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WORKPLACE DISABILITY MANAGEMENT INVENTORY: DEVELOPMENT OF A SCREENING INSTRUMENT

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WORKPLACE DISABILITY MANAGEMENT INVENTORY: DEVELOPMENT OF A SCREENING INSTRUMENT

By

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ABSTRACT

WORKPLACE DISABILITY MANAGEMENT INVENTORY: DEVELOPMENT OF A SCREENING INSTRUMENT

By

Brett Cornell VanTol

Work disability is understood as a complex process resulting from the interaction of many factors, of which one important realm is those factors related to the employer. There is a growing recognition of the need to study work disability from a broader perspective, however measures are needed which identify salient constructs from each realm in a parsimonious manner. The purpose of this study was to develop an empirically based refinement of the research instrument of employer factors reported by Hunt, Habeck, VanTol, & Scully (1993). The objective was to produce a brief survey instrument while maintaining the integrity of the theoretical model. The original instrument contained 95 likert items which were reorganized in an eight factor solution. In this study, a 44 item, four factor solution was produced using factor analysis and systematic item reduction procedures. The factors were interpreted and labeled as follows: Safety Diligence and Hazard Prevention,

Valuing Human Resources, Reducing Work Disability and Promoting Return to Work, and Top Management Support and Continuous Improvement of Safety. Multiple regression reanalyses demonstrated the comparative effectiveness of the refined instrument with the original solution in accounting for the variance of employer work disability outcomes. A regression model incorporating all four elements of the model as reflected in the four factor solution demonstrated the importance of prevention on reducing work disability outcomes. Cluster analysis was utilized to determine employer subgroups based on factor score profiles. Discriminant analysis was used to confirm and interpret the clusters. Two performance subgroups were identified with one containing employers with high factor scores and the other with significantly lower scores. MANOVA demonstrated group differences between employer subgroups on two summary measures of work disability outcomes (Lost Work Day Case Rate and Lost Work Day Rate). Logistic regression was utilized to determine if employer demographic variables demonstrated a relationship with the performance subgroups. Prediction rates were not high enough to demonstrate the utility of using employer demographic variables as screening indicators to predict disability prevention and management behaviors.

DEDICATION

This is dedicated to my family who made possible the completion of this work with their patience and enduring love. Thank you, Lyn, Adelyn, & Kylee.

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CHAPTER 1

INTRODUCTION

Work disability is impairment in work due to a work related injury or illness. Workplace disability prevention and management is a proactive employer-centered process of coordinating the activities of preventing "accidents and impairments from incurring in the first place, and an effective internal system for responding to injuries that do occur" (Hunt, Habeck, VanTol, & Scully, 1993, p.1-13).

The problem of workplace disability remains a central concern for business in terms of providing employees with work related impairments the opportunity to continue to be productive and in terms of managing the increasing costs of disability in income maintenance, medical care, and related expenditures. In order to prevent and manage work disability a greater understanding is needed of the multifaceted process of work disability which incorporates variables associated with the person and the injury or illness, as well as the larger work environment and social system.

To guide improved efforts in the future, the proposed study attempts to contribute to this important social problem by developing a research tool measuring employer factors of work disability that will facilitate an integrated understanding of the work disability process. A brief, survey instrument corresponding with the theoretical organization of employer influences on work disability will

be valuable to researchers who wish to study employer influences within a more comprehensive model of work disability.

Statement and Significance of the Problem

Research findings from various disciplines have identified a wide range of variables that are associated with work disability, including: demographic characteristics (e.g., age and gender as found in Tate, 1992), psychological traits (e.g., helplessness as found in Walker, 1992), injury characteristics (e.g., type and severity of the injury as found in Bigos, Spengler, Martin, Zeh, Fishers, & Nachemson, 1986), employer policies and behaviors which impact the process of work disability (e.g., implementing managed care for workers' compensation injuries to control costs and retain quality health care as found in Wiesel, Boden, & Feffer, 1994) and community economic conditions (e.g., general inflation and wage growth as found in Victor, Gardner, Sweeney, & Telles, 1992).

Thus, in 1988 Berkowitz described work disability as a socioeconomic phenomenon and "a complex phenomenon that does not lend itself to simple solutions" (p. 51). In 1991, Battie and Bigos deduced from medical research that work disability is a biopsychosocial process resulting from far more than physical factors. As a result of this growing body of diverse research over the past decade, the phenomenon of work disability is no longer considered to be adequately studied within a single disciplinary perspective. There

appears to be a growing demand for research that is able to study work disability from a broader perspective, incorporating the biopsychosocial realm, as well as the work environment realm and the policy systems realm which are now clearly influential (Fordyce, 1995).

In order to develop more complete models of work disability, better tools are needed to identify and measure the salient constructs from each of the realms. Comprehensive research models that seek to understand these diverse constructs and the interactions between them will become more feasible when the salient constructs from theory within each realm have been identified and parsimonious measures with adequate validity and reliability for measuring these realms have been developed.

This study proposes to refine such a measure to more efficiently assess the realm of the workplace and its impact on work disability. The study by Hunt, Habeck, VanTol, and Scully (1993) titled "Disability Management Among Michigan Employers, 1988-1993," identified and quantified a range of workplace factors described as employer policies and practices associated with the incidence and outcomes of work disability. The literature review that guided this work drew information from the fields of safety engineering, prevention and wellness, business and human resource management, medical and vocational rehabilitation, and psychology.

The review formed the basis of a theoretical model of work disability from which a research instrument was developed and on which the design for analyzing the data was based. A follow-up qualitative study was developed which corresponded to the empirical model and helped provide practical understanding of the processes involved, ultimately providing further validity to the findings and their interpretation. The results of the Hunt, et al. (1993) study further substantiated the impact of workplace factors and work disability, in that employer procedures aimed at preventing and resolving work disability were associated with lower rates of work disability.

Subsequent to this study, a number of requests have been made of the authors by other researchers to identify the most salient and powerful predictors (i.e., factor scores, items) of workplace factors from the variables included in the original study instrument. These researchers have recognized the implications of these findings and seek to incorporate the workplace realm in their studies of work disability. They include: The Rand Corporation, The Health Institute of the New England Medical Center, The Workers' Compensation Board of British Columbia, the Accident Rehabilitation and Compensation Insurance Corporation of New Zealand, the Workers' Compensation Research Institute, the California State Workers' Compensation Fund, and individual dissertators from the fields of business and nursing. These researchers are interested in

including employer factors in their models of work disability to address a broader perspective, but are constrained from using the entire research survey instrument due to the number of other variables that must be included in the data collection and data analysis. Until now, the researchers have used various intuitive methods to select a reduced set of variables from the instrument, without knowing how well these selected items represent the sequence of related behaviors and policies postulated by the theory or modeled in the analyses.

In discussing abbreviated measures, Smith and McCarthy (1995) note:

> The availability of multivariate data-analytic techniques has perhaps encouraged investigators to study models involving relationships among numerous variables simultaneously; unfortunately, this has frequently led to practices such as eliminating items from each scale in a protocol. We advise against such practices: the psychometric properties of a measure cannot be imputed to a short form without empirical testing. Often, use of abbreviated measures attenuates reliability. Even more frequently, internal consistency is preserved but validity is attenuated because of reduced coverage of the target construct. Systematic measure refinement analyses should demonstrate retained content coverage, maintained reliability, and maintained validity prior to use of abbreviated measures. (p. 306)

What is needed to guide this body of research is a systematic, empirical refinement of the research instrument with the objective of producing a brief survey instrument that corresponds with the theoretical organization developed from the literature review and original study findings.

Statement of the Purpose

Motivated by the need for continued research in the area of work disability, the objective of the proposed study is to develop an instrument which is more parsimonious and continues to correspond with the theoretical organization of the constructs of employer influence. The study by Hunt, et al. (1993) attempted to provide a high degree of specificity and practical information in the areas of safety and disability prevention for the target audience of employers and safety policy officials. Thus, the factor solution and data analysis focused on a more specific elaboration of the constructs involved.

This study proposes to develop a simpler representation of the underlying theoretical model in a refinement of the factor analysis process and to attempt further item reduction until the most parsimonious, yet reliable, set of items is selected to represent each factor. The study then proposes to empirically validate the refined instrument by testing the fit of the simpler model to the original data and comparing its ability to account for work disability outcomes as compared to the more specific model used by Hunt, et al. (1993). Finally, the study also proposes to explain the utility of the final factor solution for identifying subgroups of workplaces that have similar profiles of disability prevention behavior, to evaluate how these profiles are related to various disability outcomes, and whether

performance subgroups can be predicted from demographic characteristics of the firm.

The specific research questions to be addressed in the study include:

1. Can the reanalysis procedures produce a refined version of the original instrument that would be more parsimonious, yet equally effective in capturing the hypothesized theoretical structure of the role of the work place in preventing and managing disabilities?

2. Can the refined, brief instrument adequately capture the variance associated with employer policies and practices that contribute to the incidence and outcomes of work disability?

3. Can discernable subgroups of employers be identified on the basis of similar profiles of disability prevention and management behavior that have implications for prediction and screening?

Definition of Terms.

Within this area of investigation, certain definitions were important in order to maintain clarity in describing certain phenomena and in operationalizing variables. The following terms and their definitions are offered as they pertain to this study:

1. Work disability, as operationalized in this study, is

impairment in an employee's ability to perform work arising from a work related injury or illness. From an organization's perspective, work disability progresses in stages. The first stage is the occurrence of injury and symptom incidents. It is logically deduced that greater the frequency of exposure to injury or illness, the greater the likelihood that the organization will have injuries that result in lost work time. MIOSHA Recordable Rate is a measure of the average number of injuries and symptom incidents that require more than first aid for every 100 employees.

The second stage is an injury or illness that prevents an employee from participating in work for one day which results in a lost work day case (Restricted work, which results when an injured employee can not perform his or her typically assigned job duties but remains at work with an altered work assignment, was not measured in this study). This represents disability incidence. Lost Work Day Case Rate is a measure of the average number of lost work day cases for every 100 employees. In general, when an employee has been absent from work for seven days due to an injury or illness, a workers' compensation wage-loss claim is filed. Workers' Compensation Wage-Loss Claim Rate is the average number of wage-loss claims per 100 employees and also represents disability incidence, but at a more severe level than lost work day cases.

The third stage is a measure of the duration of the disability.

Lost Work Days Per Case is the average number of lost work days per lost work day case. In addition, there are two measures which summarize an employer's experience of work disability. Lost Work Day Rate is the average number of lost work days per 100 employees and is a function of both the incidence of lost work day cases and the duration of each case. Workers' Compensation Payment Rate is the average workers' compensation medical and wage loss expenses incurred per 100 employees.

2. Workplace disability prevention is the policies and practices an employer utilizes to prevent the occurrence of work disability. This is largely comprised of traditional safety practices such as safety training and guarding equipment to reduce exposure to hazards. However, it also includes ergonomic initiatives and strategies to improve employee diligence and consistency in the performance of these policies and practices.

3. Workplace disability management is the policies and practices an employer utilizes to respond to a work disability case. An employer responds by assessing the parameters of the case so that an appropriate response can be initiated. In addition, an employer responds by providing appropriate medical care to resolve the injury or illness. Finally, by altering the work demands, process, or environment to accommodate or compensate for impairments in such a manner as to eliminate or reduce the restriction from work

participation.

4. Corporate culture is the work environment that results from human resource policies and practices an employer utilizes to involve, cultivate, and develop its workforce. A positive work environment that values employees is consciously developed in order to attract and facilitate the retention of employees.

CHAPTER 2

REVIEW OF THE LITERATURE

This review of the literature is organized to first address the independent variables used in the study by capturing relevant information from the realms of employer prevention of injury and illness, employer response to injury and illness, and employer culture. Then study "Disability Prevention Among Michigan Employers, 1988-1993" (Hunt, et al. 1993) is reviewed.

The conceptual model which guided the Hunt, et. al, (1993) study is reproduced in Figure 1. The model conceptualizes the employer level factors as: a) organizational and business characteristics that are structural and demographic (i.e., size and industry), b) cultural and managerial characteristics which reflect the human resource philosophy of the company, c) before injury behaviors which are interventions aimed at preventing injuries or illnesses, and d) after injury responses to minimize the disability consequences of a given injury. These four main areas guided the literature review for the Hunt, et al. (1993) study and the subsequent development of the instrument.

Prevention of Workplace Injuries and Illnesses

Safety is comprised of physical aspects such as protective personal equipment, machine guards, and housekeeping (Chaffin, 1987; Michigan Department of Labor, 1990; Susser, 1989); as well as

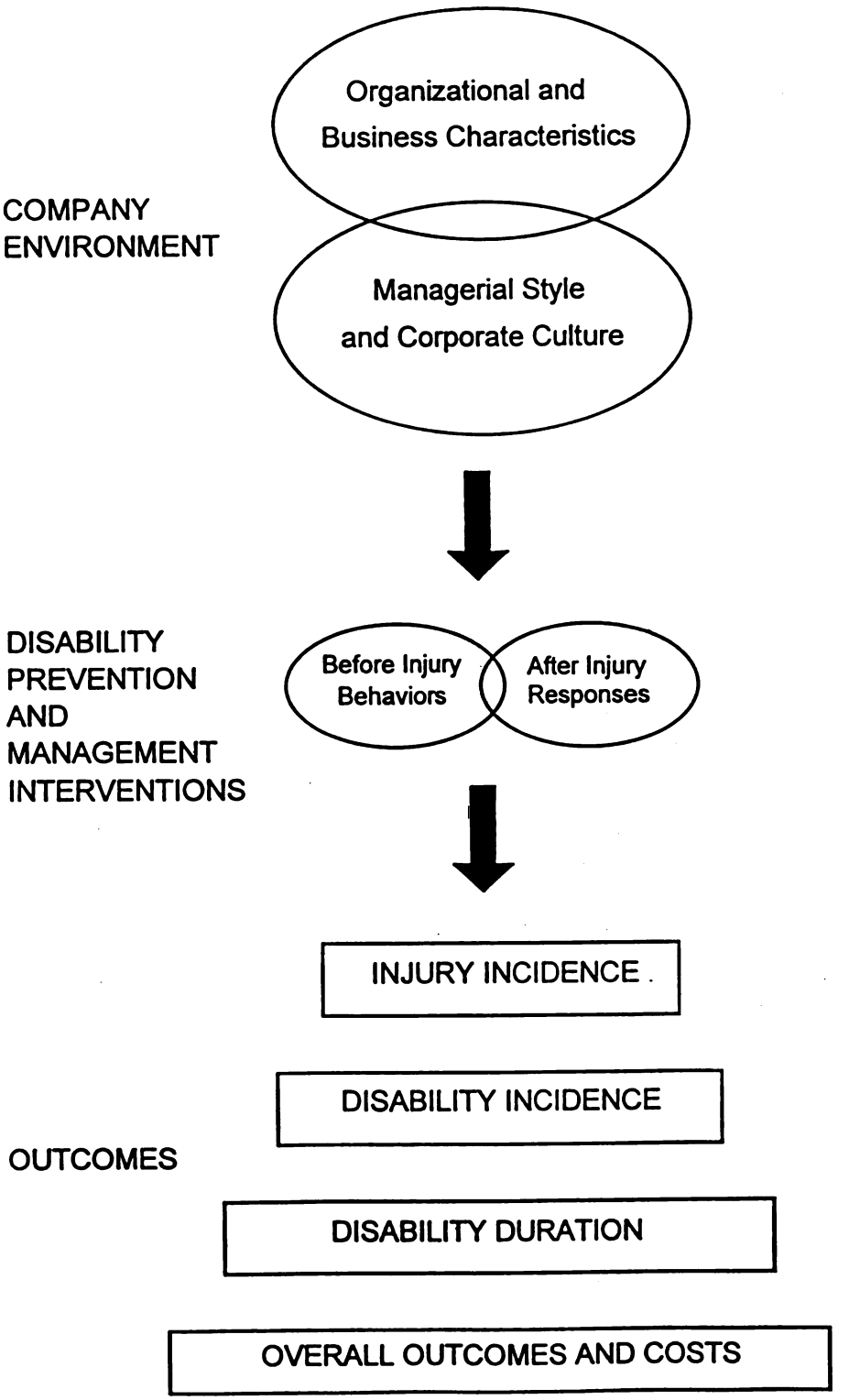

Figure 1. Conceptual Model

behavioral aspects, including motivation, knowledge acquisition, and attitudes (McAfee & Winn, 1989; Smith, 1988; Victor, 1985; Vojtecky, 1988). The safety literature demonstrates a long, well-established history of the importance of safety equipment, training, and individual accountability.

Safety programs (policies and practices) are widely and readily available, and in many instances their presence is legislated. Therefore, companies are distinguished from each other not by the presence or absence of a program, but by the level of efficiency and effectiveness achieved. Management commitment to safety training and practice, accountability, and innovations, therefore, is an important factor in explaining successful outcomes.

Management commitment is defined as the extent to which managers participate in safety by attending safety trainings, wearing safety gear, and following safety rules (Kavianian, Rao, & Sanchez, 1989; Young, 1989). Additionally, the extent to which safety is supported by management in the verbalization of safety goals which are considered equally with production and quality goals (Gaertner, Newman, Perry, Fisher, & Whitehead, 1987), and in behavioral confirmation of this stated direction via resource allocation decisions (Sims, 1988).

Accountability authorizes employees and supervisors to implement immediate, corrective action with the work process and

with each other (Marcus, 1988). Additionally, data are gathered, analyzed, and disseminated with performance incentives, consequences, and corrective actions. This process is delineated both at the incident level (accident investigation) (Jacobs & Nieburg, 1989; Webb, Redman, Wilkinson, & Sanson-Fisher, 1989), and at a systems level (Elkiss, 1987; Gaertner et al., 1987; Gross, 1988; Lutness, 1987; Phillips, 1989; Rappaport, 1988). Innovations in the area of safety equipment and practice receiving recent attention have been in the area of ergonomics (Chaffin, 1987; OSHA, 1990; Susser, 1989).

There are other programs companies use to reduce injury incidence, injury severity, and disability which do not fall in the traditional category of safety. These include a company's commitment to maintain and improve employees' health through health promotion and the provision of wellness resources (Galvin, 1986; Prevention Leadership Forum, 1987). Second, the use of active Employee Assistance Programs which provide employees and supervisors with mental health education and easily accessed treatment resources (Stern, 1990). Third, the use of testing for illegal substance use in job applicants and employees as a means to prevent accidents (Prevention Leadership Forum, 1987) and with employees when substance use is suspected of causing an accident (Michigan Department of Labor, 1990). Finally, the use of

systematic screening of employees for health or disability risks (LeClair & Mitchell, 1989; Prevention Leadership Forum, 1987), and the systematic screening of employees in high-risk jobs for early physical symptoms (Bigos et al., 1986; Galvin, 1986).

