposure to harmful substances, and all information on any substance thought to be harmful.

3. The rights with respect to enforcement--the employee has the right to confer with the compliance officer in connection with an inspection of an establishment, to special inspections if he believes there is a violation, to have his or her identity remain confidential, and the right to file a complaint to OSHA if he or she feels they have been discriminated against because they asserted their rights under the act.[2]

Along with the duties of the employer already mentioned there came responsibility for record keeping. The OSHAct has the requirement that complete records be kept of all serious injuries, illnesses and deaths.

In a memo sent to field personnel, OSHA has explained when employers must report work-related fatalities to OSHA. The

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[2]Ibid., pp. 23-24.

> Bureau of Labor Statistics had pointed out that some work deaths were not being recorded on its OSHA record keeping forms because employers were not sure whether OSHA had jurisdiction.
>
> In a few circumstances, for example a highway death where OSHA lacks jurisdiction, it may not be necessary to report the fatality to OSHA or the approved state agency within 48 hours. However employers must report all work-related serious injuries, illnesses, and deaths in the Log of Occupational Injuries and illnesses (OSHA #100 or the state equivalent), in the Annual Summary (OSHA #102), and in the Annual Survey Report (OSHA #103), if the employer is requested to participate.[3]

In the state of Utah each employer is required to fill out the "First Report of Injury Form" (UOSH #122)(Appendix) whenever there has been a serious injury, illness, or death on the job. The employer is required to file a copy of this form in his personal files and to send a copy to the Utah State Industrial Commission within five working days of the accident. The employer is also required to record the injury, illness, or death in his Annual Summary (OSHA #102) form of occupational injuries and illnesses.

At the end of every year each state is required to compile a statewide report of all serious occupational injuries, illnesses, and deaths and to send a copy of this report to the Bureau of Labor Statistics. These state reports are used in making up the national report of the work-related accidents, and, for future study.

Work related fatalities

In 1978 the National Safety Council and the Bureau of Labor Statistics reported that

> Between 1912 and 1977, accidental work deaths were reduced by 71%, from 21 to 6 per 100,000 population. In 1912, an estimated

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[3]"OSHA News Briefs," Job Safety and Health, (Nov. 1974), p. 3.

> 18,000 to 21,000 workers lives were lost. In 1977, in a work force more than double in size and producing more than eight times as much, there were only 13,000 work deaths.[4]

Even with the decrease of 71 percent in the amount of deaths per 100,000 of population, the number of lives lost per year is far too many. The question has been raised concerning what can be done to avoid the work-related death. Studies of past work-related accidents have shown that there are three possible ways to help prevent work-related deaths. These are: first, more safety rules from OSHA; second, better education of the workers in safety; and third, studies of past work-related deaths to bring to light possible hidden problems in work-related accidental deaths.

More rules from OSHA

Almost from the very beginning the 1970 OSHAct has come under fire from employers and others who have felt that it imposed too many rules and regulations. Unfortunately OSHA has become the scapegoat for many problems that are placed upon the employer by other agencies, but some of the rules enforced by OSHA do have problems.

After doing away with over 900 of the so-called "Silly Rules," Eula Bingham, present head of the Federal OSHA, was asked if there is a choice to be made between job safety and health and the cost of providing it. Her reply was as follows:

> We have not often had to face that issue. The act mandates that we provide a safe and healthful workplace. The Department of Labor is also very interested in providing jobs for workers. So we have to look at our regulations closely, because it is a

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[4]National Safety Council, Accident Facts 1978 Edition, (Chicago: National Safety Council, 1978), p. 23.

> serious matter to put one into effect that might require a plant to shut down because it can't afford to comply. But a worker should not have to lay his or her life on the line just to have a job. There is something wrong with that.
>
> It should not be an either/or situation--either you must work in an unsafe environment, or not work at all. We have to change that attitude and we have to somehow catch up with the need for better occupational safety and health. Catching up is an immense problem, because we went for years without doing anything about safety and health on the job.[5]

Better education of the workers on safety

A second possible answer in helping prevent work-related deaths is better education of the workers in the area of job safety.

A Government Study entitled "Target Industries: Profiles of Five Hazardous Occupations," was conducted in 1972, for the purpose of outlining the hazards of the five industries with the highest accident rates. The industries were--Sheet Metal and Roofing, Long Shoring, Lumber and Logging, Meat Processing, and Mobile Homes. The study brought out that all five industries had built-in hazards and dangers in common and that ". . . a hazardous environment by itself doesn't cause injuries, let alone frequent injuries."[6]

The study also found that worker attitude was a problem.

> To bring down the injury frequency rate requires a concerted effort on the part of all those concerned. It requires that workers have available the safeguards and protection devices they need. It also requires that they use them.

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[5]Eula Bingham, quoted in U.S. News & World Report, "Out Go Silly Rules on Worker Safety," (Jan. 16, 1978), pp. 65-66.

[6]U.S. Government, The Target Industries: Profiles of Five Hazardous Occupations, (Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, No. 2915-0014, 1972), p. 3.

> Unfortunately, when danger becomes a part of the everyday routine some workers, over a period of time, become indifferent or careless. The consequences can be, and all too often, are disasterious.
>
> No one has been able to overcome the indifference of some men to danger. The attitude of "it will never happen to us," is not uncommon among men who consider themselves rugged. Perhaps extensive safety training programs combined with a concerted, safety-oriented campaign will help influence workers to think safely.[7]

Along with the idea of "it will never happen to us," the study found that "plain carelessness and inattention" is probably the main cause of most of these accidents.[8]

Teaching workers safe habits and training them in the safe use of equipment is a challenge that has to be met by every employer. What kind of involvement must the employer play in the safety training? What does it take to train a worker in the skill of "thinking safely"? How can an employee best be trained in an attitude of safety?

In 1977 a study using the behavioral approach to safety was undertaken by Komaki, Barwick, and Scott, to see if the safety training of employees in a food processing plant could be positively affected.

> The behavior analysis approach was used to improve worker safety in two departments in a food manufacturing plant. Desired safety practices were identified, permitting construction of observational codes suitable for observing workers' on-the-job performance over a twenty-five week period of time. The intervention consisted of an explanation and visual presentation of desired behaviors, as well as frequent lowcost reinforcement in the form of feed back. Employees in the two departments substantially improved their safety performance from 70% & 72% to 96% & 99% respectively after the introduction of the program. During the reversal phase performance returned to 71% & 72%. It was

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[7] Ibid., pp. 4-5.

[8] Ibid., p. 10.

concluded that the intervention, particularly the frequent feedback, was effective in improving safety performance.[9]

The food manufacturing company was having particular problems with the second shift of employees in the make-up and wrapping department. Nineteen out of 39 accidents occurred in these departments during the previous year, and of the 19 accidents, 14 of them occurred during the second shift.

> Several reasons were suggested for the higher proportion of accidents during the second shift. The work area was in greater disarray following a full work day and there were less experienced workers and supervisors.[10]

After determining in which areas the accidents were concentrated, previous safety efforts were ascertained and causes of previous injuries were assessed. The study was able to determine the following information.