Response to Potential Workplace Disability

Disability management emerged in the 1980's in response to rapidly rising medical costs (Tate, Habeck, & Galvin, 1986). As with safety, management commitment is no less important for the success and effectiveness of disability management (Schwartz, Watson, Galvin, & Lipoff, 1989); however, disability management is relatively newer and the techniques and methods much less tested and refined. Management commitment to disability management is evident, in large part, by the very presence of policies and techniques. In the original instrument developed for the Hunt, et al. (1993) study, this is reflected by the item content of the Management Commitment Scale which contains nine items measuring commitment to safety, one item for commitment to disability management, and one item covering both areas. There is also one scale measuring Safety Accountability, but just one item measuring disability management accountability.

Disability management must have both structure and process. With regards to structure, it is important that disability management have a place and an initial access point with an identified individual who is knowledgeable of companies policies and workers'

compensation structure. Furthermore, it is important that the entire disability management process from injury to resolution is coordinated from this place (Askey, 1988; Koch, 1988; Schwartz & Beggelman, 1986).

The first step in the process of disability management is to determine the validity of a workers' compensation claim (Hill & Gipson, 1990). Once the validity has been established, it is important to proceed with a fair and caring approach with techniques as simple as ensuring that workers' compensation wage replacement checks are mailed on a timely basis (Shrey, 1988) to having the supervisor maintain communication with the employee (Schwartz et al., 1989). A more time consuming strategy is to evaluate and monitor the medical services available in the community in order to provide employees with the best quality care (Askey, 1988; Carbine & Schwartz, 1987; Schwartz et al., 1989).

It is important from the very beginning that the process of medical care be directed toward return to work. Thus, it is important that companies educate employees and the external medical and case management providers about their disability management process (Carbine & Schwartz, 1987; Carbine, Schwartz, & Watson, 1989; Gapen, 1990; Schwartz et al., 1989). Early return to work is the process of identifying ways to bring employees back to work in productive roles at the earliest point in time. That may be while

they are still healing, but medically stable enough to perform some meaningful task (Boschen, 1989). To accomplish this, a return-to-work program should be based on a systematic analysis of all the tasks within the company broken down by skills, physical demands, and the potential for accommodations (Gice & Tompkins, 1987; Kasdan & McElwain, 1989; McDonald, 1990; Schwartz et al., 1989). Systematic placement, in cooperation with the medical community, protects the healing process and is fair to every employee's commitment to company productivity. Accountability is also important within the disability management and return to work process. This has been implemented in the forms of charging wage loss back to an employee's department until a return-to-work placement is found and including a department's lost work day rate on a supervisor's evaluation form (Askey, 1988).

Company Culture and Management Commitment

Leadership has emerged as a critical factor in recognizing, understanding, and accepting the responsibility of changing realities for business (Frost, 1989). Leadership is expressed both in the formal policies and practices adopted by a company and in the context or culture within which those policies are practices are implemented. Therefore, it is believed that a measure of a company's culture provides an important indicator of subsequent effectiveness of safety and disability policies and practices (Kavianian, et al. 1989;

Lewin & Schecter, 1990; Schwartz, et al. 1989)

The literature revealed several important indicators of culture: management decision making styles which are characterized by employee participation (Kavianian et al., 1989; Lewin & Schecter, 1991; Marcus, 1988); support and commitment based on resource allocation and upper management visibility (Gaertner, et al. 1987; Schwartz et al., 1989); and open communication (Akabas & Gates, 1990; Lewin & Schecter, 1991). Additionally, the literature revealed the importance of more concrete aspects of environment and culture as reflected in cleanliness and housekeeping (Labor, 1990; Lutness, 1987), noise, air quality, light controls (Prevention Leadership Forum, 1987), and the provision of resources to promote employee growth through education and opportunities to learn new skills (Rosen, 1986).

Disability Prevention Among Michigan Employers, 1988-1993

Description of the Sample. The study selected seven specific industries to include in the sample. The industries were chosen with the following three objectives: (a) that they be among the top MIOSHA hazard rated industries, (b) that they have substantial employment numbers in Michigan, and (c) that they provide for some diversity among the industries to maximize the generalizability of the findings. The final selection included: Food Production, Standard Industrial Classification (SIC) 20; Furniture and Fixtures, SIC 25;

Rubber and Miscellaneous Plastics, SIC 30; Fabricated Metals, SIC 34; Machinery, except Electrical, SIC 35; Transportation Equipment, SIC 37; and Health Services, SIC 80. The sample includes six of the eight most hazardous industries and Health Services (SIC 80) which provides some diversity to the sample by contrasting with the manufacturing environment and yet is a service industry with significant work disability incidence. Employers with less than 100 employees were omitted from the sample due to the infrequent occurrence of workers' compensation claims, making it difficult to establish a reliable performance level using data that spanned four years.

Sampling Procedures. A cross-sectional sampling design was utilized due to constraints of time and resources. The Michigan Employment Security Commission, which covers establishments for unemployment insurance purposes, provided data which identified the industry (SIC classification), employment level, and total payroll of establishments within the seven industries. The universe of establishments for the second quarter of 1988 was used as the sampling frame from which to draw a random sample. In order to fully represent the sample, from the perspective of an establishment's risk for experiencing work disability, a random sampling design was developed which would sample from each industry proportional to the expected hazard rate as compared to the other industries in the

sample. Thus, in industries where work disability was distributed with greater variance, more sample points were allocated so that the efficiency of each sample point was equalized across all of the entire sample.

To accomplish this task, the theoretical assumption was made that the variance of work disability would be roughly proportional to the mean of the hazard rate chosen to represent work disability; so that allocation of sample points according to the proportions between the industry means for the expected hazard rate would be roughly the same as allocating them according to the variance. The hazard rate chosen was the average number of lost work day cases per 100 employees for that industry. The sampling ratios for each industry were calculated so that the proportional distance between them corresponded with the proportional distances between the hazard rates.

A target sample size of 500 employers (establishments) was chosen, and a target sample size for each industry was calculated. Dividing this industry sample size by three resulted in a target sample number for each of the three industry/size stratum chosen: small, 100-249 employees; medium, 250 - 499 employees; and large, 500 plus employees. These target sample numbers for each of the 21 industry/size stratum were then further modified based on the following rules: when not enough establishments were available, all

were chosen; an upper limit of 60 was imposed for the small firms in SIC 34 stratum; and an arbitrary minimum sample size of 20 establishments per stratum was adopted for SIC 80. The actual sample produced by the above decisions was 517 establishments. Table 1 outlines the population available, the sample number selected, and the final ratio of establishments for each industry.

Instrument Development. The survey questionnaire from the Hunt, et al. (1993) study was titled "Disability Prevention Among Michigan Employers," and contained 95 items in eight scales. An extensive literature review was conducted to identify and record behaviors and policies that were empirically or theoretically associated with prevention and reduction of work disability. In addition, highly visible, common practices identified by experts and believed to be associated with prevention and reduction of work disability were included. The constructs that resulted were distilled into 228 statements that were validated and prioritized by expert reviewers.

Utilizing this information and independent sorting on the part of the researchers and expert reviewers, the items were sorted and a conceptual structure of eight theme areas for scale development was identified. These eight theme areas and subsequent scales were titled: Management Commitment, Safety Accountability, Safety Intervention, Physical Work Environment, Disability Claims

Table 1

Final Sampling Proportions and Ratios

Sample N Population N Ratio	SIC 20 Food Prod.	SIC 25 Furniture	SIC 30 Rubber & Plastics	SIC 34 Fab. Metals	SIC 35 Machinery	SIC 37 Trans. Equipment	SIC 80 Health Servs.	Totals
Small (100-249 ees)	19 47 0.404	11 29 0.379	39 84 0.464	60 158 0.380	23 137 0.168	31 88 0.352	20 265 0.075	203 808 0.251
Medium (249-500 ees)	19 29 0.655	11 16 0.688	37 37 1.000	42 42 1.000	23 35 0.657	31 58 0.534	20 46 0.435	183 263 0.696
Large (500+ ees)	15 15 1.000	7 7 1.000	13 13 1.000	22 22 1.000	23 25 0.920	31 92 0.337	20 60 0.333	131 234 0.560
Totals	53 91 0.582	29 52 0.552	89 134 0.683	124 222 0.640	69 197 0.355	93 238 0.385	60 371 0.160	517 1,305 0.396
Industry Hazard Rate	9.28	8.82	10.9	10.21	5.66	6.15	2.55	

Note: The table was adapted from, "Disability Prevention Among Michigan Employers, 1988-1993, " by H. A. Hunt, R. V. Habeck, B. C. VanTol, and S. M. Scully, 1993, Upjohn Institute Technical Report No. 93-004, Kalamazoo, MI: W. E. Upjohn Insititue for Employment Research.

Management, Disability Intervention, Employee Risk Prevention, and Company Environment.

Individual items were written so that the respondent rated the employer's actual achievement on a scale from one to five (1 = never, 0%; 2 = occasionally, 25%; 3 = sometimes, 50%; 4 = usually, 75%; 5 = always, 100%), indicating the percentage of time the policy is implemented or the behavior achieved.

A similar process was utilized to capture and sort variables from related research and constructs identified in the literature which comprised organizational characteristics. These organizational and workforce characteristics that have demonstrated an association with work disability outcomes need to be measured and controlled for in the data analysis. These control variables included: type of workers' compensation insurance administration, past history of some form of safety or disability management consultation, industry regulation requirements, number of employees in various categories (e.g., part-time versus full time, salaried versus hourly), average hourly wage, workforce tenure, union representation, and employee benefits and programs.

To model the work disability process, the outcome measures ranged from measures of incidence (i.e., number of MIOSHA recordable incidents) to measures of duration (i.e., total number of lost work days, not restricted days). These self-reported performance

outcomes were taken from specific columns of data located on the company's MIOSHA Log and Summary of Occupational Injuries and Illnesses, Form 200. Specific reference to the column and location of the data needed was included to reduce confusion and facilitate consistency in reporting. In addition, companies were asked to report specific workers' compensation data for 1989.

Principles outlined by Dillman (1978) in his book, Mail and Telephone Surveys: The Total Design Method, were utilized to construct the physical aspects of the instrument so as to facilitate the ease of completion. Furthermore, the instrument was pretested with individual experts, potential consumers of the study results, and companies not in the sample, but drawn from the population. This feedback was utilized to make a final edit of the instrument. A copy of "Disability Prevention Among Michigan Employers" can be found in Appendix A.

The survey was typically addressed to the president or CEO, except for the larger firms where it was addressed to the Director of Human Resources. Again, procedures recommended by Dillman (1978) were utilized to mail and follow-up with the survey. A number of employers were identified as out-of-business, otherwise not reachable, or not appropriate for the survey making the total number of potential respondents 477. A total of 220 employers responded, for an aggregate response rate of 46 percent.

To assess for response bias, it was possible to merge the MESC data on each employer with data available from the Bureau of Workers' Disability Compensation regarding each employer's work compensation experience to date. Comparisons made with a probit regression analysis of respondents and non-respondents revealed that respondents were likely to be larger, have fewer workers' compensation claims, and show some geographical tendency. Size was controlled for in the data analysis and having employers with better work disability outcomes more likely to be represented in the sample would tend to make the research conclusions conservative.

The 95 items which comprised the eight *a priori* scales were subjected to a factor analysis to validate the theoretical framework, refine the conceptual structure of the scales, and evaluate the potential for reducing the number of items. The factor analysis utilized principle component analysis with placement of ones on the diagonal. No values were imputed for missing data. A scree analysis of the eigenvalues of the factor solution was used to determine the optimum number of factors to retain. The 8-factor solution was chosen for its greater specificity for the study purpose. Oblique rotation was utilized to interpret the factor pattern loadings. Within this 8-factor solution, items with simple structure were analyzed first to interpret the factor. In addition, items were retained that met an empirical cutoff and added to the reliability and

interpretation of the scale, even though they also loaded highly with other factors. Seventeen items were deleted because they did not meet any of the criteria for inclusion.

A confirmatory factor analysis of the items within each factor was performed using principle components analysis with a prior commonality estimate equal to 1 and no rotation. The coefficients from the first factor were analyzed to determine their correlation with the factor. Eight items which were found to detract from the overall internal consistency of their respective factor were dropped. Thus the final factors were comprised of 73 items, which included the repetition of three items shared between two factors (Disability Case Monitoring and Proactive Return to Work). The resulting eight factors were labeled and interpreted as follows in the eight paragraphs below.

Factor one, People Oriented Culture, reflects a workplace environment that achieves employee participation in decision making, open communication, and the sharing of information. In smaller organizations it may be the result of the personality of the workplace leaders, whereas in larger corporations it more likely is expressed by means of a formal structure.

Factor two, Active Safety Leadership, operationalizes the stated value of placing safety on par with other workplace objectives such as quality and production. It includes systems for tracking data so

that accountability can be implemented, risks identified, and resources committed to correct hazards. The leaders personally model safe behavior and are knowledgeable about the safety risks.

Factor three, Wellness Orientation, reflects the extent to which a company promotes the overall health of employees through education and the promotion of healthy lifestyle activities.

Factor four, Safety Training, assesses the timely provision of complete safety training to all key employees, including new and temporary employees.

Factor five, Safety Diligence, describes the extent to which safety measures are practiced by the employees on a consistent basis. This includes correcting unsafe behavior, maintaining safety equipment, housekeeping, and timely investigation of all unsafe incidents.

Factor six, Ergonomic Solutions, assesses the implementation of solutions to minimize repetitive motion and stress and strain injuries.

Factor seven, Disability Case Monitoring, describes a process for validating the medical needs of an employee and ensuring that proper medical care is provided. Furthermore, it directs the focus of medical treatment towards returning the employee back to work.

Factor eight, Proactive Return-to-Work Program, operationalizes the extent to which the company has implemented a systematic procedure for enabling employees to return to the

workplace at the earliest possible time, even before they are medically released as able to resume their regular duties.

The eight revised factors corresponded with the theoretical model of the work disability management process and retained the conceptual structure of the eight scales. Table 2 provides the reliability coefficients for each factor, which ranged from Safety Training (.72) to People Oriented Culture (.96). Table 3 displays the intercorrelation matrix of the eight factors, which ranged from the lowest correlation between Ergonomic Solutions and Wellness Orientation (.17) to the highest correlation between Disability Case Monitoring and Proactive Return to Work (.72). However, recall that these last two factors share three items. Appendix B contains the item content of each factor. These eight factors were used as the independent variables representing employers policies and practices.

Summary of the Data Analysis

People Oriented Culture and Active Safety Leadership both reflect the employer's approach to the care and management of the employees. Safety Training, Safety Diligence, and Ergonomic Solutions all represent specific safety behaviors. Disability Case Monitoring and Proactive Return to Work represent the employer's response to an employee who has been harmed or injured at work. The multivariate analysis utilized these three groups of factors in

Table 2

Reliability Coefficients for the Eight Factors

Factor	# of items	Cronbach's Alpha
Active Safety Leadership	13	.88
Safety Training	4	.72
Safety Diligence	13	.89
Ergonomic Solutions	4	.87
Disability Case Monitoring	10	.93
Proactive Return to Work	14	.92
Wellness Orientation	3	.87
People Orientated Culture	12	.96

Note. From "Disability Prevention Among Michigan Employers, 1988-1993," by H. A. Hunt, R. V. Habeck, B. C. VanTol, and S. M. Scully, 1993, Upjohn Institute Technical Report No. 93-004, Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Table 3

Observed Correlations and Alpha Coefficients for the Eight Factor Solution

Factor	1	2	3	4	5	6	7	8
1. People Oriented Culture	(.96)							
2. Active Safety Leadership	.53	(.88)						
3. Safety Diligence	.46	.57	(.89)					
4. Safety Training	.40	.43	.55	(.72)				
5. Ergonomic Solutions	.44	.41	.51	.37	(.87)			
6. Disability Case Monitoring	.28	.28	.27	.25	.31	(.93)		
7. Proactive Return-to-Work	.42	.38	.27	.35	.40	.72	(.92)	
8. Wellness Orientation	.46	.29	.20	.20	.17	.20	.32	(.87)

Note. N's ranged from 218 to 220. Alpha coefficients are presented on the diagonal, observed correlations below the diagonal. Adapated with permission from "Disability Prevention Among Michigan Employers, 1988-1993, " by H. A. Hunt, R. V. Habeck, B. C. VanTol, and S. M. Scully, 1993, Upjohn Institute Technical Report No. 93-004, Kalamazoo, MI: W. E. Upjohn Insititue for Employment Research.

four separate models titled respectively: Managerial Model, Prevention Model, Disability Management Model, and Summary Model.

The Managerial Model regressed two dependent variables which represent broad, summary measures of disability outcome, namely Lost Work Day Rate and Workers' Compensation Payment Rate for 1989 on Active Safety Leadership and People Oriented Culture. Greater achievement of Active Safety Leadership was associated with a lower Lost Work Day Rate (-1.338, $p<.10$) and greater achievement of People Oriented Culture was associated with a lower Workers' Compensation Payment Rate for 1989 (-1.852, $p<.05$).

The Prevention Model included three dependent variables: Recordable Rate, Lost Work Day Case Rate, and Workers' Compensation Claim Rate. Each of these variables were regressed on the independent variables of Safety Diligence, Safety Training, and Ergonomics. This model represents the influence of traditional safety and accident prevention on the process of work disability from injury or illness occurrence (MIOSHA Recordable Rate) to work disability occurrence (Lost Work Day Case Rate and Workers' Compensation Wage-Loss Claim Rate). The results demonstrated that a greater achievement in Safety Diligence (-1.941, $p<.05$) and Safety Training (-1.652, $p<.05$) were associated with reduced Lost Work Day Claim Rate. Greater achievement of Safety Diligence was also associated

with reduced Workers' Compensation Wage-Loss Claim Rate (-3.103, $p<.01$).

The Disability Management Model regressed dependent variables that represented the occurrence or duration of work disability (Lost Work Day Case Rate, Workers' Compensation Claim Rate, and Average Lost Work Days per Case) on Disability Case Monitoring, Proactive Return-to-Work Program, and Wellness. Increased achievement in Proactive Return-to-Work Programs was associated with reduced Lost Work Day Case Rate (-3.235, $p<.01$) and reduced Workers' Compensation Claim Rate (-1.978, $p<.05$). Counterintuitively, the results demonstrated that greater achievement of Disability Case Monitoring was associated with a higher a higher Lost Work Day Case Rate (1.581, $p<.10$). This may be attributed to the cross sectional design of the data gathering in that measures of the independent and dependent (outcome) variables were taken at the same time and thus may not indicate a causal relationship. For example, this finding could be due to an increase in case monitoring in response to an increase in lost work day cases.

A Summary Model was reported to provide an overview of the most significant variables from the previous analyses. In the Summary Model, the broad, summary outcome variable of Lost Work Day Rate was regressed on Safety Diligence, representing work disability prevention, and Disability Case Monitoring, representing

response to work disability. Greater achievement of Safety Diligence (-2.575, $p<.01$) and Proactive Return-to-Work Program (-2.134, $p<.05$) were associated with a lower Lost Work Day Rate.

CHAPTER 3

METHODOLOGY

This study proposed to reanalyze the original data to produce a refined version of the original instrument that would be parsimonious, yet equally effective in capturing the hypothesized theoretical structure of the role of the work place in preventing and managing disability. The methodology set forth below sought to accomplish that goal and address the performance of the refined instrument regarding its comparative ability to capture the variance associated with employer policies and practices that contribute to the incidence and outcomes of work disability as measured in the original study.

To further explore how the theoretical constructs of workplace policies and practices that contribute to the incidence and outcomes of work disability operate together in practice, this study also attempted to identify subgroups of employers with similar self-reported levels of behavior on the factors describing the employer policies and practices. Comparative statistics of the dependent variables were computed and examined for these subgroups, including the workplace disability incidence and outcome measures, to explore how the work disability process may differ for workplaces with different profiles of behavior. A post hoc analysis examined the extent to which employer characteristics (i.e., workplace demographic variables) could be used to identify the subgroups of employers with

similar work place prevention and response behaviors.

Instrument Refinement Procedures

This study sought to create a refined, briefer version of the original instrument for broader research efforts. The purpose of this study, was to identify a simpler factor structure that corresponded to the theory of work disability prevention and management and to build from it a refined instrument with adequate psychometric properties. The conceptual model (see Figure 1 in Chapter 2) which guided the development of the original survey instrument delineated four main construct areas which were believed to be associated with an employer's work disability outcomes. These constructs were managerial style, corporate culture, before injury behaviors, and after injury responses. The model also outlined the specificity level of the dependent variables. This study sought to operationalize the conceptual formulations set forth in this model in a simpler manner, yet consistent with level of specificity found in the outcome measures, so that the potential to capture an association was maximized (DeVellis, 1991).

The sample, sampling procedure, and data collected were retained from the original research which was reviewed in Chapter Two.

Factor Analysis. First, a factor analysis using a principal-axis factoring procedure was performed. Pedhazur and Schmelkin (1991)

report that principal-axis factoring is a method of identifying the "unobserved variables" or constructs, where the extracted factors are treated as independent variables and the items are treated as dependent variables. Principal-axis factoring attempts to explain the common variance without including the unique variance associated with each item and the error variance. Thus, the requirements for identifying the constructs are restricted to the common item variance producing, in effect, purer constructs as compared to those produced from principle components analysis which includes unique and error variance in the components which are extracted.

Factor analysis procedures included examination of the Kaiser-Meyer-Olkin measure of sampling adequacy, the Bartlett Test of Sphericity, and the anti-image correlation to assess the extent to which the factor analysis assumptions were met. Principle-axis factoring was used to extract the factors. A scree plot was produced and analyzed for determining the best factor solution with a minimum cutoff of eigenvalues greater than one. The theoretical model allowed for the likelihood that correlations between the factors exists. Therefore, both orthogonal and oblique rotations were used to identify the factors. If on the basis of the oblique rotation, "it is concluded that the correlations among the factors are negligible, the interpretation of the simpler orthogonal solution becomes tenable" (Pedhazur & Schmelkin, 1991, p. 615).

Next, because the goal of this study was to identify a simple factor structure to best explain the data, an principle components analysis was also performed with the resulting solution compared to the principle-axis solution reported above in order to assess the extent to which the objective of reduction had been obtained. Principal components analysis is most appropriately used as a data reduction method (Pedhazur & Schmelkin, 1991). It extracts error and item unique variance, as well as common variance, and therefore, assigns the maximum amount of variance to the components extracted. Thus, it has the potential for producing a simple structure which accounts for the greatest amount of variance. As a rule of thumb, principal components analysis should extract over 50 percent of the variance with the first two or three components (Pedhazur & Schmelkin, 1991). Including the total variance, however, does not allow for a meaningful interpretation of the extracted components. Thus, the solution identified by the principal components analysis was used as a standard of efficiency and effectiveness with which the principal-axis factor solution was compared. If the principal components analysis extracted components which differed from the principal-axis extracted factors, the factors extracted from the principal-axis factoring solution would have been used to develop the refined instrument because correspondence with the theory and interpretability of the factors were of greater priority than reduction

alone.

Simple structure was identified with both orthogonal rotation using the Varimax procedure and oblique rotation using the Oblimin procedure. Both rotations were compared for the degree of simple structure achieved, if orthogonal rotation achieved comparable simple structure it would be chosen for the simplicity it affords and the creation of distinct factors that result.

Reliability Analysis and Item Reduction. Constructs exist at varying levels of hierarchy or aggregation and understanding their dimensionality is important in instrument development. Broad or aggregate constructs cannot be analyzed on an aggregate level without understanding how the multidimensional facets correlate and interact with each other (Smith & McCarthy, 1975). In this study, the objective of parsimony while maintaining theoretical representation was facilitated, not only in assessing for a simpler factor solution, but also by attempting to distill the measure of each factor to the fewest prototypical items reflective of that factor (Smith & McCarthy, 1995, p.305) while maintaining a target level of reliability. Thus, to achieve parsimony the following rules were adopted to facilitate a systematic retention of the items effected to the greatest extent by the latent variable represented by the factor on which it loaded the highest, and having minimal effects from the other latent variables comprising the process of work disability

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To remain in the scale the item had to: a) achieve an initial factor loading of .40, b) needed to demonstrate that it's removal would lower alpha, c) needed to have an item-total correlation not noticeably less than the other item-total correlations, and d) needed to demonstrate a level of communality when regressed on the remaining items which was not noticeably less than the other items. An iterative process was undertaken until each of the three rules, b) through d), no longer applied. Cronbach's Alpha was targeted for .85 in order to provide room for the achievement of an acceptable alpha level with the application of the scales on another sample. The final factor solution was interpreted based on simple structure in the factor matrix.

Testing the Refined Instrument in Regression Reanalyses. In order to assess how well the refined factors explained the outcome data, the multiple regressions from the prior study were repeated. The factor scores developed from this study were used in place of the original factor scores where they corresponded to the appropriate regression model. The multiple regression analyses included the dependent variables measured in log transformation. The log transformation was chosen as the distributions of the variables in log form demonstrated greater regularity and symmetry. Furthermore, the impact of outliers on the parameter estimates were minimized. The

independent variables were measured in Z-score standardized form. The covariates had various measurement properties; either dichotomous, categorical, or continuous (these were also measured in a log transformation to reduce the influence of outliers). The same statistical procedures were used in the regression models, including simultaneous entering of all the variables. Previous research supported the a priori prediction of the direction of influence of most variables on the outcome measures, therefore the regression results were subjected to a one-tailed test of significance.

Exploring Patterns of Workplace Behavior. Next, a cluster analysis was used to determine if similar subgroups of employers could identified based on their behaviors (policies and practices) to prevent and respond to work disability. To accomplish this, an agglomerative hierarchical cluster analysis was performed using the SPSS Hierarchical Cluster Analysis procedure. The variables used to cluster the cases were the factor scores from the refined factor solution identified in this study.

The squared Euclidean distance measure was utilized to measure the distance between variables. The squared Euclidean distance is the most commonly used distance measure (Norusis, 1994). The method used for combining clusters was Ward's Method, as this uses information from all the variables and calculates clusters with the property of having the smallest squared within-cluster distances.

Ward's Method is useful when the variables are measured with the same unit, as is the case with this study (Sneath & Sokal, 1973, as cited in Norusis, 1994).

Determining the optimal number of clusters to retain involves a compromise between parsimony and homogeneity. Distance coefficients were analyzed to assist in determining the number of clusters to retain. Small coefficients indicate that fairly homogeneous clusters are being combined. A large increase in the coefficient between two adjacent steps in the agglomeration schedule indicates a point at which the clusters contain relatively dissimilar members (Norusis, 1994).

Cluster analysis can produce statistical structure in a sample where no theoretically logical structure exists. Therefore, to test the structure produced by the cluster analysis, the group membership from the clusters was used in a Discriminant Analysis to assess the extent to which the variables used to determine the clusters could be combined as independent variables to predict group membership. The SPSS Discriminant Analysis procedure was used to assess the extent to which the factors as independent variables correctly predicted group membership. The proportion of correct classification of employers into the previously assigned subgroups (clusters) was computed and examined. The discriminant analysis also provided a discriminant function which was used to provide an interpretation of

the clusters that were developed with the cluster analysis.

The resulting clusters theoretically provided discrete groups of employers found to be statistically similar based on their self-reported performance in accomplishing prevention and response policies and procedures associated with a reduction in work disability outcomes. To test the practical meaning of the performance subgroups, the next step was to describe these cluster groups in terms of the disability outcome measures. A MANOVA procedure was used to assess whether there was a statistically significant difference between the performance subgroups on the disability outcome measures. If patterns of work disability outcomes are discernable among the performance subgroups, further validity may be attributed to the refined instrument and additional understanding gained about the ways these employer policies and practices function in relation to the progression of disability outcomes.

Post Hoc Analysis

In a post hoc analysis, an attempt was made to classify the performance subgroups with the covariate variables. In the Hunt, et al. (1993) study, covariates which demonstrated significant partial regression coefficients included: average workers' tenure, industry establishments that are a part of multiple plant firms, size, unionization, wages, and type of insurance. A logistic regression was conducted to determine the extent to which the covariates could

classify the performance subgroups. Comparatively accurate classification rates would substantiate the screening value of these demographic variables.

CHAPTER 4

RESULTS

Item Analysis

Dependent Variables. In the Hunt, et. al. (1993) study the dependent variables were first transformed into rates so that the variables would be in a form that could be compared across different size employers. The measures were then reviewed for normality and a natural log transformation was much preferred for regularity and symmetry, and it minimized the influence of outliers. The log transformation used was log(1 + r) where r represented the rate of the dependent variable. This eliminated the log of 0, a legitimate value, which is undefined and it made the regression coefficients of the dependent variables interpretable as a percentage change associated with a one unit change in an independent variable.

Covariates. The covariates included both dichotomous and continuous variables. For the dichotomous variables, one category was dropped from the regression equations to avoid overdetermination. The mean of a dichotomous variable is the proportion of the sample possessing the particular characteristic. The continuous variables were measured in natural log transformation to reduce the influence of outliers and to facilitate their reporting in the regression equations such that a one unit change in the covariate would have a percentage change on the dependent variable.

Independent Variables. The first step was to examine the response distributions of the individual items used in the survey instrument. This was done to identify items that had highly skewed and unbalanced distributions and limited variability, although no items were eliminated at this point.

The items were measured on a five point Likert rating format. The item means and standard deviations are listed in Appendix C. There were two items with means less than two, 11 items with means between two and three, 48 items had means between three and four, and 34 items had means greater than four. Thus, in general, the instrument contains mostly items that describe policies and behaviors which were reported by the respondents as being achieved more than half the time.

Structural Analysis

The first research question of this study asked if a refined version of the original instrument could be produced which captured the hypothesized theoretical structure of the role of the work place in preventing and managing work disability in a more parsimonious manner, and thus be less of a burden in future research. Exploratory factor analysis was utilized to address this question.

Extraction. Exploratory factor analysis was utilized to assess the structure within the 95 items of the survey with the purpose of identifying the presence of a simpler structural solution than the

eight-factor solution attempted by Hunt, et al. (1993). The theoretical model that was set forth in the development of the study, which had become apparent in the pilot study (Habeck, et al. 1991) was based on four main constructs considered to be important in the reduction of work disability (see Figure 1 in Chapter 1). Thus, the aim was to validate the theoretical model in the factor analysis and assess the adequacy of the refined factor solution for defining these constructs within the item pool.

The Bartlett Test of Sphericity indicated that the correlation matrix was not an identity matrix. The Kaiser-Meyer-Olkin measure of sampling adequacy and inspection of the anti-image correlation matrix indicated that the linear effects of the other variables in the matrix explained much of the correlations between pairs of variables and thus the matrix met the assumptions for reduction by factor analysis.

A factor analysis was conducted using principal-axis factor procedure which initially replaces the diagonals of the correlation matrix with squared multiple correlation coefficient estimates of the communalities and iterates through the process of extracting factors. Eigenvalues were analyzed and a scree plot was produced to assess the four factor solution. The scree plot is shown in Figure 2. There are 23 factors with eigenvalues greater than one.

Visual inspection of the "elbow" shows a few potential cutoff

points for the number of factors to retain. Retaining four factors is the first potential cutoff point and is also the point at which the difference in variance accounted for by each subsequent factor most noticeably levels off. Thus, from using the scree plot, it appears that retaining four factors may provide a latent variable solution that represents the variance in the correlation matrix in a simpler solution.

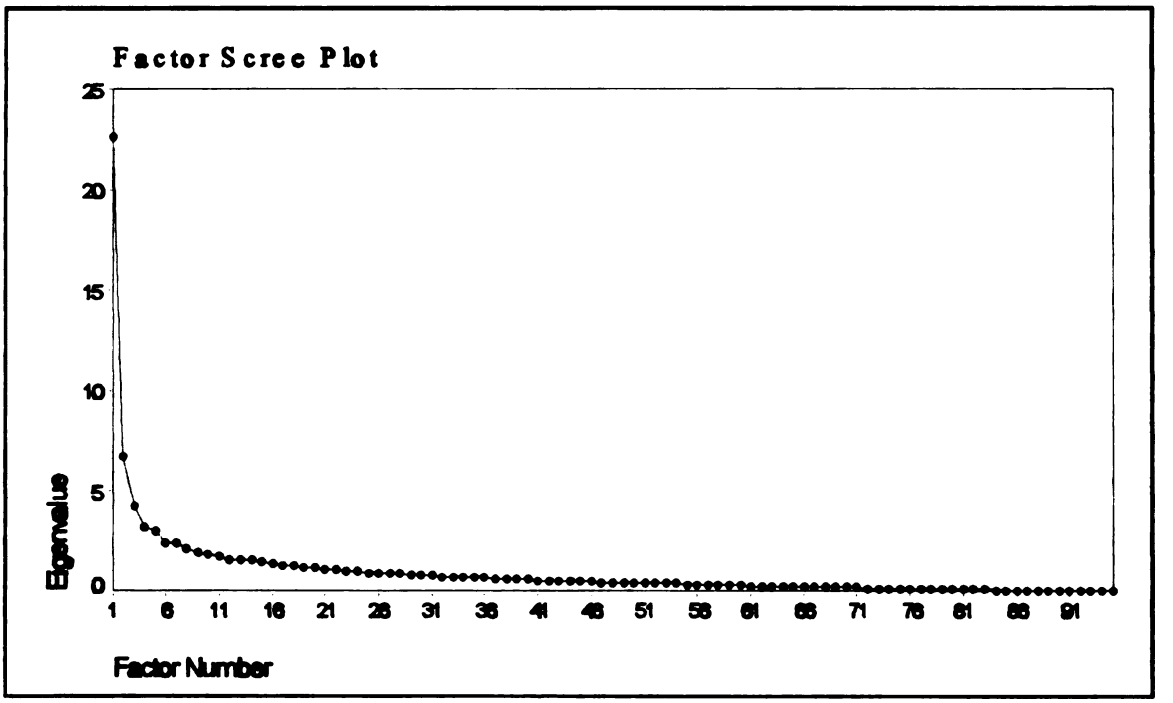

Figure 2. Scree Plot of Eigenvalues.

The first unrotated factor accounts for 23.9 percent of the variance, the second for 7.0 percent, the third for 4.5 percent, and the fourth for 3.4 percent which means that the first four factors cumulatively account for 38.8 percent of the variance in the correlation matrix. Initial communality estimates in the factor

procedure ranged from .60 to .91, thus the correlation matrix contained highly related items, showing good potential for reduction by factor analysis.

Rotation. Following extraction, the retained factors were rotated to achieve simple structure and enhance interpretability (Thurstone, 1947 and Cattell, 1978 as referenced in Kline, 1994). Orthogonal and oblique rotations were compared for simple structure. Varimax procedure for orthogonal rotation produced simple structure which was very comparable to that achieved with oblique rotation. Thus the orthogonal rotation was chosen for the simplicity of developing latent factors which are more distinct from one another (Kline, 1994).

Guadagnoli & Velicer (1988) reported that when components contained four items with factor loadings in the range of .60+, they were stable with sample sizes of 150. These four resulting factors approach that criterion and thus, with a sample size of 200, it is believed that an appropriate level of stability has been established. The rotated factor matrix is provided in Appendix D. Factor 1 contains 29 items, Factor 2 contains 22 items, Factor 3 contains 25 items, and Factor 4 contains 19 items. The rotated factors account for 36.3 percent of the variance in the correlation matrix.

The four factor solution was then compared with extraction using the Principal Components procedure, which places ones on the

diagonal of the correlation matrix and thus has the potential of accounting for greater variance with fewer factors. Extraction and Varimax rotation of four components resulted in components which were almost exactly similar to the four factors extracted with Principal-axis factoring procedure. These four rotated components accounted for 38.8 percent of the variance. The solution using Principal-axis factoring was retained as this procedure is more appropriately used for the purpose of identifying latent variables corresponding with theory. The Principal Component procedure provided confirmation that the four factors extracted were accounting for a significant amount of the potential common variance.

Factor Refinement. Conservative rules were followed to achieve parsimony. All items loading less than .40 on each factor were eliminated, resulting in the deletion of six items from Factor 1 (DCM13, DCM05, MC11, SA03, DCM01, and SA02); five items from Factor 2 (ERP09, ERP02, ERP10, CE09, and ERP04); two items from Factor 3 (DI01 and DCM03); and six items from Factor 4 (ERP01, ERP05, SA08, MC03, CE08, and SI01). Seventy-six items were retained.

Next, to further promote parsimony and construction of scales which clearly distinguished between factors, items were deleted when they loaded greater than .30 on another construct. This eliminated five items from Factor 1 (SI12, SI08, SI03, MC10, and SI10); three

items from Factor 2 (CE07, CE06, and CE05); five items from Factor 3 (DI02, DI09, DI10, DI04, and DI13), and seven items from Factor 4 (SA04, MC07, SA10, MC06, MC08, SI02, and MC01). Thus, 56 items were retained.

The next level of refinement was done within each factor using internal consistency reliability procedures. The Cronbach's alpha for Factors 1, 2, and 3 was .89 and for Factor 4 was .79, thus there was believed to be some room for greater parsimony while attempting to achieve a final alpha of greater than .85. The "Alpha If Item Deleted" statistic was assessed to determine if any items were detracting from internal consistency. One item was deleted in Factor 3 (DI07). Next, "Corrected Item-Total Correlation" and "Squared Multiple Correlation" statistics were assessed, respectively, to identify items that correlated noticeably less than the others with the factor and items with noticeably less shared communality. No items were deleted based on the item-total correlation, but two items from Factor 1 (SI09 and SI11) and one item each from Factors 2 (SA01) and 4 (SA05) were deleted based on noticeably lower shared communality.

Finally, the correlation matrix of the items was assessed for pairs of items with noticeably high correlations. These items were then judged to assess whether their content overlapped. In Factor 1, items PWE08 and PWE09 correlated .69 and items PWE07 and

PWE08 correlated .68. The content of these items was judged to overlap and PWE08 was retained as it correlated the highest with the factor and had the highest shared communality. Items PWE07 and PWE09 were deleted. SI06 and SI04 also correlated at the .68 level, but their content was not judged to overlap. Within Factor 2, items ERP06 and ERP07 correlated .88 with each other and their content was judged to overlap. ERP06 was deleted as its item-total correlation and shared communality was the lowest. In Factor 3, items DCM07 and DCM06 correlated at .74 and their item content was judged to overlap. Item DCM06 was deleted based on its lower item-total correlation and communality. DCM11 and DCM12 correlated at .63, but their content was not judged to overlap. Thus an additional nine items were deleted from the factors.