> New hirerers received no formalized safety training. On a day to day basis, safety was rarely mentioned. No single person was responsible for safety. There was little, if any, positive reinforcement for performance of safety. Little or nothing was said or done by management or co-workers when employees took the time to act in a safe manner. At the same time employees were not provided with opportunities to learn to avoid unsafe practices.[11]

After implementing a safety program the employees were even having competition between departments to see which area could keep the highest safety record. At the conclusion of the 25-week test period the safety records unfortunately seem to go out-the-window. With no person in the plant to continue the program, the employees

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[9] Judi Komaki, Kenneth Barwick, Lawrence R. Scott, "A Behavioral Approach to Occupational Safety: Pinpointing and Reinforcing Safe Performance in a Food Manufacturing Plant," Journal of Applied Psycology, (Aug. 1978), p. 434.

[10] Ibid., p. 437. [11] Ibid.

reverted to their previous "unsafe" habits. To combat the reversion the employer made the following changes.

> Continual suggestions were made about plant personnel learning to observe, record and post the safety level. Little progress was made, until the President saw the results of the reversal phase. (In the reversal phase their safety levels reverted to the preprogram low of 71% & 72%.) Within two weeks an employee was appointed and trained to post data for both shifts on an average of once a week.
>
> Within one year the injury frequency rate had stabilized at less than ten lost-time accidents per 1,000,000 man hours worked, a relatively low figure. The plant moved from last to first place in company safety standings.[12]

The challenge of educating workers in safety is an important step in helping to prevent work-related accidents and deaths.

Studies of past work-related accidents and deaths

The third area of possible prevention of work-related accidents and deaths is the study of past accidents and deaths. By studying things of the past and looking for causes and effects, greater insights are gained in preventing future events of a similar nature.

At the present time the number of work-related death studies is relatively small. A review of Abstracts of Instructional Materials in Vocational and Technical Education (AIM), Abstracts of Research Materials in Vocational and Technical Education (ARM), and Current Journals in Education revealed no studies that dealt with work-related deaths.

A review of Educational Research Information Center (ERIC), revealed only one study which dealt with work-related deaths.

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[12] Ibid., p. 441.

Although the number of studies of work-related deaths is small, their value is growing as a tool in helping to prevent future work-related deaths of a similar nature.

> A year-long study of the causes of on-the-job deaths among fire fighters has been launched by the International Association of Fire Fighters (IAFF). The union will conduct the study as part of an all-out effort to "reduce the tragic number of on-the-job deaths of fire fighters."
>
> The union hopes that the results of the study will stimulate further research in effective safety and health standards for fire fighters.[13]

By studying all of the related information on the cause and events leading up to a work-related death, patterns and similar problems can be identified.

In 1977 a mortality study of the AFL-CIO United Brotherhood of Carpenters and Jointers was concluded for the U.S. Government. The Study took in the years 1968-1970, and 1971-1972.

The Study dealt not only with the accidental deaths but also the occupational illness rates for members of the union. From the study several things were brought to light about safety on the job and prevention of work-related accidental deaths.

> One of the groups of accidental deaths was caused strictly by falls from scaffolding. Another group of deaths was caused by falls from roofs. A third large group of deaths was caused by electrocution either from contact with defective hand power tools or from contact with high tension wires.[14]

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[13]"Spotlight," Job Safety and Health, (Nov. 1974), p. 34.

[14]Samual H. Miliham, "Mortality Experience of the AFL-CIO United Brotherhood of Carpenters and Jointers," (Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, No. 017-033-00296-7, 1978), p. 5.

From the study of the groups of accidental deaths the following safety recommendations were made.

> Accidental falls from scaffolding could be prevented or minimized by the use of scaffolding safety rails and toe boards. Falls from roofs could be prevented by the use of some sort of safety harness. Accidental electrocutions could be prevented by the use of nonconductive ladders, properly grounding and repairing defective power hand tools, and insulation cranes so the cab and controls are electrically separate from the boom.[15]

Some studies are done quite quickly after work-related accidental deaths, especially when there is suspicion of a violation of the OSHAct regulations on safety and health. Such was the case during the summer of 1978 when 71 men were killed when a scaffolding collapsed in West Virginia.

> A seven-man investigating team from the Federal OSHA refused to comment on the accident cause until after they had finished "our own test, by our own standards," according to OSHA's David Rhone.[16]

There was suspicion that the major contracting company, for which the men were working, had violated some of the OSHAct regulations in the cooling tower accident. After completing their test the OSHA officials came to the following conclusions.

> The disaster was a direct result of illegal corner cutting on the part of the main company. OSHA accused the firm of ten "willful violations," three of which contributed to the tragedy. 1) The concrete mix wasn't strong enough to hold the scaffolding, workers, and equipment; 2) the catheads used to lift the heavy buckets of concrete were inadequately anchored; 3) they did not use enough bolts to secure the beams which supported the scaffolding.[17]

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[15] Ibid., p. 5, 11.

[16] Richard Boeth, Don Marsh, and Deborah Witherspoon, "The Deadly Scaffold," Newsweek (May 8, 1978), p. 43.

[17] Merril Sheils, and John Walcott, "Behind the Tower Tragedy," Newsweek, (June 19, 1978), p. 59.

Although the Federal OSHA can't bring back the lives of the 71 men who were killed, by investigating the tragedy they were able to pinpoint the cause of their deaths and by so doing hopefully prevent any further accident of a similar nature.

Not all work-related deaths have causes that can be located as quickly or easily as in the case of the cooling tower disaster in West Virginia. Often there may seem to be no real cause or reason for the death other than an "accident." A study by R. H. Van Zelst that dealt with the effect of age and experience upon accident rate has brought out the fact that there are often many factors that can influence an accident.

> In studying this accident rate graph (fig. 1) the effect of job experience upon the accident rate of these workers appears to be considerable for the first five months of employment, but seems to be of little significance beyond the fifth month of employment. Apparently five months of on-the-job duties is sufficient for these workers on this particular type of operation to become well enough trained to reduce the accident rate to what may be considered normal expectancy.[18]

In fig. 1 the accident rate started off at a high rate of almost six accidents per 1,000 man hours. After five months the rate of accidents was down to the "normal expectancy," of 3-4 accidents per 1,000 man hours. (See Figure 2.)

The study also compared the first group (fig. 1) of workers who had not previously had training before beginning their work at the plant to those of a second group (fig. 2) who had received training before beginning their on-the-job experience at the plant.

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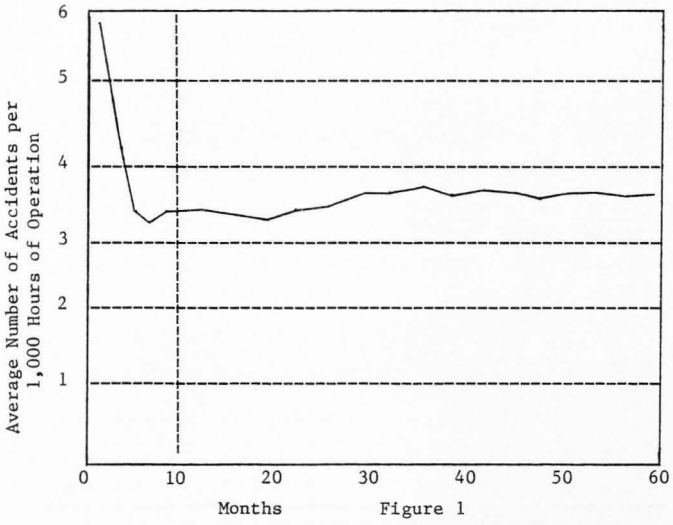
[18] R. H. Van Zelst, "The Effect of Age and Experience upon Accident Rates," Journal of Applied Psychology, (Oct. 1954), p. 315.



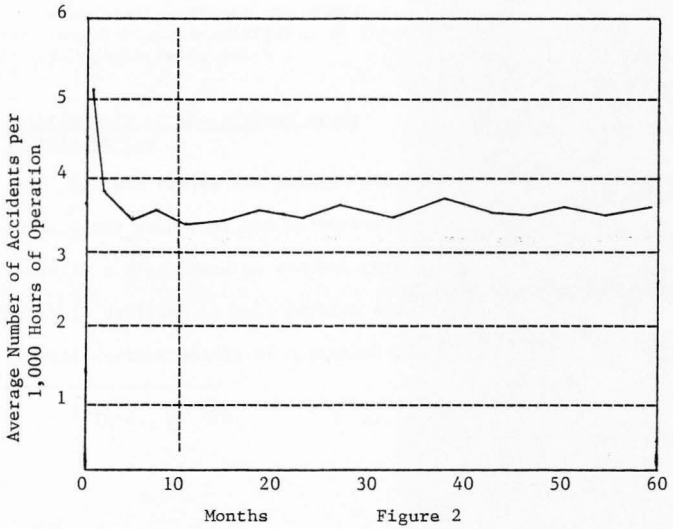


Fig. 2. Figures 1 and 2 from Van Zelst (Oct. 1954, p. 315-317).

The data of the second group for their first 60 months of on-the-job employment is graphically presented in fig. 2.

> Results here follow the same general pattern found for the first group. There is almost an identical sharp decline in accident frequency for the early on-the-job period followed by the same leveling off patern. Of note, however, is the fact that the initial accident frequency rate is markedly lower for this group. Furthermore, the level which approximates what has been termed normal expectancy for the previous group is reached after the third month of on-the-job performance rather than after the fifth.[19]

After having made the work experience comparison, the study went on to make a comparison of age groups and accident rates.

> It would appear that age in this instance apparently exerts a greater influence upon accident rate than does experience once the breaking in period is passed. From the comparison made between matched work groups it has been found that older workers tend to have fewer accidents than their younger co-workers. This appears to be true throughout the employee's work history when similar groups are compared. Lower accident rates are remarkably characteristic of these older men from their earliest job performance on.[20]

Relationship of the present study to this review

As this review has pointed out, over 13,000 workers are losing their lives each year due to work-related accidents and illnesses. There is a great need to prevent this tragic loss of manpower. This study is designed to help provide some of that need by helping to prevent further deaths of a similar nature in the future.

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[19] Ibid., p. 316. [20] Ibid., p. 317.

CHAPTER III

METHODS, PROCEDURES AND FINDINGS

Introduction

The data contained in this analysis has been obtained from the "Employer's First Report of Injury" forms (Appendix) which had been filed with the Utah Industrial Commission. The data was analyzed to determine the following: 1) if there were any common denominators involved in the work-related fatalities in Utah for the years 1976-1978; 2) the strength of those common denominators; and 3) the possible implications for training programs as related to the common denominators.

The subjects

The subjects for this study were those persons who were classified as work-related fatalities by the Industrial Commission, meaning, they had died as a result of a work-related accident or illness during the years 1976-1978.

The procedure

Copies of the "Employer's First Report of Injury" forms were obtained from the UOSHA division of the Industrial Commission for each of the work-related fatalities. The names of the victims, employers, and their addresses were blacked out for the purpose of confidentiality. From each form the following information was obtained: the Standard Industrial Classification; the Occupational Group; Nature of the Injury; Part of the Body; Source of the Injury; Type

of Injury; Age; Sex; Marital Status; Months of Employment; Months on the Job; Time of Day; Hour of the Shift; Day of the Week; Pay Scale; Days Worked per Week; and Hours Worked per Day.

Coding procedures

The data was coded according to the following systems: Standard Industrial Classifications/Office of Management and Budget; Occupational Groups/United States Census Bureau; Nature-Part-Source-Type/ American National Standards Institute (ANSI): Sex/UOSHA; and Marital Status/UOSHA.

Tables 1-17 are the coding tabulation tables which include the breakdown of the number of fatalities in each of the Occupational Groups and Industrial Classifications and the percentage representations.

Tables 18-33 contain the statistical strength correlation measurements for the Occupational Groups and Standard Industrial Classifications in the following areas--Age, Months of Employment, Time on the Job, Time of Day, Hour of the Shift, Day of the Week, Days per Week and Hours per Day.

The percentage breakdowns of the work-related fatalities, for the Standard Industrial Classifications, are shown in Table 1. The single leading classification was Manufacturing with 22.8 percent, followed by Construction with 18.5 percent, Transportation with 17.3 percent and Mining with 16.1 percent. A combined percentage of 18.5 percent was received together by: Wholesale; Retail; Finance; Insurance; Real Estate; Service; and Public Administration. Agriculture was the low rate area with only one work-related death for .6 percent of the total.

TABLE 1

STANDARD INDUSTRIAL CLASSIFICATIONS

Computer Code	Standard Industrial Classifications	Number of Work-related Fatalities	%
0	No classification given	2	1.2
1	Agriculture	1	.6
2	Mining	26	16.1
3	Construction	30	18.5
4	Manufacturing	37	22.8
5	Transportation	28	17.3
6	Wholesale, Retail, F/I/RE, Service Pub. Admin.	38	23.5
	Total	162	

Table 2 is the percentage breakdown of the Occupational Groups for the three year period. The low rate area was that of Service and Protective Services with 4.3 percent. Laborers and Farm were next with 8.0 percent of the deaths for the period. The leading area was that of Craftsmen and Operatives with 38.9 percent, well over one-third of the total fatalities. Transportation was second highest with 29.6 percent and the areas of Professional and Managers with 13.6 percent and Sales and Clerical with 5.6 percent were in third and fourth place respectively.

The American National Standards Institute classifications for Nature of the Injury, Part of the Body, Source of the Injury, and Type

TABLE 2

MAJOR OCCUPATIONAL GROUPS

Computer Code	Major Occupational Groups	Number of Work-related Fatalities	%
0	No group identified	0	--
1	Professional & managers	22	13.6
2	Sales & clerical	9	5.6
3	Craftsmen & operatives	63	38.9
4	Transportation	48	29.6
5	Laborers & farm	13	8.0
6	Service & protective services	7	4.3
	Total	162	

of Accident are listed in Tables 3-6 with their respective percentage breakdowns.