The Reliability procedure was run again on the remaining items to assess Cronbach's alpha and "Alpha if Item Deleted", "Corrected Item-Total Correlation", and "Squared Multiple Correlation" statistics. Two items, one each in Factors 1 (PWE10) and 2 (ERP08), detracted from alpha and were deleted. This procedure was repeated a third time and one item from Factor 2 (ERP07), which now showed noticeably lower communality, was deleted. The final Reliability procedure demonstrated completion of the decision making rules used above to refine each factor. Forty-four total items were retained. Cronbach's alpha for Factor 1 (n = 13) was .87; for Factor 2 (n =

10), .89; for Factor 3 (n = 16), .89; and for Factor 4 (n = 5), .78.

Factor Interpretation. The four factors as refined and used in the subsequent data analysis are reported in Tables 4 - 7. The Tables list the factor loadings for each item and its original scale membership on the questionnaire as indicated by the item number (i.e., MC = Management Commitment, SA = Safety Accountability, SI = Safety Intervention, PWE = Physical Work Environment, DCM = Disability Claims Management, DI = Disability Intervention, ERP = Employee Risk Prevention, and CE = Company Environment). The items contained in each factor are presented in tabled format. Interpretation of the factors is presented in narrative format in the following paragraphs.

Factor 1 is titled "Safety Diligence and Hazard Prevention." The items retained in this factor appear to reflect a high level of commitment, attention, and involvement in preventing risks to safety. They reflect the role that supervisors play in the practice of safety and the conscientious and meticulous application of safety practices throughout the company. Knowledge provided through safety training is specifically targeted in regard to specific audiences within the company, specific hazards, specific jobs, and specific safe work practices. Additionally, this factor reflects the use of hazard prevention techniques both in terms of purchasing or modifying equipment and work procedures to reduce hazards and risks for

injury, and techniques incorporated into employee behavior in the form of using personal protective equipment where indicated.

This factor, then, is best understood not as a simple representation of the breadth of safe behavior but as a measure of the quality to which targeted safety practices are diligently and consistently achieved. For example, the item regarding safety training for employees, a more common behavior, dropped out; but the items regarding specific training for new employees, temporary employees, and supervisors were retained because they represent a higher level of diligence and attention to detail. This diligent and conscientious attention to detail is noted in the other items, too. For example, "Supervisors document <u>even minor</u> accidents and violations for review and consideration" and "The company achieves <u>excellent</u> housekeeping" (underlined for emphasis).

Factor 2 is titled, "Valuing Human Resources." This factor represents an effort on the part of management to cultivate and use employee input in meaningful and important ways in company decision making. This factor reflects the extent to which the company facilitates employee involvement in various decision making processes, such as aspects of the immediate work process as well as long term planning; the extent and directions in which information is communicated throughout the company; the achievement of a collaborative climate in which employees are empowered to raise

Table 4

Items and Factor Loadings for Factor 1, Safety Diligence and Hazard Prevention

Factor Loading	Item#	Item
.66	SI07	Supervisors confront and correct unsafe behavior and hazards when they occur.
.60	SA07	Supervisors document even minor accidents and violations for review and consideration.
.57	PWE02	Equipment is well maintained.
.57	SI06	Supervisors are informed about possible hazards and trained in safe work practices for the jobs they supervise.
.56	PWE06	Existing equipment and tools at this plant have been modified to minimize safety hazards.
.54	SA06	Supervisors complete accident records promptly.
.54	PWE08	Strategies are used to reduced repetitive movements.
.53	SI05	Temporary or temporarily assigned employees are given training on-site before being placed on a job or working with new equipment.

Table 4 (cont'd)

Factor Loading	Item #	Item
.53	PWE03	Workers use personal protective equipment where indicated.
.51	PWE04	Safety guards and equipment are used in hazardous operations.
.51	PWE05	Safety and health issues are considered in the acquisition of new machinery, equipment and tools.
.49	PWE01	The company achieves excellent housekeeping.
.46	SI04	New and transferred employees are given training regarding specific hazards for their particular job before being placed on the job.

Table 5

Items and Factor Loadings for Factor 2, Valuing Human Resources

Factor Loading	Item #	Item
.67	CE13	Management seeks and considers employee input in company decisions.
.66	CE15	Workers have some control over the work process and productivity demands.
.62	CE10	Employees are formally included in the company's goal setting and planning process.
.62	CE12	The company shares information with employees about the financial status and productivity needs of the company.
.61	CE11	The company achieves open communications where employees feel free to raise issues and concerns, or make suggestions.
.60	CE03	Job satisfaction among employees at this company is high.
.60	CE04	Working relationships are collaborative and cooperative in this company.

Table 5 (cont'd)

Factor Loading	Item #	Item
.56	CE14	Employee involvement programs, such as quality circles and labor-management participation teams, are used to generate employee participation in company operations.
.51	CE01	Ownership and accountability are pushed to the lowest levels of the organization.
.50	CE02	The company demonstrates concern about retaining and developing personnel through its human resources policies and programs.

Table 6

Items and Factor Loadings for Factor 3, Reducing Work Disability and Promoting Return to Work

Factor Loading	Item #	Item
.70	DCM07	Duration of disability is evaluated to identify claims needing case management and rehabilitation services.
.70	DCM12	Claim management is well coordinated from initial injury to claim resolution.
.68	DCM04	The company monitors employees off work due to disability and their projected return-to-work date.
.68	DCM09	When the company refers for professional case management or rehabilitation services, they still maintain contact with the employee and monitor the return-to-work process.
.66	DI06	The company maintains regular communication with the injured employee's attending physician.
.62	DCM11	Responsibility for disability claim management and return-to-work coordination is assigned to a specific individual in the company.

Table 6 (cont'd)

Factor Loading	Item #	Item
.58	DI03	Injured employees are contacted by a designated person within the company immediately following medical treatment.
.57	DI12	Follow-up contact is made with the employee and supervisor after successful return-to-work to deal with any needed adjustments.
.56	DI05	The treating physician is asked to identify worker restrictions and capacities as well as a target date for return-to-work.
.53	DI14	There is cooperation and coordination among departments in efforts to return injured employees to work.
.51	DI08	The company develops alternative placement options and modified job duties to return disabled employees to work.
.50	DI11	When an injured worker is unable to resume prior duties the company provides job retraining for reassignment in a productive capacity.

Table 6 (cont'd)

Factor Loading	Item #	Item
.48	DCM08	Rehabilitation professionals are used to evaluate work capacity and develop individualized rehabilitation plans when injured workers are unable to resume employment.
.47	DCM10	The company conducts audits to evaluate the quality and effectiveness of medical and rehabilitation care provided to its injured employees.
.46	DCM02	Disability claims are evaluated early and accurately to determine their validity.
.42	ERP03	Employees are encouraged to promptly report physical symptoms arising from job tasks.

Table 7

Items and Factor Loadings for Factor 4, Top Management Support and Continuous Improvement of Safety

Factor Loading	Item #	Item
.66	MC04	Management allocates staff time of specific individual(s) for safety responsibilities.
.63	MC09	The company strives for continuous improvement in safety performance.
.56	MC05	The safety manager receives support from top management.
.55	MC02	Top management supports the safety program by attending safety meetings and training sessions.
.44	SA09	The company identifies specific jobs and departments with high accident incidence and lost work time.

issues and concerns; and the value of employees as demonstrated by support for personnel development.

Factor 3 is titled, "Reducing Work Disability and Promoting Return to Work." This factor is comprised of policies and practices employers utilize to identify and prevent potential work disability through effective early intervention for return to work and to address disabilities of longer durations that require more extensive medical and rehabilitative intervention to resolve. An important aspect of the factor is that communication is maintained with all the parties involved, including the employee, during critical points in the process such as immediately following a medical procedure. The focus of these actions is coordinated communication and policy to facilitate early return to work. Within the company, resources and strategies for accommodation are provided in an organized and cooperative manner. The motivational manner and interactive quality with which all these actions are carried out can vary from care and concern to control and cost containment.

There are two facets of responding contained within this factor. The first facet is the length of responding across time such that there continues to be interaction with an employee with extended work disability duration even to a point after referral for professional rehabilitation involvement and job retraining. The second facet of responding is the extent to which the employer responds with a

variety of flexible, alternative placement options to promote return to work opportunities. With some exceptions, the items of this factor tend not to reflect the quality of the behavior or policy as much as the existence of the behavior or policy. For example, "Duration of disability is evaluated to identify claims needing case management and rehabilitation services" does not address quality aspects of the evaluation nor how or when need is ascertained. It simply measures the presence of some form of duration monitoring. This reflects the relative newness of the literature and corresponding practices in the discipline of disability management where solutions are often achieved through exploration and innovation as opposed to refinement.

Factor 4 is titled, "Top Management Support and Continuous Improvement of Safety." The items in this factor reflect the level to which top management supports safety as evident in resource allocation and top management's visibility in safety programs; and the proactive use of data to reduce risk and measure improvement. The items reflect the importance of having individuals who are responsible for safety acting with authority and support provided by top management. The importance of accountability is demonstrated in the measurement of safety and disability management performance, and management principles of continuous improvement are utilized.

The factor inter-correlation matrix is reported in Table 8 along with the correlation correction for attenuation due to unreliability

(Schmitt, 1996). From the corrected correlations it is observed that Factor 1 and Factor 4 correlate the highest (.62, n = 220). This supports the expected relationship that a company's diligence in the practice of safety is associated with their top management support for safety. Factor 2 and Factor 4 are moderately correlated (.53, n = 219), demonstrating the association between valuing of human resources and top management support for safety. Additionally, Factor 1 and Factor 2 are moderately correlated (.52, n = 219) demonstrating the relationship between valuing of human resources and diligent practice of safety.

Factor 3 correlates moderately with both Factor 1 (.44 n = 219) and Factor 4 (.44, n = 219) demonstrating the relationship between preventive efforts to reduce work disability and promote return to work with diligence in safety practice and top management support for safety. Factor 3 and Factor 2 are moderately correlated (.40, n = 219) demonstrating the general link between valuing of human resources and efforts to reduce work disability and promote return to work.

To further assess for multidimensional representation within each refined factor, each factor was subjected to a principle components analysis with forced extraction of three components. Next, the loadings of the items on the first component were examined to determine how well each item loaded on the first component in

Table 8

Observed Correlations, Alpha Coefficients, and Corrected Correlations Among the Four Factors

Factor	1	2	3	4
Safety Diligence and Hazard Prevention	(.87)	.52	.44	.62
Valuing Human Resources	.46	(.89)	.40	.53
Reducing Work Disability	.39	.36	(.89)	.44
Top Management Support	.51	.44	.37	(.78)

Note. Alpha coefficients are presented on the diagonal, observed correlations below the diagonal, and correlations corrected for attenuation above the diagonal.

comparison to the other components extracted. In all cases, the items loaded highly on the first component. The lowest loading within each of the four factors was .51, and in no case did an item load higher on another component. This provides further evidence for unidimensionality with each of the four factors (Clark & Watson, 1995).

Psychometric Properties. The resulting four scales were assessed for normality using the Lilliefors test of hypothesis that the data are from a normal distribution (Norusis, 1994). With Factors 3 and 4 the hypothesis of normality was rejected, however, it is noted that with large sample sizes small differences can be significant. The

factors were observed in graphic form and a negative skew was much more pronounced in Factor 4 than in Factor 3. Thus, for Factor 4 the property of having a normal distribution has not been met. The items measuring this factor have a low ceiling and may not capture the full variance associated with top management support. The potential for Factor 4 to perform in the analyses is limited by its psychometric properties.

The Lavene Statistic was computed to assess the equality of each factor's variance across the SIC and size categories which were used as structural covariates in the regression models (Norusis, 1994). All group variances were equal across size categories and all group variances, except for Factor 4, were equal across SIC code categories. Visual analysis of box plots for Factor 4 by SIC Code revealed a noticeably large variance for SIC 20 as compared with each of the other SIC categories. Thus, as noted above, the non-normal distribution of Factor 4 may represent a low measurement ceiling in terms of the items selected for inclusion. Factor 4 does not demonstrate adequate psychometric properties to facilitate its performance in the analyses. New items for Factor 4 will need to be written and tested in future research. As this study is constrained to the items available, Factor 4 will be used in the analyses, but interpretation of the results made in light of this finding.

In summary, this study has developed a four factor, 44 item

solution with conservative rules for item inclusion while maintaining alphas in the upper end of the acceptable range, with one exception, for each factor. These four factors correspond very highly with the conceptual, theoretical model (see Figure 1 found in Chapter 1) used in the Hunt, et al. (1993) study. The content of Factor 2, Valuing Human Resources, and Factor 4, Top Management Support and Continuous Improvement of Safety correspond with the theorized factors of Managerial Style and Corporate Culture from the conceptual model. Factor 1, Safety Diligence and Hazard Prevention corresponds with the theorized factor of Disability Prevention describing behaviors implemented to prevent injury. Factor 3, Reducing Work Disability and Promoting Return to Work, corresponds with the theorized factor of Disability Management describing behaviors implemented after an injury to prevent work disability. Thus, the four factor solution provides validity to the theoretical model used to conceptualize the study. Furthermore, a four factor solution provides a more parsimonious structure for a refined version of the instrument.

Multiple Regression Reanalyses

The second research question asked in this study was whether the refined, parsimonious instrument would adequately capture the variance associated with employer policies and practices that contribute to the incidence and outcomes of work disability.

To address this question, the study compared the empirical performance of the refined research instrument with the performance of the eight factor solution, 73 item version used in the Hunt, et al. (1993) study. The validity of the refined instrument was assessed by replicating the original regression models as closely as possible and comparing the results with the earlier version. The series of multiple linear regression analyses performed in the Hunt, et al. (1993) study was replicated in this study. The predictive variables were entered using forced entry in a single step. Complete description of the regression models for each of the nine reanalyzed regressions are presented in Appendix E. However, the SPSS regression program is not able to apply a one-tailed test to the t-statistic of the partial regression coefficient. Thus, the one-tailed significance tests are reported in the Hunt, et al. (1993) study and two-tailed t-tests are reported in the descriptions contained in Appendix E of this study. Two-tailed t tests present a more stringent requirement for obtaining significance as the confidence interval is split between the two tails of the distribution. Partial regression coefficients reported as significant in the Hunt, et al. (1993) study may not appear as significant in the output generated by the SPSS program and a t-distribution table is needed for comparative purposes (Glass & Hopkins, 1984).

In the Hunt, et al. (1993) study three multiple regression

analyses were performed within the Prevention Model to explore the relationship between Disability Prevention (before injury behaviors) and outcomes of injury incidence (MIOSHA Recordables) and disability incidence (Lost Work Day Cases and Worker's Compensation Wage-Loss Claim Rate). In the Hunt, et al. (1993) study, before-injury prevention behaviors were represented by three factors: Safety Diligence, Ergonomic Solutions, and Safety Training. In the four factor solution developed in this study, before-injury prevention behavior is represented by Factor 1, Safety Diligence and Hazard Prevention. Reported in Table 9 are Partial Regression Coefficients for each of the factors for the three multiple regressions and the three re-analyses using the Prevention Model. Also reported is the t-statistic, with an indication of its one-tailed significance level taken from a t-distribution table. In this manner, Table 9 is designed to facilitate comparison of the three factors from the Hunt, et al. (1993) study with the single, corresponding factor from this study. In addition, the R^2 and Adjusted R^2 for each regression is presented so that a comparison can be made between the variance accounted for by regressions from the Hunt, et al. (1993) study versus this study.

As with the eight factor solution, the model based on the four factor solution, using Safety Diligence and Hazard Prevention to predict MIOSHA recordable incidents, demonstrated no significant relationship. Safety Diligence and Hazard Prevention demonstrated

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significant relationships with both Lost Work Day Case Rate and Workers' Compensation Wage-Loss Claims in the expected direction. In both of these regressions, using Safety Diligence and Hazard Prevention accounted for just slightly less variance than in the Hunt, et al. (1993) study; Adjusted R^2 =.13 to .14 and .11 to .12, respectively.

Reported in Table 10 are three regression analyses and their re-analyses which were used with the Disability Management Model to explore relationships between Disability Management Interventions (after injury responses) and disability incidence (Lost Work Day Cases and Workers' Compensation Wage-Loss Claims) and disability duration (average number of Lost Work Days Per Case). Once again, three factors in the Hunt, et al. (1993) study reflected Disability Management Interventions, namely, Disability Case Monitoring, Proactive Return-to-Work Programs, and Wellness Orientation. The corresponding factor from the four factor solution in this study is Factor 3, Reducing Work Disability and Promoting Return to Work. The second regression attempted to explore the relationship between these factors and the duration of disability, measured as the average number of Lost Work Days per Case. Neither the regression from the Hunt, et al. (1993) study nor its reanalysis in this study produced a significant F statistic and both had Adjusted R^2 values near zero. In the other two regressions Factor 3 from this study demonstrated

Table 9

Prevention Model - Summary of Selected Partial Regression Coefficients and Model Performance

Solution - Dependent Variable Factor	B	t	R^2	Adj. R^2
From 8-Factor - Recordable Incidents			0.30	0.21
Safety Diligence	-0.066	-0.865		
Ergonomic Solutions	0.003	0.049		
Safety Training	-0.006	-0.082		
From 4-Factor			0.30	0.22
Safety Diligence & Hazard Prev.	-0.064	-1.127		
From 8-Factor - Lost Work Day Case Rate			0.24	0.14
Safety Diligence	-0.166	-1.941*		
Ergonomic Solutions	0.031	0.413		
Safety Training	-0.130	-1.652*		
From 4-Factor			0.21	0.13
Safety Diligence & Hazard Prev.	-0.219	-3.298**		
From 8-Factor - Workers' Compensation Wage-Loss Claim Rate			0.21	0.12
Safety Diligence	-0.213	-3.103**		
Ergonomic Solutions	0.044	0.741		
Safety Training	-0.031	-0.522		
From 4-Factor			0.19	0.11
Safety Diligence & Hazard Prev.	-0.179	-3.381**		

p=significant at .10 level, *=significant at .05 level, **=significant at .01 level

Table 10

Disability Management Model - Summary of Selected Partial Regression Coefficients and Model Performance

Solution - Dependent Variable Factors	B	t	R^2	Adj. R^2
From 8-Factor - Lost Work Day Case Rate			0.24	0.16
Disability Case Monitoring	0.147	1.581p		
Proactive RTW Program	-0.295	-3.235**		
Wellness Orientation	0.071	1.056		
From 4-Factor			0.21	0.13
Reducing Work Disability	-0.130	-2.124*		
From 8-Factor - Lost Work Days Per Case			0.07	-0.02
Disability Case Monitoring	0.057	0.856		
Proactive RTW Program	-0.019	-0.290		
Wellness Orientation	-0.060	-1.240		
From 4-Factor			0.05	-0.03
Reducing Work Disability	0.006	0.142		
From 8-Factor - Workers' Compensation Wage-Loss Claim Rate			0.15	0.07
Disability Case Monitoring	0.034	0.496		
Proactive RTW Program	-0.145	-1.978*		
Wellness Orientation	0.038	0.703		
From 4-Factor			0.14	0.07
Reducing Work Disability	-0.091	-1.893*		

p=significant at .10 level, *=significant at .05 level, **=significant at .01 level

Table 11

Managerial Model - Summary of Selected Partial Regression Coefficients and Model Performance

Solution - Dependent Variable Factor	B	t	R^2	Adj. R^2
From 8-Factor - Lost Work Day Rate			0.18	0.10
Active Safety Leadership	-0.113	-1.338p		
People Oriented Culture	-0.081	-0.893		
From 4-Factor			0.17	0.09
Top Management Support	-0.051	-0.656		
Valuing Human Resources	-0.112	-1.317p		
From 8-Factor - Workers' Compensation Payment Rate			0.16	0.07
People Oriented Culture	-0.212	-1.852*		
Active Safety Leadership	0.040	0.380		
From 4-Factor			0.16	0.08
Valuing Human Resources	-0.237	-2.224*		
Top Management Support	0.062	0.612		

p=significant at .10 level, *=significant at .05 level, **=significant at .01 level

Table

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Table 12

Summary Model - Selected Partial Regression Coefficients and Model Performance

Solution - Dependent Variable Factor	B	t	R^2	Adj. R^2
From 8-Factor - Lost Work Day Rate			0.25	0.17
Safety Diligence	-0.211	-2.575**		
Proactive RTW Program	-0.160	-2.134*		
Wellness Orientation	-0.039	-0.501		
From 4-Factor			0.22	0.14
Safety Diligence & Hazard Prev.	-0.207	-2.482**		
Reducing Work Disability	-0.091	-1.194		
Full 4-Factor Solution - Lost Work Day Rate			0.22	0.13
Safety Diligence & Hazard Prev.	-0.225	-2.392**		
Top Mngt. Support	0.059	0.698		
Reducing Work Disability	-0.097	-1.198		
Valuing Human Resources	-0.031	-0.357		

p=significant at .10 level, *=significant at .05 level, **=significant at .01 level

significant relationships with the dependent variables at the .05 level. The overall model explained 13 percent of the variance in Lost Work Day Case Rate compared with 16 percent for the Hunt, et al. (1993) study, and seven percent of the variance in Workers' Compensation Wage-Loss Claim Rate which was equivalent to the Hunt, et al. (1993) study.