Lacerations, Dislocations, Fractures, and Multiple Injuries led the list in Nature of the Injury area with 64.2 percent. Heart Attack, Asphyxia, and Systemic Effects carried 29.6 percent of the total listed in Table 3. The remaining area of Burns and Electrocution was the lowest of the three areas with only 6.2 percent.

Multiple Parts at 51.2 percent was the area in Table 4 which had the highest number of deaths. Slightly more than 25 percent of the deaths were attributed to Body Systems at 27.2 percent. The body areas of the Head and the Neck were the injured part 16.1 percent of the time. The Trunk, Upper, and Lower Extremities had a combined total of 5.5 percent.

TABLE 3

NATURE OF THE INJURY

Computer Code	Nature of the Injury	Number of Work-related Fatalities	%
0	No code given	0	--
1	Laceration, dislocation, fractures, and mult. inj.	104	64.2
2	Asphyxia, systemic effects, heart attack, and other	48	29.6
3	Burns, electrocution	10	6.2
	Total	162	

TABLE 4

PART OF THE BODY INJURED

Computer Code	Part of the Body Injured	Number of Work-related Fatalities	%
0	No code given	0	--
1	Head, neck	26	16.1
2	Trunk	7	4.3
3	Upper and lower extremities	2	1.2
4	Multiple parts	83	51.2
5	Body systems	44	27.2
	Total	162	

Almost half of the fatalities involved motor-vehicles. As shown in Table 5, this code was responsible for 46.9 percent of the deaths. The second highest source of injury was that of Objects at 25.3 percent. Machinery, Equipment and "Other" were the source for the remaining 45 deaths or 27.8 percent.

TABLE 5

SOURCE OF THE INJURY

Computer Code	Source of the Injury	Number of Work-related Fatalities	%
0	No code given	0	--
1	Objects	41	25.3
2	Machinery, equipment	23	14.2
3	Motor-vehicles	76	46.9
4	Other	22	13.6
	Total	162	

In Table 6 are listed the Types of Accidents. Falls, Struck by, Abraded, Body Reaction, and Overexertion led the list with 59.9 percent of the deaths. Second were work-related motor-vehicle accidents at 30.2 percent. A low percentage of 9.9 percent of the accidents were in the third area of Public Transportation.

The ages of the victims are used to classify the work-related fatalities in Table 7. The ages of 14-20 and 61+ are the two lowest categories with 7.4 percent and 8.6 percent respectively. The 41-60

TABLE 6

TYPE OF ACCIDENT

Computer Code	Type of Accident	Number of Work-related Fatalities	%
0	No code given	0	--
1	Fall, struck, abraded, body reaction, overexertion	97	59.9
2	Public transportation	16	9.9
3	Motor-vehicle	49	30.2
	Total	162	

TABLE 7

AGE OF THE VICTIM

Computer Code	Age of the Victim	Number of Work-related Fatalities	%
0	No age given	2	1.2
1	14-20	12	7.4
2	21-40	96	59.3
3	41-60	38	23.5
4	61+	14	8.6
	Total	162	

group was the second highest with 23.5 percent, and over half of the deaths, 59.3 percent, occurred in the 21-40 age bracket.

Only two women were killed in work-related accidents during the years 1976-1978. In Table 8 the Female percentage was only 1.2 percent while the males accounted for 98.8 percent of the deaths.

TABLE 8

SEX OF THE VICTIM

Computer Code	Sex of the Victim	Number of Work-related Fatalities	%
0	No sex given	0	--
1	Male	160	98.8
2	Female	2	1.2
	Total	162	

The marital status of the victim is shown in Table 9. Of those who lost their lives in work-related accidents in Utah during the three years of this study, 78.4 percent were married, 17.9 percent were single and 3.7 percent were either divorced or separated.

The amount of time an employee had worked for the employer is reflected in Table 10. Those employees who had worked for their employer up to one year were responsible for 48.8 percent of the fatalities. Those who had worked between 1-5 years had 24.0 percent of the deaths, and those who had been with the employer more than five years were responsible for 17.2 percent of the deaths.

TABLE 9

MARITAL STATUS OF THE VICTIM

Computer Code	Marital Status	Number of Work-related Fatalities	%
0	No status given	0	--
1	Single	29	17.9
2	Married	127	78.4
3	Divorced, separated	6	3.7
	Total	162	

TABLE 10

MONTHS OF EMPLOYMENT

Computer Code	Months	Number of Work-related Fatalities	%
0	No time given	16	9.9
1	1-12	79	48.8
2	13-60	39	24.0
3	61+	28	17.2
	Total	162	

The amount of time an employee had worked at the job at which he was working when the accident or illness occurred is reflected in Table 11. As in Table 10, those employees who had been on their jobs for less than one year accounted for the highest percentage,

TABLE 11

MONTHS ON THE JOB

Computer Code	Months	Number of Work-related Fatalities	%
0	No time given	59	36.5
1	1-12	77	47.5
2	13-60	18	11.1
3	61+	8	4.9
	Total	162	

47.5 percent of the deaths. Those who had been at their jobs for 1-5 years were responsible for 11.1 percent of the deaths, and those who had worked at their jobs for over five years accounted for only 4.9 percent of the total.

In Table 12 the work day is broken down into three shifts, day, swing, and graveyard. Of the total work-related fatalities for the three years, 46.9 percent occurred during the day shift, or from 8 a.m.-4 p.m. Graveyard had the lowest amount of fatalities, 32, or 19.8 percent of the total. Swing shift was second with 24.7 percent of the deaths.

Table 13 is the breakdown of a regular eight-hour shift into three categories. The first category is representative of the first half of the work shift; it is the time when 24.1 percent of the work-related deaths occurred. The second half of the shift, hours 5-8, had 20.4 percent of the deaths. The third category is for the 9+ hour shift (those deaths which occurred after the first eight hours

TABLE 12

TIME OF DAY

Computer Code	Time of Day (24-hour clock)	Number of Work-related Fatalities	%
0	No time given	14	8.6
1	8:01-16:00 (Day Shift)	76	46.9
2	16:01-24:00 (Swing Shift)	40	24.7
3	0:01-8:00 (Graveyard Shift)	32	19.8
	Total	162	

TABLE 13

HOUR OF SHIFT

Computer Code	Hour of Shift	Number of Work-related Fatalities	%
0	No time given	70	43.2
1	1st-4th (first half)	39	24.1
2	5th-8th (second half)	33	20.4
3	9th +	20	12.3
	Total	162	

of a shift). In the third category there were 20 deaths or 12.3 percent of the total.

The "normal" five-day work week is Monday through Friday. Table 14 represents the seven-day week divided into three sets of days.

TABLE 14

DAY OF THE WEEK

Computer Code	Day of the Week	Number of Work-related Fatalities	%
0	No day given	0	--
1	Monday, Tuesday	63	38.9
2	Wednesday, Thursday	49	30.2
3	Friday, Saturday, Sunday	50	30.9
	Total	162	

During Monday and Tuesday, the first set, 38.9 percent of the deaths occurred. During the second set of days, Wednesday and Thursday, 30.2 percent of the fatalities occurred. Finally during the third set of days, known as the "weekend period" Friday, Saturday and Sunday, 30.9 percent of the fatalities occurred.