Reported in Table 11 are two regressions and their re-analyses using the Managerial Model. In the Hunt, et al. (1993) study, the two factors of People Oriented Culture and Active Safety Leadership represent the Managerial Model. From the four factor solution, Factor 2, Valuing Human Resources, and Factor 4, Top Management Support, correspond and are used in the reanalyses. Factor 2, Valuing Human Resources demonstrated an association at the .10 level with Lost Work Day Rate and Top Management Support showed no relationship. In the Hunt, et al. (1993) study, People Oriented Culture showed no relationship and Active Safety leadership was associated at the .10 level. Using Factors 2 and 4 accounted for just slightly less variance compared with the Hunt, et al. (1993) study (Adj. R^2 = .09 vs. .10, respectively). Factor 2, Valuing Human Resources was also related to Workers' Compensation Payment Rate at the .05 level of significance, corresponding to the finding in the Hunt, et al. (1993) study where People Oriented Culture was also equivalently related. Using Factors 2 and 4 accounted for 8 percent

of the variance compared with 7 percent for the Hunt, et al. (1993) study.

Reported in Table 12 is the Summary Model from the Hunt, et al. (1993) study and its corresponding reanalysis. The Summary Model was reported to provide an overview of the most significant factors from the previous analyses. The two factors chosen from the Hunt, et al. (1993) study's eight factor solution were Safety Diligence representing disability prevention and Proactive Return-to-Work Programs representing disability management. Wellness Orientation was also included to see if a relationship would emerge in a simultaneous analysis when the elements of prevention and management were controlled. In the reanalysis there was no way to represent wellness as none of the items reflecting wellness made it into the four factor solution. The corresponding factors representing disability prevention and disability management from the four factor solution are Factor 1, Safety Diligence and Hazard Prevention and Factor 3, Reducing Work Disability and Promoting Return-to-Work. In the reanalysis, Factor 1 performs nearly equivalent in comparison and Factor 3 falls just short of a significant relationship at the .10 level. The reanalysis accounts for 14 percent of the variance compared to 17 percent for the Hunt, et al. (1993) study regression.

In addition, Table 12 reports the findings for a Full Summary Model using all four the factors from this study. This full summary

provides an exploration of the relationships for all four primary elements of the theoretical model in a simultaneous analysis. The first step in the analysis was to determine whether multicollinearity was a problem in the Full Summary Model. Lewis-Beck (1980) suggests that the best way to determine whether multicollinearity presents a problem is to regress each independent variable on all other independent variables. If any R^2 is near 1.0, there is high multicollinearity. When this procedure was followed, the highest R^2 found was .35, indicating that multicollinearity does not present a problem in this study. Safety Diligence and Hazard Prevention continues to demonstrate a significant relationship while Reducing Work Disability and Promoting Return-to-Work falls just short of significance at the .10 level. Neither Top Management Support or Valuing Human Resources demonstrate a significant relationship. The regression accounts for 13 percent of the variance in Lost Work Day Rate.

The regression reanalyses demonstrated that the psychometric or empirical properties of the four factor, 44-item solution are nearly equivalent to the eight-factor, 73-item solution, but with considerable efficiency gained in the number of independent variables used in the analytical model.

Classification Analysis

The third research question asked in this study was whether discernable subgroups of employers could be identified on the basis of similar profiles of disability prevention and management behavior.

Clusters Based on Factor Profile. To address this question cluster analysis was used to determine if meaningful subgroups of employers could be determined by their factor scores. A cluster analysis procedure was used to identify homogeneous groups of employers based on their scores from the four factor solution. Squared Euclidean distance, which is the sum of the squared distance over all the variables, was computed for each pair of employers in terms of their four factor scores. The factor scores are z-scores and thus are measured on the same scale equalizing each variable's contribution to the distance measure.

Agglomerative hierarchical cluster analysis with Ward's method for cluster formation was used to form clusters. In this technique, clusters are formed by grouping cases, based on the distance measures for each case to each cluster, into bigger and bigger clusters until all cases are members of a single cluster. Clusters are represented by the overall sum of the squared within-cluster distances, thus each case contributes to the cluster score, and clusters are formed based on homogenous or "nearest alike" factor scores.

During the clustering process, as the clusters get bigger so do the distance scores, indicating that the clusters being formed are less homogeneous. Identifying an "optimal" number of subgroups of employers involves finding an adequate compromise between parsimony (a manageable number of subgroups) and homogeneity (high similarity in the factor scores for the employers in each subgroup). Plotting the distance coefficient used in each agglomerative step provides a visual method of observing the decrease in homogeneity as the number of clusters gets smaller. A large jump in the sequence of distance coefficients indicates the grouping of two dissimilar clusters and thus indicates a stopping point. Figure 3 shows the plot of the distance coefficients and the clustering stage.

In the clustering procedure, 219 cases were used with one case eliminated due to missing variables. At cluster stage 218 a noticeable increase in the distance coefficient in noted, indicating that relatively homogeneous clusters were formed until the last possible cluster when two were formed into one. Thus two subgroups of employers are identified based on similarity among their four factor score profile. The number of employers in each group were 107 and 112 respectively.

Confirming the Cluster Solution. A discriminant analysis was performed to validate and help interpret the cluster solution. A

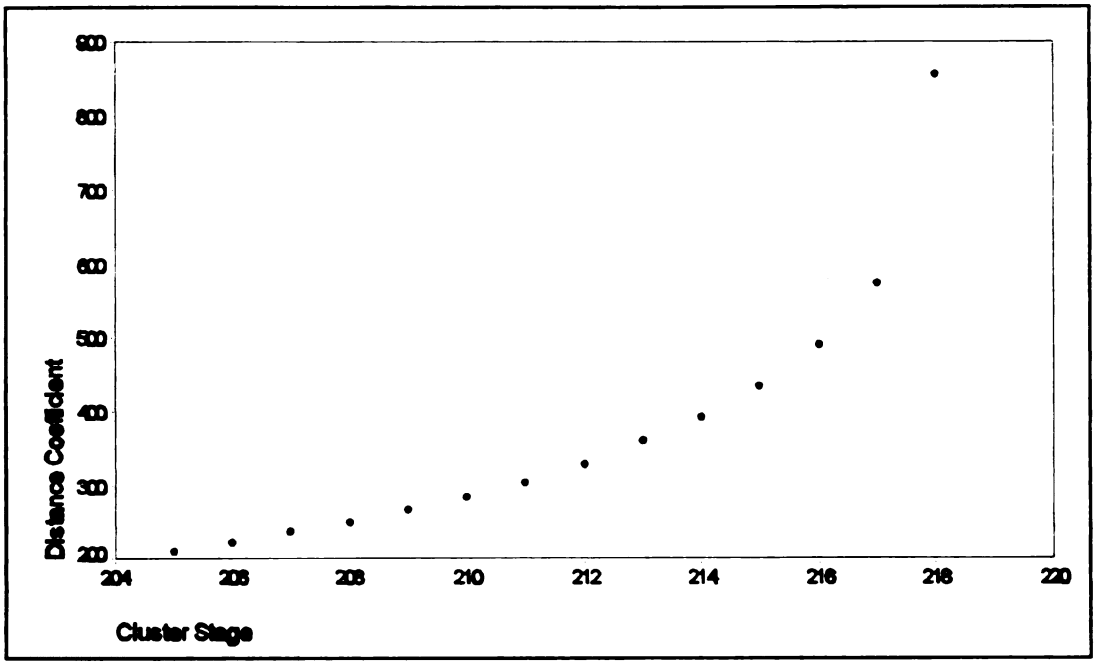

Figure 3. Plot of Distance Coefficients by Cluster Stage

discriminant analysis procedure was used with the four factor scores re-entered as the independent variables for predicting employer subgroup membership. The dependent variable was the two subgroups created from the cluster analysis. One function was created by the analysis to discriminate among the two employer subgroups, based on the factor score profiles. The canonical correlation between the discriminate scores and the groups was .81 (n = 219). The square of the canonical correlation is the ratio of the between-groups sum of squares and the total sum of squares and represents the proportion of the total variance attributable to differences among the groups. Thus, the discrimination function produced was able to account for 66 percent of the total variance

attributable to differences among the employer subgroups.

Interpretation of the function proceeds similar to that in multiple regression since the coefficients for a particular variable are dependent on the other variables in the solution. Since the variables in this function are measured in standardized form, their relative contributions to the function can be observed in the function coefficients. Further understanding of the factor can be derived from examining the correlations between the values of the function and the values of the variables. Table 13 reports the function coefficients and the pooled within-groups correlations between the variables and the canonical discriminant functions.

Table 13

Canonical Discriminant Function Coefficients and Pooled Within-group Correlations between Factors and Canonical Discriminant Functions.

Factor	Function Coefficient	Pooled Within-Group Correlation
Safety Diligence/Hazard Prev.	.7903	.77
Valuing Human Resources	.0212	.34
Reducing Work Disability	.5994	.54
Top Management Support	.1460	.40

Factor 1 demonstrated highest coefficient within the function

and high correlation with the discriminant function scores (.77, n = 219). Factor 3 demonstrated an important contribution to the discriminant function with its coefficient level and it correlated moderately with the discriminant function scores (.54, n = 219). The remaining factors, Factor 2 and Factor 4 correlated moderately with the discriminant function scores (.34 and .40 respectively, n = 219), but were of comparatively limited contribution in the discriminant function. Thus, the discriminating function relied to a large extent on the performance of an employer for Factor 1, Safety Diligence and Hazard Prevention, and Factor 3, Reducing Work Disability and Promoting Return to Work, compared with the remaining two factors to distinguish between the two groups which were created in the cluster analysis using all four factors.

Finally, the discriminant function was used to assign employers to the two cluster groups to determine its ability to correctly classify the employers. The proportion of the 219 employers correctly classified was 94.06 percent, supporting the validity of the clustering solution. Therefore, the two groups of employers are presented and described based on the four factor scores. Table 14 reports the group means and standard deviations for the two clusters on each factor.

The discriminant function provides a straight forward explanation of the two cluster groups. The employers comprising

cluster 1 demonstrated, as a group, higher achievement of work place policies and practices as measured by all four factors, than did the employers comprising cluster 2. Validation of this cluster grouping would be further supported by comparing the cluster means on the outcome variables for significant differences. It was expected that cluster 1 would have significantly lower group means on each of the six dependent variables used to measure work disability.

Table 14

Factor Z-Score Group Means and Standard Deviations for the Two Clusters

Cluster	Safety Diligence mean s.d.	Valuing HR mean s.d.	Reducing Work Dis mean s.d.	T.M. Support mean s.d.
1	0.7451 0.577	0.4343 0.973	0.6166 0.564	0.5072 0.636
2	-0.6809 0.973	-0.4159 0.839	-0.5898 0.972	-0.4673 1.041

Multivariate analysis of variance was used to test for differences between cluster means for each of the six outcome variables. Hotellings Test of Significance with 6 D.F. was significant ($p < .05$). Therefore, Table 15 reports the results of univariate F-tests. The outcome variables were entered in log form.

There is no difference between the performance subgroups (Cluster 1 and Cluster 2) for incidence rate of MIOSHA recordables (MIOSHA Recordable Rate), average duration of a lost work day case (Lost Work Days Per Case), number of workers' compensation wage loss claims per 100 employees (W.C. Wage Loss Claim Rate), and the average workers' compensation losses per employee (Workers' Compensation Losses Per Employee). The number of lost work day cases per 100 employees (Lost Work Day Case Rate) and the number of lost work days per 100 employees (Lost Work Day Case Rate) do show a significant difference at the .05 level.

Table 15

MANOVA Testing for Difference between Cluster Means on Six Outcome Variables

Source	Hyp. MS	Error MS	F Ratio
MIOSHA Recordable Rate	0.0026	0.5648	0.0046
Lost Work Day Case Rate	2.8279	0.5734	4.9317*
Lost Work Days Per Case	0.0949	0.2470	0.3845
Lost Work Day Rate	3.1210	0.6684	4.6688*
W. C. Wage-Loss Claim Rate	0.8540	0.4230	2.0190
W. C. Losses Per Employee	0.0895	1.2664	0.0706

Note. Univariate F-tests with (1, 140) D.F. *$p < .05$

Thus, creating performance subgroups by differentiating between employers at two levels, based on their achievement of policies and practices as measured by a profile of the four factors developed in this study, is validated by a significant difference in the work disability variables for disability incidence (Lost Work Day Case Rate) and a broad, summary measure of work disability (Lost Work Day Rate).

Post Hoc Analysis

Predicting Clusters with Covariates. The final step in this study was to assess the extent to which these performance subgroups could be predicted from demographic variables. If demographic variables could be used to predict high or low disability outcomes, then information which is easily available could be used in a screening instrument to initially classify employers at some known level of probability. Logistic regression analysis, which can be used with dichotomous dependent variables and either dichotomous or continuous predictor variables, produces a linear regression equation which selects coefficients that maximize the likelihood of classifying a case correctly. Therefore, logistic regression was used to explore the relationships between covariates and high and low performance subgroups of employers.

In the Hunt, et al. (1993) study, there were 11 covariates used in the regression analyses. These included whether or not a labor

union represented some of the employees, percent of employees on rotating shifts, percent of employees with tenure less than one year, percent of the workforce salaried, and the average hourly wage paid to employees. Three covariates describe characteristics of an employer related to risk management. These include the type of insurance (individual self-insurance, group insurance, and commercial insurance); safety standards required for accreditation or affiliation; and the use of risk management services that are offered by insurance companies, industry affiliated groups, or outside consultants. The remaining covariates are structural in nature and included the size of the employer, if the company was comprised of more than one work-site location, and the industry classification.

While there is some inherent structure to these covariates, there is no theory to determine a priori which variables should precede others in a hierarchical analysis. The covariates were entered simultaneously into a logistic regression for purely technical prediction purposes, to see what their performance would be in predicting an employer's classification based on the four factor performance profile. Thirty-four cases were excluded due to missing data, 186 cases were entered into the analysis. There were 91 cases in the high performance group (cluster 1) and 95 cases in the low performance group (cluster 2).

The regression function from the logistic analysis correctly

classified 59 percent of the high performance employers and 68 percent of the low performance employers, for an overall correct classification rate of 64 percent (correct classification, n = 119; misclassified, n = 67). Having multiple site locations (WCC1R) was significant at the .01 level and belonging to SIC 25, as compared with the other industrial classifications included in the regression, was significant at the .05 level. Both variables demonstrated a coefficient which was associated with greater likelihood of being a low performance employer. Having individual self-insurance was significant at the .10 level and was also associated with a greater likelihood of being a low performance employer.

Thus the variables of multiple site locations and SIC 25 were the only variables to be assigned significant beta coefficients. The regression equation combined for a correct classification of 64 percent of the employers, which is above the expected chance classification of 50 percent.

CHAPTER 5

Discussion

The purpose of this study was to develop a research instrument which would correspond with the theoretical organization developed in the Hunt, et al. (1993) study but achieve greater parsimony than the eight factor solution utilized in the Hunt, et al. (1993) study. This study was organized around three research questions. First, could reanalysis procedures produce a refined version of the original instrument that would be more parsimonious, yet equally effective in capturing the hypothesized theoretical structure of the role of the workplace in preventing and managing disability? Second, could the refined, briefer instrument adequately capture the variance associated with employer policies and practices that contribute to work disability? Third, could subgroups of employers be identified on the basis of similar profiles of disability prevention and management behavior that have implications for prediction and screening?

Content Coverage and Reliability

Refinement of an instrument is important to on-going research for the purposes of demonstrating construct consistency and for raising questions that motivate theory building and improvement (Smith & McCarthy, 1985). The challenge of the first research question in this study was to determine whether a refined parsimonious instrument could retain content coverage of the targeted

constructs as outlined by the theoretical model of prevention and managing workplace disability. The refinement sought to promote item reduction, unidimensionality, and maintenance of internal consistency in a manner that would facilitate stability and enhance the potential for replication of the factor structure on an independent sample.

From the results presented in Chapter 4, one can conclude that a more parsimonious model for representing the variance structure within the "Disability Prevention Among Michigan Employers" survey questionnaire does exist. Principal-axis factoring with orthogonal rotation produced four unidimensional factors which correspond in content with the four main areas of employer controlled influence on work disability described in the conceptual model of work disability outlined in the Hunt, et al. (1993) study.

The four factors that were extracted demonstrated a range of factor loadings consistent with the findings reported by Guadagnoli & Velicer (1988) for factor stability with sample sizes of 200. In initial scale development a benchmark internal consistency level of .80 is recommended (Nunnally, 1978; Clark & Watson, 1995). In balancing parsimony with internal consistency, a target Cronbach's alpha was set at .85, where possible, to provide a cushion of internal consistency for maintaining the benchmark level when replicating the scale on an independent sample. Factor 1 (.87, n = 13), Factor 2

(.89, n = 10), and Factor 3 (.89, n = 16) achieved the target level of alpha following complete iteration of the chosen conservative rules for item retainment. The internal consistency for Factor 4 was acceptable (.78, n = 5).

In the Hunt, et al. (1993) study, factors from the eight factor solution corresponding to before injury behaviors aimed at preventing the occurrence of a work-related injury of illness were Safety Diligence, Ergonomic Solutions, and Safety Training. In the Hunt, et al. (1993) study these three scales were comprised of 21 items. In this study, Factor 1, Safety Diligence and Hazard Prevention corresponds to this area and contains 13 items. The focus of Factor 1 is diligent and meticulous application of safety behavior, and its items represent active attention and thorough involvement in hazard reduction and risk prevention.

In the Hunt, et al. (1993) study, factors from the eight factor solution corresponding to after injury responses aimed at monitoring work disability and promoting return to work were Disability Case Monitoring, Proactive Return-to-Work Program, and Wellness Orientation. The three factors in the Hunt, et al. (1993) study were comprised of 24 items. In this study, Factor 3, Reducing Work Disability and Promoting Return to Work, corresponds to this area and contains 16 items. The focus of Factor 3 is continued monitoring of work disability of longer duration to ensure appropriate

treatment and services for resolution and identifying and preventing potential work disability through effective early intervention for return to work.

In the Hunt, et al. (1993) study, the factor from the eight factor solution corresponding to cultural characteristics and human resource orientation was People Oriented Culture, which contained 13 items. In this study, Factor 2, Valuing Human Resources corresponds to this area and contains 10 items. The focus of Factor 2 is effort on the part of management to use employee input in meaningful ways in company decision making and to cultivate employee growth.

In the Hunt, et al. (1993) study, the factor from the eight factor solution corresponding to managerial style was Active Safety Leadership, which contained 13 items. In this study, Factor 4, Top Management Support and Continuous Improvement of Safety, corresponds to this area and contained 5 items. The focus of Factor 4 is support of top management to the safety program through resources and visibility, accountability through measurement, and continuous improvement.

Thus, the Hunt, et al. (1993) study utilized 73 items across eight factors. This study achieved reduction to 44 items across four factors. It was important in the systematic refinement procedures utilized in this study to retain, in balance with parsimony, an

adequate level of content coverage. Constrained to the items available in the original instrument, it is believed that content coverage for the targeted constructs was adequate in that for the three broader constructs ten or more items were retained with moderate inter-item correlations and significant item overlap was eliminated. For researchers interested in including employer factors in their models of work disability, they now have a theory based, refined instrument. In some instances, this level of parsimony is not adequate for the constraints with which the researchers are faced. Further research is needed to determine, separate from the theory of work disability, which specific items may be highly predictive of outcomes.

Comparative Associations.

In the multiple regression analyses, Safety Diligence and Safety Training from the Hunt, et al. (1993) study were associated with Lost Work Day Case Rate ($p < .05$), and Safety Diligence was associated with Workers' Compensation Wage-Loss Claim Rate ($p < .01$). In this study, Factor 1, Safety Diligence and Hazard Prevention was associated with both of these outcome measures at the .01 level.

Furthermore, the discriminant function which confirmed the performance subgroups contained a comparatively large coefficient for Safety Diligence and Hazard Prevention compared with the other

three providing further evidence for the importance of prevention in achieving low work disability. Safety Diligence and Hazard Prevention demonstrates a prominent place in the model of work disability.

In the multiple regression analyses, Disability Case Monitoring was associated with Lost Work Day Case Rate ($p < .10$). Proactive Return-to-Work Program was associated with Lost Work Day Case Rate ($p < .01$) and with Workers' Compensation Wage-Loss Claim Rate ($p < .05$). In this study, Factor 3, Reducing Work Disability and Promoting Return to Work, was associated with both Lost Work Day Case Rate and Workers' Compensation Wage-Loss Claim Rate ($p < .05$). The refined factor did not demonstrate as strong of a relationship with Lost Work Day Case Rate as did the more specific Proactive Return-to-Work Program from the Hunt, et al. (1993) study. This may suggest that in reducing items and factors in favor of parsimony, the ability of the factor to measure an employers' provision of appropriate, alternative return-to-work options was compromised. The ability to measure an association with a dependent variable is maximized by independent variables that corresponds in level of specificity DeVellis, 1991). Factor 3, Reducing Work Disability and Promoting Return-to-Work achieves parsimony, but perhaps at the expense of specificity .

However, the ability of Factor 3 to demonstrate a relationship

with both Lost Work Day Case Rate and Workers' Compensation Wage-Loss Claim Rate demonstrates the general and significant relationship between after injury response behaviors and the incidence of lost work day and workers' compensation cases and the relative importance of this factor in the conceptual theory of work disability. In the discriminant function which was produced, Factor 3 had the second largest coefficient and provided an important contribution to the equation.

In the original multiple regression analyses, People Oriented Culture was significantly associated with Workers' Compensation Payment Rate ($p < .05$). In this study, The performance of Factor 2, Valuing Human Resources, revealed an association with Lost Work Day Rate ($p < .10$) and an association with Workers' Compensation Payment Rate ($p < .05$). These associations provide validity towards the inclusion of workplace culture in a model of work disability.

In the multiple regression analyses, Active Safety Leadership from the Hunt, et al. (1993) study demonstrated an association with Lost Work Day Rate ($p < .10$). In this study, Factor 4, Top Management Support and Continuous Improvement, did not demonstrate a significant relationship. This area of employer influence, as represented in both the Hunt, et al. (1993) study and this study, has not demonstrated a level of association comparative to the other three areas. The lack of comparative association in these

studies raised several questions.

First, does this factor belong in the model as a distinct and separate area of employer influence? This question is supported by the fact that a number of items were eliminated from this factor due to the fact that these items also loaded at a significant level on Factor 1, Safety Diligence and Hazard Prevention, and Factor 2, Valuing Human Resources. In fact, a eight of the items loaded significantly on either Factor 1, Factor 2, or both. The existence of relationships between Factor 2 and Factor 4, and Factor 1 and Factor 4 suggests that Factor 4 may be describing a link between Factor 2 and Factor 1, and not a distinct construct area.

Retaining the belief that Factor 4 is a distinct construct area begs the question of how the scale fell short in measuring that construct area. The analysis of psychometric properties demonstrated that the distribution of the scale, Factor 4, in this study negatively skewed and significantly different from normal, thus violating the assumptions for multivariate analyses. This scale had a low ceiling in that most employers reported achieving a high level of top management support as measured by this scale. It may be that the scale failed to capture the true variance existing within the sample and thus was less likely to reflect the association that may exist in the sample between top management support and outcomes of work disability..

The parsimony achieved in modeling employer factors influencing work disability with a four factor solution allowed the full model to be entered into regression analysis. This full regression model, incorporating all components of the theory, provides additional information on the inter-relationships of the components within the theoretical model. Simultaneous analysis of these components demonstrated the relative weight and importance of preventative behaviors in the relationship of disability prevention and management behaviors to overall work disability performance.

However, while the achievement of parsimony provides the opportunity to represent the full model of employer factors, the results suggest the more general construct measures may be less effective in demonstrating the relationships between the employer factors and measures of work disability. Controlling for all other factors present in the model, Safety Diligence and Hazard Prevention demonstrated its association with the dependent variable of Lost Work Day Rate, the summary dependent variable of work disability reflecting both the incidence and duration of lost work day cases. However, the fact that Factor 3, Reducing Work Disability and Promoting Return-to-Work, did not demonstrate an association with workplace disability in the summary model, despite doing so in the more narrowly modeled regressions of Lost Work Day Case Rate and Workers' Compensation Wage-Loss Claim Rate, suggests that more

narrowly defined constructs and associated measures of employer behavior may be needed to demonstrate the specific influence of employer behaviors on work disability. For example, in Factor 3, a few items were dropped from the Proactive Return-to-Work Program factor used in the Hunt, et al. (1993). It may be that the associative power of certain specific behaviors (e.g., return to work) are muted when they are contained with other specific behaviors (e.g., claim management) to represent a broader construct (e.g., post injury response).

Employer Subgroups

The third question raised in this study was whether employers could be classified into subgroups based on their performance as profiled with the four factors. If achievement levels on the four factors resulted in employer subgroups that could be classified, then the outcome and covariate levels associated with those subgroups could be examined to learn more about how the process of work disability may differ for different types of employers.

Classification of the employers using their scores on the four factors resulted in two clearly distinguishable groups. A discriminant analysis demonstrated that these two employer groups differed on their achievement of work disability prevention and management across all four factors. Thus, if employers reported high achievement on one factor, they were likely to report comparatively higher

achievement on all of the factors. In a MANOVA analysis the performance subgroups created by the discriminant analysis also demonstrated significant differences in Lost Work Day Case Rate and Lost Work Day Rate. In particular, this finding provides further support for the important role of Safety Diligence and Hazard Prevention and Reducing Work Disability and Promoting Return to Work in modeling the influence of employer factors on work disability.

Using covariates to predict membership in high and low performance subgroups demonstrated that the presence of multiple plants is associated with the lower performing subgroup. The interpretation derived from this finding is that multiple location plants are an impediment to the achievement of higher levels of workplace disability prevention and management.

Another finding is that SIC 25 (Furniture Manufacturing) is associated with the lower performing subgroup. This finding is probably best explained in light of the findings from the qualitative portion of the Hunt, et al. (1993) study which reported that those employers who were engaged in and knowledgeable of innovative disability management solutions, rated their achievement on the disability management scales with a tougher standard of reference. Within Michigan, SIC 25 is known to have companies who have been recognized for their innovation, leadership, and achievements in the

area of disability prevention and management (Wasserman, 1993; Habeck, Williams, Dugan, & Ewing, 1989). This finding and its interpretation in light of the qualitative findings of the Hunt, et al. (1993) study serves to highlight the importance of replicating these findings on an independent sample.

Implications for Further Research.

Implications for further research include the need to perform a confirmatory factor analysis. A confirmatory factor analysis would assess for the goodness-of-fit of a four factor model in explaining the variance. Furthermore, a better exploration of the strengths of the relationships between the four factors could be modeled and analyzed. In particular, the theory needs to operationalize the path of influence of workplace culture on work disability outcomes, and the extent to which Top Management Support and Continuous Improvement of Safety is a distinct construct.

Furthermore, this study is limited by the possibility of reverse causation. The employers were surveyed in 1991 and asked to self report their disability prevention and management behaviors. Outcome measures were provided from the MIOSHA log data for the years of 1987 - 1989. The study correlates prior outcomes with later behaviors thought to be associated with those outcomes in a proactive, not reactive, manner. Further research with a prospective design is required to establish an appropriate sequential relationship

between behaviors and outcomes.

Additionally, the study demonstrates the achievement of parsimony in the number of factors used to model the realm of workplace constructs associated with work disability outcomes. However, in achieving parsimony specificity was compromised. The results suggest the need for research that attempts more parsimony, yet with better specification. This might be achieved with the identification of hierarchical levels of constructs.

Workplace disability is a multifaceted phenomenon. Increasingly, employers have realized that disability incidence and duration can, to some degree, be mediated by workplace factors. Researchers attempting to model and understand the influence of the workplace on disability, particularly within a broad context, need empirically sound instruments which provide specified coverage of the target constructs and appropriate reliability so that informed decisions can be made regarding the need for specificity versus parsimony. Further research that explores greater levels of specificity, particularly in relation to more specific outcome measures is warranted. For example, neither the eight factor nor the four factor solutions demonstrated theorized relationships with recordable incidents or work disability duration . Systematic error in the measurement of these outcomes may have contributed to the lack of expected findings. Further research is needed to explore the

relationship between employer factors and accident incidence and disability duration.

APPENDICES

APPENDIX A

Disability Prevention Among Michigan Employers

W. E. UPJOHN INSTITUTE
for Employment Research

MICHIGAN STATE UNIVERSITY

Disability Prevention Among Michigan Employers

Private and social costs associated with accidents, illnesses and resulting disability compensation claims have risen dramatically in the past several years. This questionnaire has been designed to assess what Michigan employers are doing to prevent and manage disability risks, and what impact their actions have on claims and costs.

Your firm has been carefully selected for participation in this study. Thus, completion of this questionnaire is very important to the final value of the study. Your responses will not be revealed to anyone and will be used only for aggregate descriptions of employer behavior.

If you have any questions about the study, or what we are asking of you, please call (616) 343-5541. Thank you for your assistance. Please return this questionnaire in the enclosed postage-paid envelope to:

H. Allan Hunt
W. E. Upjohn Institute
300 South Westnedge Avenue
Kalamazoo, Michigan 49007-4686

Ref _____

Part I. Organizational Self-Assessment

This section covers several areas of policies and practices that employers may use to manage the risks of injuries and disability. We understand that no company is involved in all these activities, and that in reality these strategies are hard to achieve. Therefore, it is important that you ***critically rate***, from your perspective, the extent to which your organization ***actually achieves*** the behavior in each statement. Please rate every item using the scale provided, by circling the best response for each item. If an item is not applicable to your situation, please circle [1], indicating that it never occurs.

Management Commitment

Please begin by considering the actual role that your top management currently plays in supporting safety efforts at this firm. (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. Top management provides leadership and actively participates in managing the safety process.	1	2	3	4	5
2. Top management supports the safety program by attending safety meetings and training sessions.	1	2	3	4	5
3. Managers wear protective gear as appropriate and follow safety rules.	1	2	3	4	5
4. Management allocates staff time of specific individual(s) for safety responsibilities.	1	2	3	4	5
5. The safety manager receives support from top management.	1	2	3	4	5
6. Management has direct knowledge of the potential hazards in the workplace.	1	2	3	4	5
7. Top management regularly reviews the company's accident and workers' compensation claim performance.	1	2	3	4	5
8. The company commits funds to address unsafe conditions and equipment.	1	2	3	4	5
9. The company strives for continuous improvement in safety performance.	1	2	3	4	5
10. Safety is considered equally with production and quality goals in management thinking and plant operations.	1	2	3	4	5
11. Top management is committed to maintaining workers in employment when injuries or disabilities occur.	1	2	3	4	5

Safety Accountability

Now think about management methods your firm uses to evaluate and reinforce safety performance. Please rate the extent to which you use each of the methods described below. (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. Safe behavior is recognized and reinforced through personal contact and/or written praise.	1	2	3	4	5
2. Violating safety rules results in disciplinary action.	1	2	3	4	5
3. The company uses a reliable system for employees to report hazardous conditions without fear of reprisal.	1	2	3	4	5
4. Supervisors have established goals for safety and receive regular feedback on their performance.	1	2	3	4	5

5. Safety performance is evaluated as part of supervisors' performance appraisal.	1	2	3	4	5
6. Supervisors complete accident records promptly.	1	2	3	4	5
7. Supervisors document even minor accidents and violations for review and consideration.	1	2	3	4	5
8. Meaningful safety audits involving supervisors, line employees, and senior management are conducted at regular intervals.	1	2	3	4	5
9. The company identifies specific jobs and departments with high accident incidence and lost work time.	1	2	3	4	5
10. The company uses occupational health and accident data to analyze patterns and trends that indicate risk situations.	1	2	3	4	5
11. The company charges accident and disability claim costs back to the department in which the injury occurred.	1	2	3	4	5

Safety Intervention

Next, consider the actual strategies your firm uses to achieve safety. Critically rate the extent to which each strategy is currently used. (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. Safety goals are developed and communicated to everyone.	1	2	3	4	5
2. The safety program or committee has the responsibility, authority and resources to identify and address safety problems.	1	2	3	4	5
3. Employees are informed about possible hazards of their jobs and are trained in safe work practices for their jobs.	1	2	3	4	5
4. New and transferred employees are given training regarding specific hazards for their particular job before being placed on the job.	1	2	3	4	5
5. Temporary or temporarily assigned employees are given training on-site before being placed on a job or working with new equipment.	1	2	3	4	5
6. Supervisors are informed about possible hazards and trained in safe work practices for jobs they supervise.	1	2	3	4	5
7. Supervisors confront and correct unsafe behaviors and hazards when they occur.	1	2	3	4	5
8. Employees are trained how to confront and correct unsafe behaviors of co-workers.	1	2	3	4	5
9. Employees are encouraged to shut down an unsafe machine or stop the work process when an unsafe condition arises.	1	2	3	4	5
10. Identified hazards are corrected on a timely basis.	1	2	3	4	5
11. Accident records are complete, identifying causes and including recommendations for corrective action.	1	2	3	4	5
12. Problems identified through analysis of injury and illness data are investigated for possible engineering solutions.	1	2	3	4	5

Physical Work Environment

This section asks you to evaluate the extent to which your firm controls risks by attending to the physical environment in which work is performed. (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. The company achieves excellent housekeeping.	1	2	3	4	5
2. Equipment is well maintained.	1	2	3	4	5
3. Workers use personal protective equipment where indicated.	1	2	3	4	5
4. Safety guards and equipment are used in hazardous operations.	1	2	3	4	5
5. Safety and health issues are considered in the acquisition of new machinery, equipment and tools.	1	2	3	4	5
6. Existing equipment and tools at this plant have been modified to minimize safety hazards.	1	2	3	4	5
7. Jobs are modified to keep heavy and repetitive lifting to a minimum.	1	2	3	4	5
8. Strategies are used to reduce repetitive movements.	1	2	3	4	5
9. Ergonomic strategies are used to improve workstation design and work flow.	1	2	3	4	5
10. Position rotation or job enlargement is used where jobs cannot be further ergonomically corrected.	1	2	3	4	5

Disability Claims Management

Now think about your firm's approach to managing workers' disability compensation claims when they occur. To what extent are each of the following strategies used in your approach? (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75%) of the time)	Always (100%)
1. Someone capable of handling work related disability claims is accessible to employees during all working hours.	1	2	3	4	5
2. Disability claims are evaluated early and accurately to determine their validity.	1	2	3	4	5
3. Disability benefit checks are issued in a timely manner.	1	2	3	4	5
4. The company monitors employees off work due to disability and their projected return-to-work date.	1	2	3	4	5
5. Supervisors are evaluated on their lost work day rate and given specific objectives to achieve.	1	2	3	4	5
6. Employees with continuing disability are reevaluated through an assessment of their medical recovery and potential for returning to work.	1	2	3	4	5
7. Duration of disability is evaluated to identify claims needing case management and rehabilitation services.	1	2	3	4	5
8. Rehabilitation professionals are used to evaluate work capacity and develop individualized rehabilitation plans when injured workers are unable to resume employment.	1	2	3	4	5

9. When the company refers for professional case management or rehabilitation services, they still maintain contact with the employee and monitor the return-to-work process.	1	2	3	4	5
10. The company conducts audits to evaluate the quality and effectiveness of medical and rehabilitation care provided to its injured employees.	1	2	3	4	5
11. Responsibility for disability claim management and return-to-work coordination is assigned to a specific individual in the company.	1	2	3	4	5
12. Claim management is well coordinated from initial injury to claim resolution.	1	2	3	4	5