Table 15 is representative of the amount of money being earned by the victim per week at the time of his or her death. Twenty-eight and four tenths percent of the victims were earning $200.00 or less. In the larger middle ground, 48.8 percent were earning between $200.00-$400.00. Only 9.9 percent were earning over $400.00 at the time of their death.

In Table 16 the percentages shown are of those victims who were working a work week of 1-5 days, or those who worked six and seven days per week. The larger number of fatalities occurred within the first group, those who worked 1-5 days per week. Thus 64.2 percent

TABLE 15

PAY SCALE

Computer Code	Pay Scale (Dollars per Week)	Number of Work-related Fatalities	%
0	No scale given	21	12.9
1	$001.00-$200.00	46	28.4
2	$201.00-$400.00	79	48.8
3	$401.00 +	16	9.9
	Total	162	

TABLE 16

DAYS WORKED PER WEEK

Computer Code	Days per Week	Number of Work-related Fatalities	%
0	Number of days not given	22	13.6
1	1-5	104	64.2
2	6, 7	36	22.2
	Total	162	

of the fatalities occurred in the first group while 22.2 percent of the fatalities occurred in the second group, those who were working six or seven days per week.

In Table 17 the hours worked per day by the victim are arranged into two groups, 1-8 hours per day and 9+ hours per day. Of the

TABLE 17

HOURS WORKED PER DAY

Computer Code	Hours Worked per Day	Number of Work-related Fatalities	%
0	No time given	24	14.8
1	1-8	95	58.6
2	9 +	43	26.6
	Total	162	

work-related fatalities for the three year period, 58.6 percent occurred in the first group, those working 1-8 hours per day. Of the victims, 26.6 percent were working a nine-hour day or longer.

Statistical measurement

This study was intended to test the null hypothesis between the common denominators, the Standard Industrial Classifications, and the Occupational Groups. In order to test the strength of the common denominators the X^2 statistical test was used. The statistic is as follows:

$$X^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

where: fo = observed frequency

fe = expected frequency (null-hypothetical)

$\sum$ is taken over all categories.

The data was the complete population of work-related fatalities in Utah for the years 1976-1978. A confidence level of .05 was used to establish the significant difference. Using a one-tailed test with $\alpha = .05$, we would reject when:

$x^2 > 3.84$ when df = 1 $X^2 > 5.99$ when df = 2

df = k - 1 where - k = the number of categories.

The procedure to be followed will be to state the null hypothesis, presentation of the data in Tables 18-33, and a statement of acceptance or rejection of the hypothesis.

The sign of (---) in the X^2 column and the sign (NV) in the action - taken column is an indication that the area did not have enough work-related fatalities in the combined total to use the X^2 statistical measurement.

Findings

Age as compared with Occupational Groups and Standard Industrial Classifications.

Hypothesis: There is no significant difference in the age of those classified as work-related fatalities, in the Occupational Group or the Industrial Classification.

As shown in Table 18, the null hypothesis is rejected in the following areas: Craftsmen & Operatives, Transportation, and Laborers & Farm Workers. The hypothesis is also rejected in Table 19 in the following Industrial Classifications--Mining, and Transportation,

TABLE 18

AGE AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	5.99	3.86	accept
Sales & Clerical	2	5.99	3.76	accept
Crafts & Oper.	3	5.99	19.42	reject
Transportation	4	5.99	15.54	reject
Laborers & Farm	5	5.99	10.23	reject
Service & Prof. Ser.	6	5.99	.76	accept

α = .05 df = 2

TABLE 19

AGE AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	5.99	11.54	reject
Construction	3	5.99	3.26	accept
Manufacturing	4	5.99	3.27	accept
Transportation	5	5.99	8.42	reject
Combined	6	5.99	4.37	accept

α = .05 df = 2

because there is significant differences in those areas as shown by the X^2 value.

Months of employment as compared with Occupational Groups and Standard Industrial Classifications.

Hypothesis: There is no significant difference in the amount of time a person classified as a work-related death had worked for the employer and the Occupational Group or Industrial Classification.

The null hypothesis is rejected in Table 20 in the following areas: Craftsmen & Operatives, and Transportation. Listed in Table 21 are the rejected areas of Mining, Construction, and Transportation because there are significant differences in the amount of time the employee had spent on the job in those areas according to the X^2 values.

TABLE 20

MONTHS OF EMPLOYMENT AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	5.99	---*	NV*
Sales & Clerical	2	5.99	---*	NV*
Craft. & Oper.	3	5.99	135.10	Reject
Transportation	4	5.99	99.77	Reject
Laborers & Farm	5	5.99	---*	NV*
Ser. & Prot. Serv.	6	5.99	---*	NV*

$\alpha = .05$ $df = 2$

*The sign of (---) in the X^2 column and the sign of (NV) in the Action Taken column is an indication that the area of the table did not have enough work-related fatalities in the combined total to use the X^2.

TABLE 21

MONTHS OF EMPLOYMENT AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	5.99	8.28	reject
Construction	3	5.99	15.99	reject
Manufacturing	4	5.99	.91	accept
Transportation	5	5.99	18.51	reject
Combined	6	5.99	4.19	accept
$\alpha = .05$		df = 2		

Time on the job as compared with Occupational Groups and Standard Industrial Classifications.

Hypothesis: There is no significant difference between the amount of time an employee has worked at a job before being killed and the Occupational Group or the Industrial Classification.

As indicated in Tables 22 and 23 respectively, the null hypothesis is rejected in the following areas: 1) Occupational Groups--Craftsmen & Operatives, and Transportation; 2) Industrial Classifications--Construction, and Combined, because the X^2 values for those groups have shown that there are significant differences.

Time of day as compared with Occupational Groups and Standard Industrial Classifications.

Hypothesis: There is no significant difference between the time of day the accident occurred and the Occupational Group or the Industrial Classification.

TABLE 22

TIME ON THE JOB AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	5.99	---	NV
Sales & Clerical	2	5.99	---	NV
Craft. & Oper.	3	5.99	193.58	reject
Trans.	4	5.99	179.93	reject
Laborers; Farm	5	5.99	---	NV
Prot. Ser.	6	5.99	---	NV
$\alpha = .05$	df = 2			

TABLE 23

TIME ON THE JOB AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	5.99	---	NV
Construction	3	5.99	133.64	reject
Manufacturing	4	5.99	---	NV
Transportation	5	5.99	---	NV
Combined	6	5.99	133.26	reject
$\alpha = .05$	df = 2			

As shown in Table 24, the null hypothesis is rejected in the following areas: Professional & Management, Craftsmen & Operatives, Laborers, and Farm. As shown in Table 25, the null hypothesis is

TABLE 24

TIME OF DAY AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	5.99	92.45	reject
Sales & Clerical	2	5.99	1.75	accept
Craft. & Oper.	3	5.99	17.99	reject
Transportation	4	5.99	1.20	accept
Laborers & Farm	5	5.99	12.16	reject
Serv. & Prot. Serv.	6	5.99	1.00	accept
$\alpha = .05$	df = 2			

TABLE 25

TIME OF DAY AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	5.99	.32	accept
Construction	3	5.99	15.07	reject
Manufacturing	4	5.99	6.23	reject
Transportation	5	5.99	6.99	reject
Combined	6	5.99	2.36	accept
$\alpha = .05$	df = 2			

rejected in the following areas: Construction, Manufacturing, and Transportation, because the X^2 values that are shown are significantly different.