Disability Intervention

Assuming an accident occurs, consider the strategies your firm has in place and acually uses in cases of injury and disability. To what extent are the strategies listed below used in your approach? (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. The company educates supervisors and managers about disability issues and their own roles in company disability management efforts.	1	2	3	4	5
2. A company representative educates local physicians about your jobs and your procedures for safely accommodating early return-to-work.	1	2	3	4	5
3. Injured employees are contacted by a designated person within the company immediately following medical treatment.	1	2	3	4	5
4. Follow-up contacts with disabled workers are made at regular intervals by a company representative according to a predetermined plan.	1	2	3	4	5
5. The treating physician is asked to identify worker restrictions and capacities as well as a target date for return-to-work.	1	2	3	4	5
6. The company maintains regular communication with the injured employee's attending physician.	1	2	3	4	5
7. The company maintains a detailed inventory that quantifies the physical demands of its jobs.	1	2	3	4	5
8. The company develops alternative placement options and modified job duties to return disabled employees to work.	1	2	3	4	5
9. The company uses resources such as assistive devices and flexible work scheduling to facilitate placement of restricted workers.	1	2	3	4	5
10. Assistance is provided to supervisors to make job accommodations or purchase special services needed to assist return-to-work.	1	2	3	4	5
11. When an injured worker is unable to resume prior duties the company provides job retraining for reassignment in a productive capacity.	1	2	3	4	5
12. Follow-up contact is made with the employee and supervisor after successful return-to-work to deal with any needed adjustments.	1	2	3	4	5
13. Return-to-work assistance is clearly organized with assigned responsibilities.	1	2	3	4	5
14. There is cooperation and coordination among departments in efforts to return injured employees to work.	1	2	3	4	5

Employee Risk Prevention

Some companies try to identify or prevent various risk factors that may lead to employee disability. To what extent has your firm become involved in the risk prevention strategies listed below? (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. Physical testing is used to assess whether new employees can perform the required tasks of particular jobs safely.	1	2	3	4	5
2. Employees are screened for job related health or disability risks on a continuing basis.	1	2	3	4	5
3. Employees are encouraged to promptly report physical symptoms arising from job tasks.	1	2	3	4	5
4. Supervisors are trained to recognize job performance problems that may indicate employee difficulties (such as substance abuse, stress, personal problems).	1	2	3	4	5
5. The company actively promotes the use of an employee assistance program (EAP) to help employees who are showing signs of problems that may interfere with work (such as substance abuse, stress, personal problems).	1	2	3	4	5
6. The company commits resources to support health promotion or wellness programs.	1	2	3	4	5
7. Top management supports and participates in health promotion (wellness) activities.	1	2	3	4	5
8. Employees are provided with personal data about their specific health risk factors.	1	2	3	4	5
9. The company screens job applicants for illegal substance use.	1	2	3	4	5
10. The company conducts "for cause" substance abuse testing of its employees.	1	2	3	4	5

Company Environment

Finally, it may be that management style and organizational "culture" relate in some way to safety performance and disability costs. Please consider your company environment and critically rate the extent to which these statements characterize your organization. (Circle the best response for each item.)	Never (0%)	Occasionally (about 25% of the time)	Sometimes (about half of the time)	Usually (about 75% of the time)	Always (100%)
1. Ownership and accountability are pushed to the lowest levels of the organization.	1	2	3	4	5
2. The company demonstrates concern about retaining and developing personnel through its human resource policies and programs.	1	2	3	4	5
3. Job satisfaction among employees at this company is high.	1	2	3	4	5
4. Working relationships are collaborative and cooperative in this company.	1	2	3	4	5
5. There is a high level of trust in the employee/employer relationship at this company.	1	2	3	4	5

6. Skills in team building, coaching, problemsolving, and communication are important factors in the selection of supervisors and managers at this company.	1	2	3	4	5
7. Supervisors and managers are trained in interpersonal skills such as effective communication and conflict management.	1	2	3	4	5
8. An organized, effective process is used for grievances and conflict resolution within the organization.	1	2	3	4	5
9. Strategic and long range planning occur throughout the organization on a routine basis.	1	2	3	4	5
10. Employees are formally included in the company's goal setting and planning process.	1	2	3	4	5
11. The company achieves open communications where employees feel free to raise issues and concerns, or make suggestions.	1	2	3	4	5
12. The company shares information with employees about the financial status and productivity needs of the company.	1	2	3	4	5
13. Management seeks and considers employee input in company decisions.	1	2	3	4	5
14. Employee involvement programs, such as quality circles and labor-management participation teams, are used to generate employee participation in company operations.	1	2	3	4	5
15. Workers have some control over work process and productivity demands.	1	2	3	4	5

Part II. Organizational Summary

This section calls for specific facts that are essential to determine how the behaviors rated in Part I relate to company outcomes. In some cases, it may be necessary for you to consult with others in your organization to obtain this information. Where exact data are not available, reasonable estimates are sufficient. Your effort to secure this information is critically important to the value of the study, and will enable us to prepare the comparative analysis of your firm's accident and disability performance that we have offered to provide to you. We assure you that the confidentiality of your responses will be protected at the Upjohn Institute.

Insurance and Regulation

Q1. What is your workers' compensation insurance source? (Circle 1, 2, or 3)

1. Individual self-insurance
   Do you use a third-party administrator? (Circle answer)
   No
   Yes . . . Administrator name _____
2. Group self-insurance
   Group name _____
3. Insurance carrier
   Carrier name _____

Q2. Has your company received loss control services or consultation in the past two years? (Circle number)

1. No (Go to Q3)
2. Yes . . . From whom? (Circle letters of those that apply)
   A. Private sector source such as insurance carrier or trade association.
   B. Public sector source such as Michigan Department of Labor (SET), Commerce Department, or Public Health Department.

   To what extent have these services improved your loss control experience? (Circle number)

	Improvement			
	None (0%)	Some (10%)	Significant (25%)	Substantial (>50%)
Private Sector Services	1	2	3	4
Public Sector Services	1	2	3	4

Q3. Is your company required to meet safety standards imposed by a major customer or industry certification (e.g., hospital accreditation)? (Circle number)

1. No
2. Yes

Workforce Characteristics and Climate

For the questions in this section please fill in the totals or percents, using estimates when necessary.

Q1. Does this firm have multiple plants or facilities? (Circle number)

1. No
2. Yes . . . Please indicate which specific plant(s) or facility(s) your responses refer to.

_____

_____

	1986	1987	1988	1989
Q2. Number of employees at this facility:				
Full time	____	____	____	____
Part time	____	____	____	____
Temporary or Contract	____	____	____	____

Q3. Approximate percent of current workforce who are:

Salaried (exempt) _____%

Hourly (non-exempt) _____%

Q4. Approximate current average hourly wage for non-exempt workers $_____

Q5. Approximately what percent of your job applicants do you generally hire? _____%

Q6. Approximate percent of workforce in the following job categories:

A. Executive, administrative, managerial _____%

B. Supervisory, technical and support staff _____%

C. Production workers or direct care providers _____%

total 100 %

Q7. Approximate percent of employees who work rotating shifts: _____%

Q8. Approximate percent of employees in the last year who worked overtime _____%

Q9. Approximate percent of current employees who:

Have been with the company less than one (1) year _____%

Have been with the company more than ten (10) years _____%

Have received significant new duties or assignments in the last year _____%

Q10. Approximate number of new employees hired in 1989 _____employees

Q11. Approximate total number of employees leaving (turnover) in 1989 _____employees

Q12. Approximately what percent of employees leaving were lay-offs or terminations due to business conditions? _____%

Q13. Is any of your workforce at this facility represented by a union? (Circle number)

1. No (please go to the next section)
2. Yes . . . Approximately what percent of this workforce is unionized? _____%

What unions are represented? _____

_____

_____

How often do union and management achieve a cooperative working relationship here? (Circle number)

Never	Occasionally	Sometimes	Usually	Always
1	2	3	4	5

Approximate total number of grievances in 1989 _____

MIOSHA Log Data

The information needed to complete Q1 - Q4 can be found on the MIOSHA Log and Summary of Occupational Injuries and Illnesses, Form 200. Please fill in the total numbers for the appropriate years.

	1986	1987	1988	1989
Q1. Total number of recordable work-related injuries and illnesses (columns 1, 2, 6 + columns 8, 9, 13 from Form 200)	_____	_____	_____	_____
Q2. Total number of recordable cases resulting in lost work days (column 3 + column 10)	_____	_____	_____	_____
Q3. Total number of lost work days (column 4 + column 11)	_____	_____	_____	_____
Q4. Total number of 1989 recordable cases which involved repetitive strains or cumulative trauma (column 7(f))				_____

Workers' Compensation Data

For the questions in this section please fill in the totals or percents, using estimates when necessary.

Q1. Approximate number of new workers' compensation claims in 1989:
Claims with medical costs only _____claims
Claims with wage loss benefits (more than 7 lost workdays) _____claims

Q2. Approximate percent of new claims in 1989 which were stress related _____%

Q3. Approximate total workers' compensation losses paid in 1989:
Medical costs $_____
Wage loss benefit payments $_____

Employee Benefits and Programs

Please rate the proportion of your workforce who are eligible for the following benefits and programs through your company. If a particular benefit or program is not offered, please circle (1) indicating that no employees are eligible. (Circle the best response for each item.)

	None (0%)	Some (about 25% of employees)	Many (about 50% of employees)	Most (about 75% of employees)	All (essentially 100%)
1. Health insurance benefits	1	2	3	4	5
2. Paid sick leave	1	2	3	4	5
3. Short term disability benefits	1	2	3	4	5
4. Long term disability benefits	1	2	3	4	5
5. Pension or retirement benefits	1	2	3	4	5
6. Continuation pay to supplement workers' compensation benefit to match regular wage	1	2	3	4	5
7. Continuation pay during waiting period before workers' compensation benefits begin (days 1 - 7)	1	2	3	4	5
8. Employee assistance program	1	2	3	4	5
9. Health promotion program	1	2	3	4	5
10. Parental leave or child care benefits	1	2	3	4	5
11. Return-to-work program	1	2	3	4	5
12. Substance abuse treatment	1	2	3	4	5
13. Profit sharing or gain sharing plan	1	2	3	4	5
14. Bonus pay for individual performance	1	2	3	4	5

If you wish to comment on any questions or qualify your answers, please feel free to do so below. Also, any comments you wish to make that you think will help us to understand what you are doing about accidents, claims, and their associated costs will be appreciated. Your comments, either here or in a separate letter, will be read and taken into account.

Thank you for your participation.

APPENDIX B

Eight Factors from the Hunt, Habeck, VanTol, & Scully (1993) Study

Table B1

Final Factors and Items for the Michigan Disability Prevention and Management Survey

Factor Items
Factor 1: People Oriented Culture
1. The company demonstrates concern about retaining and developing personnel through its human resources policies and programs. (CE02)
2. Job satisfaction among employees at this company is high. (CE03)
3. Working relationships are collaborative and cooperative in this company. (CE04)
4. There is a high level of trust in the employee/employer relationship at this company. (CE05)
5. Skills in team building, coaching, problem solving, and communication are important factors in the selection of supervisors and managers at this company. (CE06)
6. Supervisors and managers are trained in interpersonal skills such as effective communication and conflict management (CE07)
7. Employees are formally included in the company's goal setting and planning process. (CE10)
8. The company achieves open communications where employees feel free to raise issues and concerns, or make suggestions. (CE11)
9. The company shares information with employees about the financial status and productivity needs of the company. (CE12)
10. Management seeks and considers employee input in company decisions. (CE13)
11. Employee involvement programs, such as quality circles and labor-management participation teams, are used to generate employee participation in company operations. (CE14)
12. Workers have some control over the work process and productivity demands. (CE15)
Factor 2: Active Safety Leadership
1. Top management provides leadership and actively participates in managing the safety process. (MC01)

Table B1 (cont'd)

Factor Items
2. Top management supports the safety program by attending safety meetings and training sessions. (MC02) 3. Management allocates staff time of specific individual(s) for safety responsibilities. (MC04) 4. The safety manager receives support from top management. (MC05) 5. Management has direct knowledge of the potential hazards in the workplace. (MC06) 6. The company commits funds to address unsafe conditions and equipment. (MC08) 7. The company strives for continuous improvement in safety performance. (MC09) 8. Supervisors have established goals for safety and received regular feedback on their performance. (SA04) 9. Safety performance is evaluated as part of supervisor's performance appraisal. (SA05) 10. Meaningful safety audits involving supervisors, line employees, and senior management are conducted at regular intervals. (SA08) 11. The company identifies specific jobs and departments with high accident incidence and lost work time. (SA09) 12. The company uses occupational health and accident data to analyze patterns and trends that indicate risk situations. (SA10) 13. The safety program or committee has the responsibility, authority and resources to identify and address safety problems. (SI02)
Factor 3: Safety Diligence
1. Violating safety rules results in disciplinary action. (SA02) 2. Supervisors complete accident records promptly. (SA06) 3. Supervisors document even minor accidents and violations for review and consideration. (SA07) 4. Supervisors confront and correct unsafe behavior and hazards when they occur. (SI07) 5. Identified hazards are corrected on a timely basis. (SI10) 6. Accident records are complete, identifying causes and including recommendations for corrective action. (SI11) 7. The company achieves excellent housekeeping. (PWE01)

Table B1 (cont'd)

Factor Items
8. Equipment is well maintained. (PWE02) 9. Workers use personal protective equipment where indicated. (PWE03) 10. Safety guards and equipment are used in hazardous operations. (PWE04) 11. Existing equipment and tools at this plant have been modified to minimize safety hazards. (PWE06) 12. Safety is considered equally with production and quality goals in management thinking and plant operations. (MC10) 13. Someone capable of handling work related disability claims is accessible to employees during all working hours. (DCM01)
Factor 4: Disability Case Monitoring
1. Disability claims are evaluated early and accurately to determine their validity. (DCM02) 2. Employees with continuing disability are reevaluated through an assessment of their medical recovery and potential for returning to work. (DCM06) 3. Duration of disability is evaluated to identify claims needing case management and rehabilitation services. (DCM07) 4. Rehabilitation professionals are used to evaluate work capacity and develop individualized rehabilitation plans when injured workers are unable to resume employment. (DCM08) 5. Responsibility for disability claim management and return-to-work coordination is assigned to a specific individual in the company. (DCM11) 6. The treating physician is asked to identify worker restrictions and capacities as well as a target date for return-to-work. (DI05) 7. The company monitors employees off work due to disability and their projected return-to-work date. (DCM04) 8. When the company refers for professional case management or rehabilitation services, they still maintain contact with the employee and monitor the return-to-work process. (DCM09) 9. Claim management is well coordinated from initial injury to claim resolution. (DCM12) 10. The company maintains regular communication with the injured employee's attending physician. (DI06)

Table B1 (cont'd)

Factor Items
Factor 5: Proactive Return-to-Work Program
1. Follow-up contacts with disabled workers are made at regular intervals by a company representative according to a predetermined plan. (DI04)
2. The company maintains a detailed inventory that quantifies the physical demands of its jobs. (DI07)
3. The company develops alternative placement options and modified job duties to return disabled employees to work. (DI08)
4. The company uses resources such as assistive devices and flexible work scheduling to facilitate placement of restricted workers. (DI09)
5. Assistance is provided to supervisors to make job accommodations or purchase special services needed to assist return-to-work. (DI10)
6. Follow-up contact is made with the employee and supervisor after successful return-to-work to deal with any needed adjustments. (DI12)
7. Return-to-work assistance is clearly organized with assigned responsibilities. (DI13)
8. There is cooperation and coordination among departments in efforts to return injured employees to work. (DI14)
9. Top management is committed to maintaining workers in employment when injuries or disabilities occur. (MC11)
10. The company monitors employees off work due to disability and their projected return-to-work date. (DCM04)
11. When the company refers for professional case management or rehabilitation services, they still maintain contact with the employee and monitor the return-to-work process. (DCM09)
12. Injured employees are contacted by a designated person within the company immediately following medical treatment. (DI03)
13. The company maintains regular communication with the injured employee's attending physician. (DI06)
14. When an injured worker is unable to resume prior duties the company provides job retraining for reassignment in a productive capacity. (DI11)

Table B1 (cont'd)

Factor Items
Factor 6: Wellness Orientation
1. The company commits resources to support health promotion or wellness programs. (ERP06) 2. Top management supports and participates in health promotion (wellness) activities. (ERP07) 3. Employees are provided with personal data about their specific health risk factors. (ERP08)
Factor 7: Ergonomic Solutions
1. Job are modified to keep heavy and repetitive lifting to a minimum. (PWE07) 2. Strategies are used to reduced repetitive movements. (PWE08) 3. Ergonomic strategies are used to improve workstation design and work flow. (PWE09) 4. Position rotation or job enlargement is used where jobs cannot be further ergonomically corrected. (PWE10)
Factor 8: Safety Training
1. Employees are informed about possible hazards of their jobs and are trained in safe work practices for their jobs. (SI03) 2. New and transferred employees are given training regarding specific hazards for their particular job before being placed on the job. (SI04) 3. Temporary or temporarily assigned employees are given training on-site before being placed on a job or working with new equipment. (SI05) 4. Supervisors are informed about possible hazards and trained in safe work practices for the jobs they supervise. (SI06)

APPENDIX C

Item Means and Standard Deviations

Table C1

Item Means and Standard Deviations

Variable	Mean	Std Dev	N
MC01	3.69	1.11	220
MC02	3.35	1.32	220
MC03	4.28	.83	220
MC04	4.22	.94	219
MC05	4.27	1.03	220
MC06	4.12	.73	220
MC07	4.08	1.09	220
MC08	4.17	.92	220
MC09	4.35	.85	220
MC10	3.90	1.01	220
MC11	4.16	.89	220
SA01	2.84	1.07	220
SA02	3.28	1.14	219
SA03	4.39	.80	220
SA04	2.95	1.31	220
SA05	2.95	1.41	216
SA06	3.91	.81	220
SA07	3.37	1.12	219
SA08	3.35	1.32	220
SA09	3.75	1.22	220
SA10	3.56	1.30	219
SI01	3.66	1.17	216
SI02	4.15	1.10	220
SI03	4.10	.78	219
SI04	3.79	.93	220
SI05	3.62	1.05	218
SI06	3.89	.93	218
SI07	3.67	.85	219
SI08	2.67	1.24	219
SI09	4.00	1.20	218
SI10	4.11	.72	219
SI11	4.22	.80	219
SI12	3.58	1.11	217
PWE01	4.02	.79	218
PWE02	4.13	.59	218
PWE03	4.35	.62	218

Table C1 (cont'd)

Variable	Mean	Std Dev	N
PWE04	4.58	.58	216
PWE05	4.21	.93	217
PWE06	4.23	.74	216
PWE07	3.67	.93	218
PWE08	3.38	1.04	216
PWE09	3.25	1.07	216
PWE10	2.91	1.29	215
DCM01	4.00	1.07	219
DCM02	4.44	.68	218
DCM03	4.41	.63	218
DCM04	4.44	.86	218
DCM05	1.83	1.25	219
DCM06	4.33	.86	219
DCM07	4.32	.91	219
DCM08	4.06	1.10	215
DCM09	4.13	1.01	216
DCM10	3.19	1.35	217
DCM11	4.47	.97	218
DCM12	4.20	.82	219
DCM13	1.64	1.30	217
DI01	3.24	1.15	218
DI02	3.41	1.28	218
DI03	3.64	1.25	219
DI04	3.36	1.34	219
DI05	4.67	.58	219
DI06	4.02	.97	219
DI07	2.97	1.39	218
DI08	3.87	1.09	219
DI09	3.21	1.35	219
DI10	3.03	1.31	215
DI11	3.28	1.24	214
DI12	3.48	1.19	219
DI13	3.46	1.21	217
DI14	3.61	1.10	219
ERP01	2.76	1.65	218
ERP02	2.64	1.50	219
ERP03	4.58	.74	217
ERP04	3.25	1.18	218

Table C1 (cont'd)

Variable	Mean	Std Dev	N
ERP05	3.51	1.56	218
ERP06	3.24	1.51	219
ERP07	3.18	1.45	219
ERP08	2.88	1.52	218
ERP09	3.92	1.73	218
ERP10	2.72	1.77	218
CE01	3.11	1.11	216
CE02	3.83	.90	218
CE03	3.53	.79	219
CE04	3.68	.70	219
CE05	3.40	.84	219
CE06	3.85	.91	219
CE07	3.50	1.02	219
CE08	4.15	.88	219
CE09	3.74	1.08	219
CE10	2.72	1.17	219
CE11	3.80	1.00	219
CE12	3.63	1.13	219
CE13	3.22	1.04	218
CE14	3.20	1.29	219
CE15	3.10	1.08	219

Note. The authors changed item SA11 to DCM13 to more accurately reflect the content of the item. Number of valid observations (listwise) = 183.