Hour of the shift as compared with Occupational Groups and Standard Industrial Classifications.

Hypothesis: There is no significant difference between the hour of the shift the accident occurred and the Occupational Group or the Industrial Classification.

The null hypothesis is rejected in the following areas: 1) Table 26, Occupational Groups--Craftsmen and Operatives; 2) Table 27, Industrial Classifications--Mining, because of the significant differences of the X^2 value.

Day of the week as compared with Occupational Group and Standard Industrial Classification.

Hypothesis: There is no significant difference between the day of the week the accident occurred and the Occupational Group or the Industrial Classification.

TABLE 26

HOUR OF THE SHIFT AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	5.99	4.74	accept
Sales & Clerical	2	5.99	4.00	accept
Craft. & Oper.	3	5.99	10.31	reject
Transportation	4	5.99	.29	accept
Laborers & Farm	5	5.99	2.00	accept
Serv. & Prot. Ser.	6	5.99	1.00	accept

$\alpha = .05$ df = 2

TABLE 27

HOUR OF THE SHIFT AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	5.99	6.50	reject
Construction	3	5.99	2.80	accept
Manufacturing	4	5.99	3.00	accept
Transportation	5	5.99	.63	accept
Combined	6	5.99	1.04	accept
$\alpha = .05$	df = 2			

As shown in Table 28, the null hypothesis is accepted in all areas. The null hypothesis is rejected for the Combined area in Table 29 because of the significant value of the X^2.

TABLE 28

DAY OF THE WEEK AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	5.99	1.18	accept
Sales & Clerical	2	5.99	0.00	accept
Crafts & Oper.	3	5.99	.19	accept
Transportation	4	5.99	4.62	accept
Laborers & Farm	5	5.99	.15	accept
Serv. & Prot. Ser.	6	5.99	5.44	accept
$\alpha = .05$	df = 2			

TABLE 29

DAY OF THE WEEK AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	5.99	1.54	accept
Construction	3	5.99	1.80	accept
Manufacturing	4	5.99	1.68	accept
Transportation	5	5.99	1.14	accept
Combined	6	5.99	7.09	reject
$\alpha = .05$		df = 2		

Days per week as compared with Occupational Group and Standard Industrial Classification.

Hypothesis: There is no significant difference between the days worked per week by the victim and the Occupational Group or the Industrial Classification.

The null hypothesis is rejected in two areas in Table 30, Craftsmen and Operatives. The hypothesis is also rejected for the following Industrial Classifications as shown in Table 31: Mining, Construction, Manufacturing, and Combined, because of the significant values of X^2.

Hours per day as compared with Occupational Groups and Standard Industrial Classifications.

Hypothesis: There is no significant difference between hours worked per day by the victim and the Occupational Group or the Industrial Classification.

TABLE 30

DAYS PER WEEK AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	3.84	0.00	accept
Sales & Clerical	2	3.84	---	NV
Craft. & Oper.	3	3.84	24.32	reject
Transportation	4	3.84	1.88	accept
Laborers & Farm	5	3.84	.08	accept
Serv. & Prot. Ser.	6	3.84	---	NV
α = .05	df = 1			

TABLE 31

DAYS PER WEEK AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	3.84	4.17	reject
Construction	3	3.84	8.53	reject
Manufacturing	4	3.84	20.57	reject
Transportation	5	3.84	.20	accept
Combined	6	3.84	11.11	reject
α = .05	df = 1			

From Tables 32 and 33 it can be seen that the null hypothesis is rejected in the following areas: 1) Occupational Groups--Craftsmen and Operatives; 2) Industrial Classifications--Mining, Construction,

TABLE 32

HOURS PER DAY AS COMPARED WITH OCCUPATIONAL GROUPS

Occupational Groups and Codes		Crit X^2	X^2	Action Taken
Prof. & Mgr.	1	3.84	.04	accept
Sales & Clerical	2	3.84	---	NV
Craft. & Oper.	3	3.84	44.08	reject
Transportation	4	3.84	2.31	accept
Laborers & Farm	5	3.84	0.00	accept
Serv. & Prot. Ser.	6	3.84	---	NV
$\alpha = .05$	df = 1			

TABLE 33

HOURS PER DAY AS COMPARED WITH INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classifications and Codes		Crit X^2	X^2	Action Taken
Mining	2	3.84	4.84	reject
Construction	3	3.84	7.76	reject
Manufacturing	4	3.84	5.14	reject
Transportation	5	3.84	5.00	reject
Combined	6	3.84	8.53	reject
$\alpha = .05$	df = 1			

Manufacturing, Transportation, and Combined because of the significant differences as shown by the values of X^2.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Each year in the United States thousands of workers lose their lives to work-related accidents. This tragic loss of manpower cost the nation billions of dollars in wage loss, medical expenses, insurance administration, property damage and indirect work loss.

The prevention of work-related accidents, especially those that might result in a death, should be high on the list of priorities of every employer. The knowledge of the cause of accidents can be one of the best tools in their prevention.

The purpose of this study was to determine if there were any common denominators and how they correlated to the work-related fatalities reported in Utah for the years 1976-1978.

The objectives of this study were to determine the following:

1. If there were any common denominators involved with the work-related fatalities in Utah for the years 1976-1978.
2. The statistical significance of the common denominators.
3. The strength of the correlation between the common denominators and the ten Industrial Classifications.
4. The strength of the correlation between the common denominators and the eleven Occupational Groups.
5. The implications for training programs as related to the common denominators involved with the work-related fatalities.

A review of literature in Abstracts of Instructional Materials in Vocational and Technical Education, Abstracts of Research Materials in Vocational and Technical Education, and Abstracts of Current Journals in Education, revealed no data dealing with the study of work-related fatalities in any form. A review of Educational Research Information Center revealed one study dealing with work-related fatalities and mortality rate. The best source of literature was found to be the Work-Related Abstracts, wherein several studies were found which dealt with work-related accidents and death.

In the studies several references were made to the theory that many factors can influence accident rates, such as age, time on the job, and on-the-job training.

During the period of January 1, 1976 to December 31, 1978, there were 162 work-related fatalities in the state of Utah reported to the Industrial Commission.

The data for each of the 162 fatalities in this study was obtained from the "Employer's First Report of Injury" forms that had been filed with the State Industrial Commission.

In examining the data the following areas were analyzed to determine if common denominators were present: Nature of the Injury, Part of the Body Affected, Source of the Injury, Accident Type, Age of the Victim, Sex of the Victim, Marital Status, Length of Time with the Employer, Time at the Same Position, Time of Day, Hour of the Shift, Day of the Week, Wage Scale, Hours Worked per Day, and Days Worked per Week.

To determine the significance and strength of the common

denominators the following eight hypotheses were established relating to the variables.

1. There is no significant difference in the ages of those classified as work-related fatalities, in the Occupational Group or Industrial Classification.

2. There is no significant difference in the amount of time the people classified as a work-related fatality had worked for their employers and the Occupational Group or the Industrial Classification.

3. There is no significant difference between the amount of time an employee had worked at a job before being killed and the Occupational Group or the Industrial Classification.

4. There is no significant difference between the time of day the accident occurred and the Occupational Group or the Industrial Classification.

5. There is no significant difference between the hour of the shift when the accident occurred and the Occupational Group or the Industrial Classification.

6. There is no significant difference between the day of the week the accident occurred and the Occupational Group or the Industrial Classification.

7. There is no significant difference between the days worked per week by the victim and the Occupational Group or the Industrial Classification.

8. There is no significant difference between the hours worked per day by the victim and the Occupational Group or the Industrial Classification.

Finding number 27 dealing with identification of the common denominators is related to objectives one and two. Findings numbers 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, and 26, dealing with the strength of the common denominators are related to objectives three, four, and five.

Findings

1. There were 162 work-related deaths in Utah for the years 1976-1978.

2. The number of the fatalities and the percentages were classified under the Standard Industrial Classification system as follows: Agriculture - 1 (.6%); Mining - 26 (16.1%); Construction - 30 (18.5%); Manufacturing - 37 (22.8%); Transportation - 28 (17.3%); Combined - 38 (23.5%), and No Group Identified - 2 (1.2%).

3. The number of fatalities and the percentages were classified under the Occupational Groups as follows: Professional & Managers - 22 (13.6%); Sales & Clerical - 9 (5.6%); Craftsman & Operatives - 63 (38.9%); Transportation - 48 (29.6%); Laborers & Farm - 13 (8.0%); and Services & Protective Services - 7 (4.3%).

4. A breakdown of the Nature of Injury is as follows: Lacerations, Dislocations, Fractures, and Mult. Inj. - 104 (64.2%); Asphyxia, Systemic Effects, Heart Attack, & Other - 48 (29.6%); and Burns & Electrocution - 10 (6.2%).

5. The fatalities categorized according to Part of the Body Injured were: Head and Neck - 26 (16.1%); Trunk - 7 (4.3%); Upper and Lower Extremities - 2 (1.2%); Multiple Parts - 83 (51.2%); and Body Systems - 44 (27.2%).

6. Under the classification of Source of the Injury the fatalities were separated as follows: Objects - 41 (24.3%); Machinery & Equipment - 23 (14.2%); Motor-vehicle - 76 (46.9%); and Other - 22 (13.6%).

7. The Type of Accident divided the fatalities as follows: Fall, Struck, Abraded, Body Reaction, and Overexertion - 97 (59.9%); Public Transportation - 16 (9.9%); and Motor-vehicle - 49 (30.2%).

8. The victims were divided by age as follows: Fourteen to 20 years old - 12 (7.4%); 21-40 years old - 96 (59.3%); 41-60 years old - 38 (23.5%); and 60+ years old - 14 (8.6%).

9. The first hypothesis stated that there is no significant difference in the age of those classified as work-related fatalities by the Occupational Group or by the Industrial Classification. The following areas were rejected because of the significant concentrations of fatalities according to the age categories: Occupational Groups--Transportation, Craftsmen & Operatives, and Laborer & Farm; Industrial Classifications--Mining, and Transportation.

10. There were 160 males and two females reported as work-related fatalities during the three year period.

11. Out of the 162 fatalities, 127 (78.4%) were married, 29 (17.9%) were single and 6 (3.7%) were divorced or separated.

12. The amount of time the victim had worked for the employer is broken down by months, and the number of fatalities and the percentages are as follow: 1-12 months--79 (48.8%); 13-60 months--39 (24.0%); 61+ months--28 (17.2%); and no time listed--16 (9.9%).

13. The second hypothesis stated that there is no significant difference between the amount of time the victim had been working for the employer and the Occupational Group or the Industrial Classification. The following areas were rejected because of the significant differences in the amount of time the victim had worked for the employer: Occupational Groups--Craftsmen & Operatives, and Transportation; Industrial Classifications--Mining, Construction, and Transportation.

14. The amount of time the victim had worked at the job is broken down and the number of fatalities and the percentages are as follow: 1-12 months--77 (47.5%); 13-60 months--18 (11.1%); 61+ months--8 (4.9%); and no time listed--59 (36.5%).

15. The third hypothesis stated that there is no significant difference between the amount of time the victim had worked on the job and the Occupational Group or the Industrial Classification. The following areas were rejected because of the significant differences in the amount of time the victim had worked on the job: Occupational Groups--Craftsmen & Operatives, and Transportation; Industrial Classifications--Construction and Combined.

16. There were 76 fatalities (46.9%) during the hours of 8 a.m. to 4 p.m., 40 fatalities (24.7%) between 4 p.m. and 12 a.m., and 32 fatalities (19.8%) between 12 a.m. and 8 a.m. There were 14 fatalities (8.6%) with no time of the accident listed.

17. The fourth hypothesis stated that there is no significant difference between the time of day the accident occurred and the Occupational Group or the Industrial Classification. The following

areas were rejected because of the significant differences in the time of day the accident had occurred: Occupational Groups--Professional & Management, Craftsmen & Operatives, and Laborers & Farm; Industrial Classifications--Construction, Manufacturing, and Transportation.

18. During the first four hours of the shift there were 39 fatalities (24.1%), during the second four hours of the shift there were 33 fatalities (20.4%), and after the first eight hours of the shift there were 20 fatalities (12.3%). There were 70 fatalities (43.2%) with no time of the shift listed.

19. The fifth hypothesis stated that there is no significant difference between the hour of the shift the accident occurred and the Occupational Group or the Industrial Classification. The following areas were rejected because of significant differences in the hour of the shift when the accident occurred: Occupational Groups--Craftsmen & Operatives; Industrial Classifications--Mining.

20. There were 63 fatalities (38.9%) on Monday or Tuesday, 49 fatalities (30.2%) on Wednesday or Thursday, and 50 fatalities (30.9%) on Friday, Saturday or Sunday.

21. The sixth hypothesis stated that there is no significant difference between the day of the week the accident occurred and the Occupational Group or the Industrial Classification. The following areas were rejected because of the significant differences in the days of the week when the accident occurred: Industrial Classifications--Combined.

22. In the area of wage scale the fatalities and percentages were as follows: $001.00 - $200.00/week--46 fatalities (28.4%);

$201.00 - $400.00/week--79 fatalities (48.8%); $400.00+/week--16 fatalities (9.9%); and no wage scale listed--21 fatalities (12.9%).

23. In the category of days worked per week the fatalities and percentages were divided as follows: one to five days/week--104 (64.2%); six or seven days/week--36 (22.2%); and no days/week listed--22 (13.6%).