APPENDIX D

Rotated Factor Matrix

Table D1

Factor Loadings From An Exploratory Factor Analysis of the Disability Prevention Among Michigan Employers Questionnaire

Item	Factor 1	Factor 2	Factor 3	Factor 4
SI07	**.65540**	.22893	.11685	.05052
SA07	**.59885**	.05715	.06329	.16018
PWE02	**.57367**	.15551	.08255	.16934
SI06	**.56928**	.24889	.23198	.14259
SI10	**.56632**	.17712	.05881	**.31126**
PWE07	**.56488**	.19128	.13576	.02515
PWE06	**.55696**	.03036	.06323	.19153
SA06	**.54137**	-.02155	.06284	.11408
PWE08	**.53740**	.25899	.23020	.11500
SI05	**.53409**	.19670	.06998	.00668
PWE03	**.53070**	.01892	.14777	.13039
MC10	**.51896**	.26277	-.08135	**.44207**
SI11	**.51735**	.08348	.18013	.08248
PWE09	**.51478**	.23059	.23979	.18235
PWE04	**.51194**	.04121	.07983	.20106
PWE05	**.50855**	.27157	.03214	.18696
PWE01	**.48515**	.20376	.01794	.12243
SI03	**.46924**	**.32779**	.15413	.13334
SI09	**.46015**	.24839	.06732	-.00284
SI04	**.45920**	.18779	.19620	.13240
PWE10	**.44971**	.10515	.28551	.09679
SI08	**.43199**	**.35525**	.08532	.09125
SI12	**.41738**	.30177	.19429	.27903
SA02	**.38927**	.04422	-.09100	.07224
DCM01	**.36699**	-.08716	.27499	-.00413
SA03	**.36623**	.06648	**.32384**	.24671
MC11	**.32103**	.28428	.22885	.16739
DCM05	.25036	.24197	.11514	.18434
DCM13	.08171	.05943	.01175	.04351
CE13	.18723	**.67282**	.00103	.20131
CE15	.27245	**.65732**	.08170	.06794
CE10	.25389	**.62462**	.04674	.13522

Table D1 (cont'd)

Item	Factor 1	Factor 2	Factor 3	Factor 4
CE12	.10389	**.61948**	.07317	.18750
CE11	.27674	**.60521**	.12002	.25578
CE05	**.34745**	**.60269**	.01188	.12035
CE03	.20960	**.60011**	.10241	.09894
CE04	.29292	**.59726**	.03346	.04144
CE14	.10812	**.56383**	.14041	.12533
ERP07	-.04773	**.55194**	.15156	.19717
ERP06	-.04081	**.53648**	.15786	.13711
CE06	**.31542**	**.53219**	.12565	.28439
CE01	.17782	**.51319**	.10645	.16023
CE02	.23933	**.50040**	.14305	.12319
ERP08	-.03805	**.48492**	.18030	.13146
CE07	**.36079**	**.48342**	.18068	.22355
SA01	.29848	**.42457**	.11341	.19540
ERP04	.16728	**.38493**	.27530	.15716
CE09	.21010	**.36705**	.11257	**.35223**
ERP10	.08440	**.31391**	.14135	.10614
ERP02	.11478	.26985	.18879	.20390
ERP09	-.08158	.17756	.03498	.14497
DI13	.12382	**.30698**	**.71311**	-.02520
DCM07	-.06813	-.09713	**.69831**	.22861
DCM12	.18020	.08812	**.69767**	.09445
DCM04	-.02925	.04695	**.68387**	.02970
DCM09	.08727	.10596	**.67558**	-.01165
DCM06	-.02218	-.08353	**.66405**	.17822
DI06	.01785	.16910	**.66387**	.14238
DCM11	.19357	.04074	**.62370**	.01595
DI03	.03557	.15210	**.57702**	.13934
DI12	.20181	.19162	**.56894**	-.05634
DI05	.11852	.04085	**.55714**	.13437
DI04	.02356	.34095	**.55483**	.03908
DI14	.28291	.28783	**.53129**	-.19526
DI10	.18239	**.42635**	**.51354**	-.03159
DI09	.20485	**.32889**	**.51219**	-.11743
DI08	.10196	.23134	**.50880**	-.02065
DI11	.19377	.24777	**.50052**	.01659
DCM08	-.02346	-.08028	**.48437**	.17868

Table D1 (cont'd)

Item	Factor 1	Factor 2	Factor 3	Factor 4
DCM10	.12595	.14171	**.47323**	.07834
DCM02	.26337	-.10763	**.46415**	.15555
DI02	.10913	.06291	**.44193**	**.31667**
ERP03	.19475	.19806	**.41517**	.13521
DI07	.01049	.27296	**.40476**	.02797
DI01	**.30067**	.29571	**.34095**	.24866
DCM03	.21145	-.05868	.27781	.04992
MC04	.16501	.13831	.09506	**.66450**
MC09	.28428	.24405	.03126	**.63070**
MC01	**.32780**	**.30276**	.01407	**.62972**
MC05	.28948	.18899	.08428	**.55898**
MC02	.24958	.26125	.05573	**.54776**
SI02	.22593	**.31717**	.16442	**.50050**
MC08	.29727	**.34708**	.03628	**.49312**
SA09	.26925	.17397	.24224	**.44438**
MC06	**.36939**	.18900	.04199	**.44072**
SA10	.16376	.25972	**.30521**	**.41424**
MC07	**.32521**	.17172	.15253	**.40871**
SA05	.28748	.27991	.00498	**.40720**
SA04	**.36665**	**.37448**	.07267	**.40315**
SI01	.18401	**.38100**	.08612	**.38518**
CE08	.13772	.18417	**.35023**	**.37424**
MC03	.29107	-.06216	.06823	**.34069**
SA08	**.32886**	.26668	.08902	**.33643**
ERP05	-.14772	.19003	.14377	.24387
ERP01	-.04724	.11889	.18612	.22565

APPENDIX E

Regression Models

Table E1

Summary of Multiple Regression Analysis for Variables in th Prevention Model Predicting MIOSHA Recordable Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.2091	.1305	-.1273
Large (over 500)	-.2554	.1463	-.1470p
SIC 25 - Furniture	-.2140	.2822	-.0628
SIC 30 - Rubber & Plastics	-.1226	.2058	-.0595
SIC 34 - Fabricated Metals	.1324	.1898	.0756
SIC 35 - Non-Electric. Mach.	-.2402	.2311	-.0991
SIC 37 - Transport. Equip.	.0000	.2164	.0000
SIC 80 - Health Services	-1.2660	.2551	-.4975**
Control Variables:			
Percent Salaried	-.0988	.0960	-.0784
Tenure < 1 Year	.1832	.0542	.2713**
Rotating Shifts	-.1452	.2073	-.0506
Multiple Plants	-.2354	.1185	-.1439*
Safety Standards	-.0940	.1367	-.0555
Unionized	.1774	.1270	.1101
Loss Control Consult.	-.0817	.1339	-.0460
Independent Variable:			
Safety Diligence & Hazard Reduction	-.0643	.0570	-.0824

Note. R^2 = .30; Adjusted R^2 = .22; N = 163; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E2

Summary of Multiple Regression Analysis for Variables in the Prevention Model Predicting Lost Work Day Case Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	.0790	.1507	.0444
Large (over 500)	-.4957	.1680	-.2637**
SIC 25 - Furniture	.2164	.3242	.0588
SIC 30 - Rubber & Plastics	.1453	.2368	.0652
SIC 34 - Fabricated Metals	.4073	.2187	.2152p
SIC 35 - Non-Electric. Mach.	.1900	.2664	.0709
SIC 37 - Transport. Equip.	.2895	.2486	.1221
SIC 80 - Health Services	-.2002	.2930	-.0728
Control Variables:			
Percent Salaried	.0071	.1116	.0051
Tenure < 1 Year	.1531	.0624	.2100*
Rotating Shifts	.2007	.2382	.0647
Multiple Plants	-.0527	.1376	-.0294
Safety Standards	-.1370	.1570	-.0748
Unionized	.2176	.1465	.1249
Loss Control Consult.	-.1079	.1523	-.0566
Independent Variable:			
Safety Diligence & Hazard Reduction	-.2195	.0665	-.2555**

Note. R^2 = .21; Adjusted R^2 = .13; N = 162; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E3

Summary of Multiple Regression Analysis for Variables in the Prevention Model Predicting Workers' Compensation Wage-Loss Claim Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.1005	.1191	-.0699
Large (over 500)	-.0294	.1302	-.0192
SIC 25 - Furniture	.3572	.2576	.1253
SIC 30 - Rubber & Plastics	.1427	.2043	.0757
SIC 34 - Fabricated Metals	.4960	.1869	.3166**
SIC 35 - Non-Electric. Mach.	.2664	.2187	.1326
SIC 37 - Transport. Equip.	.2142	.2047	.1137
SIC 80 - Health Services	-.1267	.2357	-.0608
Control Variables:			
Percent Salaried	-.1094	.0857	-.1005
Tenure < 1 Year	.1120	.0487	.1895*
Rotating Shifts	.1827	.1841	.0740
Multiple Plants	-.1504	.1079	-.1033
Safety Standards	.0194	.1259	.0132
Unionized	.2447	.1144	.1753*
Loss Control Consult.	.1277	.1194	.0809
Independent Variable:			
Safety Diligence & Hazard Reduction	-.1787	.0528	-.2532**

Note. R^2 = .19; Adjusted R^2 = .11; N = 178; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E4

Summary of Multiple Regression Analysis for Variables in the Disability Management Model Predicting Lost Work Day Case Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.0420	.1454	-.0239
Large (over 500)	-.4661	.1654	-.2490**
SIC 25 - Furniture	-.0054	.3156	-.0014
SIC 30 - Rubber & Plastics	-.1009	.2281	-.0456
SIC 34 - Fabricated Metals	.2777	.2069	.1493
SIC 35 - Non-Electric. Mach.	.1878	.2559	.0694
SIC 37 - Transport. Equip.	.1545	.2322	.0679
SIC 80 - Health Services	-.3209	.2561	-.1215
Control Variables:			
Multiple Plants	-.0275	.1332	-.0156
Unionized	.2378	.1340	.1377p
Group Self-Insurance	.3493	.1456	.2101*
Individual Self-Insurance	.2125	.1950	.0873
Hourly Wage	-.8978	.2790	-.2830**
Independent Variable:			
Reducing Work Disability and Promoting RTW	-.1308	.0616	-.1606*

Note. R^2 = .20; Adjusted R^2 = .13; N = 170; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E5

Summary of Multiple Regression Analysis for Variables in the Disability Management Model Predicting Lost Work Days Per Case

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.0109	.1032	-.0092
Large (over 500)	-.0292	.1167	-.0236
SIC 25 - Furniture	.0624	.2215	.0260
SIC 30 - Rubber & Plastics	.0645	.1665	.0431
SIC 34 - Fabricated Metals	.0716	.1522	.0568
SIC 35 - Non-Electric. Mach.	-.0269	.1806	-.0157
SIC 37 - Transport. Equip.	.0394	.1664	.0263
SIC 80 - Health Services	-.0161	.1775	-.0098
Control Variables:			
Multiple Plants	.1559	.0943	.1335p
Unionized	-.0442	.0939	-.0387
Group Self-Insurance	.0528	.1040	.0478
Individual Self-Insurance	-.1837	.1392	-.1115
Hourly Wage	.1684	.2004	.0799
Independent Variable:			
Reducing Work Disability and Promoting RTW	.0062	.0437	.0114

Note. R^2 = .05; Adjusted R^2 = -.03; N = 178; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E6

Summary of Multiple Regression Analysis for Variables in the Disability Management Model Predicting Workers' Compensation Wage-Loss Claim Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.2073	.1167	-.1467p
Large (over 500)	-.0886	.1333	-.0588
SIC 25 - Furniture	.1538	.2481	.0562
SIC 30 - Rubber & Plastics	-.0185	.1985	-.0100
SIC 34 - Fabricated Metals	.3654	.1804	.2381*
SIC 35 - Non-Electric. Mach.	.2084	.2088	.1021
SIC 37 - Transport. Equip.	.1568	.1923	.0881
SIC 80 - Health Services	-.1592	.2094	-.0794
Control Variables:			
Multiple Plants	-.0810	.1062	-.0567
Unionized	.2226	.1073	.1624*
Group Self-Insurance	.2573	.1179	.1911*
Individual Self-Insurance	.1113	.1589	.0545
Hourly Wage	-.5929	.2228	-.2342**
Independent Variable:			
Reducing Work Disability and Promoting RTW	-.0914	.0483	.1388p

Note. R^2 = .14; Adjusted R^2 = .07; N = 186; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E7

Summary of Multiple Regression Analysis for Variables in the Managerial Model Predicting Lost Work Day Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.0456	.1770	-.0222
Large (over 500)	-.4562	.1973	-.2133*
SIC 25 - Furniture	.3542	.3811	.0838
SIC 30 - Rubber & Plastics	.1484	.2740	.0589
SIC 34 - Fabricated Metals	.5288	.2498	.2421*
SIC 35 - Non-Electric. Mach.	.3597	.3014	.1169
SIC 37 - Transport. Equip.	.3313	.2768	.1258
SIC 80 - Health Services	-.2425	.3052	-.0806
Control Variables:			
Tenure < 1 Year	.1344	.0761	.1609p
Multiple Plants	.0163	.1598	.0080
Unionized	.2089	.1663	.1049
Hourly Wage	-.5849	.3600	-.1591
Individual Self-Insurance	.4544	.1637	.2371**
Independent Variable:			
Valuing Human Resources	-.1121	.0851	-.1118
Top Management Support and Continuous Improvement of Safety	-.0512	.0780	-.0545

Note. R^2 = .17; Adjusted R^2 = .09; N = 165; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E8

Summary of Multiple Regression Analysis for Variables in the Managerial Model Predicting Workers' Compensation Payment Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.4222	.2237	-.1660p
Large (over 500)	-.3378	.2449	-.1304
SIC 25 - Furniture	.1285	.4923	.0252
SIC 30 - Rubber & Plastics	-.2680	.3715	-.0843
SIC 34 - Fabricated Metals	.2398	.3333	.0886
SIC 35 - Non-Electric. Mach.	-.1230	.3750	-.0354
SIC 37 - Transport. Equip.	.2384	.3539	.0761
SIC 80 - Health Services	-.4490	.3936	-.1265
Control Variables:			
Tenure < 1 Year	.1109	.0962	.1116
Multiple Plants	-.1434	.1987	-.0581
Unionized	.5819	.2091	.2433**
Hourly Wage	.1180	.4371	.0266
Individual Self-Insurance	.2409	.2052	.1029
Independent Variable:			
Valuing Human Resources	-.2366	.1064	-.1908p
Top Management Support and Continuous Improvement of Safety	.0630	.1030	.0522

Note. R^2 = .16; Adjusted R^2 = .08; N = 160; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E9

Summary of Multiple Regression Analysis for Variables in the Summary Model Predicting Lost Work Day Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.0560	.1721	-.0273
Large (over 500)	-.4898	.1929	-.2290*
SIC 25 - Furniture	.4332	.3711	.1025
SIC 30 - Rubber & Plastics	.0543	.2617	.0216
SIC 34 - Fabricated Metals	.4582	.2425	.2098p
SIC 35 - Non-Electric. Mach.	.3011	.2948	.0978
SIC 37 - Transport. Equip.	.2403	.2694	.0912
SIC 80 - Health Services	-.2802	.2975	-.0932
Control Variables:			
Tenure < 1 Year	.1428	.0742	.1709p
Multiple Plants	-.0361	.1562	-.0177
Unionized	.1627	.1634	.0817
Hourly Wage	-.6936	.3458	-.1887*
Individual Self-Insurance	.5018	.1612	.2618**
Independent Variable:			
Safety Diligence & Hazard Prevention	-.2071	.0834	-.2047*
Reducing Work Disability & Promoting RTW	-.0917	.0768	-.0985

Note. R^2 = .22; Adjusted R^2 = .14; N = 165; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

Table E10

Summary of Multiple Regression Analysis for Variables in the Complete Summary Model Predicting Lost Work Day Rate

Variable	B	SE B	Beta
Structural Variables:			
Small (100 - 249)	-.0378	.1754	-.0184
Large (over 500)	-.4971	.1941	-.2325*
SIC 25 - Furniture	.4183	.3740	.0990
SIC 30 - Rubber & Plastics	.0391	.2716	.0155
SIC 34 - Fabricated Metals	.4575	.2474	.2094p
SIC 35 - Non-Electric. Mach.	.3022	.2972	.0982
SIC 37 - Transport. Equip.	.2350	.2746	.0893
SIC 80 - Health Services	-.2940	.2998	-.0978
Control Variables:			
Tenure < 1 Year	.1484	.0750	.1777*
Multiple Plants	-.0302	.1575	-.0148
Unionized	.1391	.1670	.0698
Hourly Wage	-.6794	.3544	-.1848p
Individual Self-Insurance	.5099	.1624	.2661**
Independent Variable:			
Safety Diligence & Hazard Prevention	-.2248	.0940	-.2222*
Valuing Human Resources	-.0315	.0882	-.0314
Reducing Work Disability & Promoting RTW	-.0972	.0812	-.1044
Top Management Support and Continuous Improvement of Safety	.0596	.0854	.0634

Note. R^2 = .22; Adjusted R^2 = .13; N = 165; p = significant at .10 level, * = significant at .05 level, ** = significant at .01 level.

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