24. The seventh hypothesis stated that there is no significant difference between the amount of days worked per week by the victim and the Occupational Group or the Industrial Classification. The following areas were rejected because of the significant differences in the amount of days the victim worked per week: Occupational Group--Craftsmen & Operatives; Industrial Classifications--Mining, Construction, Manufacturing, and Combined.

25. The category of hours worked per day was divided as follows: one-eight--95 fatalities (58.6%); nine+ hours--43 fatalities (26.6%); and no hours/day listed--24 fatalities (14.8%).

26. The eighth hypothesis stated that there is no significant difference between the number of hours the victim was working per day and the Occupational Groups or the Industrial Classification. The following areas were rejected because of the significant differences in the number of hours the victim was working: Occupational Groups--Craftsmen & Operatives; Industrial Classifications--Mining, Construction, Manufacturing, Transportation, and Combined.

27. Of the 15 areas of information (Nature, Part, Source, Type, Age, Sex, Marital Status, Months of Employment, Months on the Job, Time of Day, Hour of the Shift, Day of the Week, Pay Scale, Days

Worked per Week and Hours Worked per Day) eight were determined to be significant common denominators. They were Age, Months of Employment, Months on the Job, Time of Day, Hour of the Shift, Day of the Week, Days Worked per Week and Hours Worked per Day.

To determine their strength, each of the eight common denominators was statistically analyzed in comparison with the eleven Occupational Groups and the ten Standard Industrial Classifications.

General conclusions

It can be concluded from this study that there are many factors that can influence work-related accidents and fatalities. Several of the common denominators identified in this study are quite weak in their effect upon work-related accidents but at the same time there are two common denominators that are very strong as accident influencing factors. Time on the Job and Age are the two strongest common denominators as identified in this study.

It can be concluded that there is a need to offset the influence of Time on the Job and Age. It also can be concluded that there is a need to offset the effects of any factors which can negatively influence the accident and fatality rates.

Although many areas of this study have shown large numbers of fatalities concentrated by groups, it is inappropriate to conclude that the areas are significant without knowing the corresponding percentages of the work force involved in each group.

Recommendations

The recommendations that may be drawn from the findings and conclusions of this study are listed below.

1. It is recommended that training programs be developed and implemented in the following areas to help offset the influence of Time on the Job, and Age: (a) Extensive preemployment training in the areas of safety and health to the end of making the new employee aware of the dangers. (b) Ongoing training in safety and health to the end of keeping the employee aware of the dangers. (c) More in-depth training for those of the younger age categories to help offset the influence of age.

2. It is recommended that research should be conducted again into the area of common denominators that are involved not only in accidents that result in fatalities but those that are an influence in all work-related accidents. The value of the research could be increased by taking in larger populations or wider distributions.

3. It is recommended that research be conducted into the correlation between the percentages of the work force in Utah and the percentages of the fatalities as determined by the common denominators.

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APPENDIX

UOSH No. 122

Case or file number

EMPLOYER'S FIRST REPORT OF INJURY

ORIG: INDUSTRIAL COMMISSION CC: INSURANCE CARRIER CC: EMPLOYEE

This form contains all items requested on OSHA Form 101 – "Supplementary Record of Occupational Injuries and Illnesses"

THE Industrial Commission of Utah — **350 East 500 South – Salt Lake City, Utah 84111**

Do NOT Use These Spaces

Case Number

Claim Number

Adjuster

Class Cause

Employer

1. EMPLOYER'S NAME ..... (Individual, Partnership, or Firm Name)
2. UNEMPLOYMENT INSURANCE NUMBER ..... – ..... – .....
3. MAIL ADDRESS ..... Zip ..... Phone .....
4. LOCATION IF DIFFERENT FROM MAIL ADDRESS .....
5. NATURE OF BUSINESS .....
6. (IMPORTANT) NAME OF INSURANCE CARRIER .....
7. REPORT OF INJURY WAS MADE TO ..... (Name) (Position) (Date Reported)

Employee

8. NAME OF INJURED EMPLOYEE ..... Date of Birth .....
9. HOME ADDRESS ..... (Street & Number) (City) (Zip)
10. SOCIAL SECURITY NUMBER ..... MARITAL STATUS ..... AGE ..... SEX .....
11. OCCUPATION ..... (Enter regular job title, NOT the specific activity he was performing at time of injury)
12. LENGTH OF TIME EMPLOYED BY ABOVE NAMED EMPLOYER ..... TIME IN SAME POSITION .....
13. DEPARTMENT ..... (Department or division where injured was regularly employed, regardless of place of injury)
14. NUMBER OF HOURS WORKED PER DAY ..... NUMBER OF DAYS EMPLOYEE WORKS PER WEEK .....
15. WAGES: PER HOUR $ ..... OR PER DAY $ ..... OR PER WEEK $ ..... OR PER MONTH $ .....
16. IF ON COMMISSION OR PIECE BASIS, GIVE AVERAGE EARNINGS $ ..... PER .....
17. (IMPORTANT) NAME OF WIFE AND OTHER MINOR DEPENDENTS AND THEIR BIRTH DATES:

Dependents

Name	Relationship	Birthdate	Present Address

Accident Details

18. DATE of INJURY or DIAGNOSIS OF ILLNESS ..... HOUR OF DAY ..... HOUR SHIFT COMMENCED .....
19. INJURED LEFT WORK ..... IF SO, GIVE DATE .....
    HAS INJURED RETURNED TO WORK ..... IF SO, GIVE DATE .....
20. WAS PLACE OF ACCIDENT OR EXPOSURE ON EMPLOYER'S PREMISES ..... WAS INJURY FATAL .....
21. IF SO, GIVE DATE OF DEATH ..... PLACE OF ACCIDENT OR EXPOSURE ..... (Street & Number)
22. ..... (Street & Number) (City) (County) (State) (Zip)
    (If it occurred on employer's premises give address of plant or establishment in which it occurred.
    If it occurred outside employer's premises state address or provide place references locating place of injury as accurately as possible.)
23. WHAT WAS EMPLOYEE DOING WHEN INJURED .....
    (Be Specific – if he was using tools or equipment, name them and tell what he was doing with them.)
24. HOW DID THE ACCIDENT OCCUR .....
    (Describe fully the events, give full details on all factors which led or contributed to the accident.)
25. NAME THE OBJECT OR SUBSTANCE WHICH DIRECTLY INJURED THE EMPLOYEE .....
    (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)
26. INDICATE THE PART OF BODY AFFECTED AND DESCRIBE THE INJURY OR ILLNESS IN DETAIL .....
27. ATTENDING PHYSICIAN ..... ADDRESS .....
28. HOSPITAL ..... ADDRESS .....

SIGNATURE of person making report (Sign in Ink) ..... TITLE ..... DATE .....
(This report Must Be Signed By Employer Or Person Other Than Injured Employee)

THE FILING OF THIS REPORT DOES NOT ADMIT LIABILITY.

VITA

Dale A. Swiss

Candidate for the Degree of

Master of Science

Thesis: An Analysis of the Work Related Fatalities in Utah as Reported to the Utah Industrial Commission for the Years 1976-1978.

Major Field: Industrial and Technical Education

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