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## Disability Prevention Among Michigan Employers, 1988-1993

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**DISABILITY PREVENTION  
AMONG MICHIGAN EMPLOYERS**

**1988-1993**

**Upjohn Institute Technical Report No. 93-004**

**Final Report  
Submitted to**

**Safety Education and Training (SET) Division  
Bureau of Safety and Regulation  
Michigan Department of Labor**

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**September 1993**



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HAH  
RVH  
BVT  
SMS



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## CHAPTER 1 INTRODUCTION AND OVERVIEW

This chapter briefly discusses the magnitude of the problem of disability in the workplace. It also presents an overview of the three and one-half year research project for which this Final Report is the product. It highlights the origins of the project and the major design elements that are reflected in this report. It concludes with a discussion of the remaining limitations of the research.

### **Problem Addressed**

The problem of disability in the workplace has become a central concern for business and labor, as the economic and human costs continue to grow unabated. The extensive personal losses associated with disability and resulting unemployment, the staggering economic cost of disability in income maintenance, health care, and related expenditures, and the value of lost productivity due to disability have gained greater recognition as problems that impact all parties and sectors. Further, because of changes in the availability and skill level of the labor force and the requirements of the Americans With Disabilities Act (ADA), companies are compelled to maintain the healthy and productive employment of their current workers and to accommodate workers who develop chronic impairments. It is no longer feasible to discard skilled workers who have acquired disabilities; they cannot be easily replaced.

The unacceptably high incidence of workplace injury and disability constitutes a major social problem. The Centers for Disease Control (1991) estimates that seven in every 100 workers sustains a nonfatal work injury in a given year. In 1989, nearly two million workers sustained injuries that resulted in disabilities. At that time, the cost of accidents occurring on work time was conservatively estimated at \$83 billion (Hensler, et al, 1991). These injuries resulted in 2.9 million lost work day cases, at an average of 19 lost work days per case, or 55 million total lost work days.

Burton (1992) projects that employers' direct cost of workers' compensation insurance alone passed the \$60 billion level in 1991. The Urban Institute (1990) estimates that employers pay an average of \$1,052 in additional indirect costs due to work-related injuries for every employee covered under workers' compensation. Chelius, Galvin, and Owens (1992) found that total disability costs comprised slightly more than 8 percent of payroll in a small non-random sample of firms they studied.

Further, the rate of increase in the costs of workers' compensation and other disability insurance programs has been astronomical. From 1980 to 1989, the last year for which figures are available, the average medical claim in workers' compensation rose from \$1,741 to \$5,370, while the average wage-loss claim increased from \$4,522 to \$10,735 (Nation's Business, November, 1991). The incidence rates for occupational injuries and illnesses has also been on the rise since 1983 (1982 in Michigan) and, while this may be due to changes in reporting behavior thus far no one has offered a fully acceptable explanation. The number of work days lost to occupational injury has also apparently been increasing alarmingly since 1982, resulting in 110 lost work days per 100 full time workers in Michigan by 1990 (Occupational Injuries and Illnesses, MIOSHA Information Division, 1992). Of course, these figures do not account in any way for the immeasurable personal consequences of pain, suffering, stress and reduced quality of life for injured workers and their families.

It has become increasingly apparent that the safety and accident prevention programs of the past are not sufficient to achieve disability cost containment today. It is necessary to go beyond simple safety and accident prevention methods to an integrated disability management approach, encompassing accident prevention, injury management, claims management and return-to-work techniques. The National Industrial Rehabilitation Corporation (1991) estimates that companies can reasonably expect a 25 to 30 percent cost reduction in workers' compensation costs after the first year of implementing a disability management program, and that cost reductions can be nearly twice as great when long-term, relatively inactive cases are resolved.

Rousmaniere (1990) has pointed out that roughly 50 percent of the costs that result from accidents depend on how the company responds to and manages injuries after they occur. This was confirmed in our pilot study (Habeck, Leahy, Hunt, Chan, and Welch, 1991), when it was demonstrated that a sample of poorly performing Michigan employers had twice as many MIOSHA recordable incidents, but four times as many workers' compensation claims as a sample of high performance employers. This implies that what happens after the accident could have as much influence on workers' compensation costs as preventing the accident from occurring in the first place.

This research project was designed to provide statistically valid and behaviorally reliable empirical evidence to substantiate the impact of workplace policies and practices on the prevention and management of disability. The strategy adopted was to study the contributions of these policies and practices in explaining individual company accident and disability experience. Once this is adequately understood, it becomes possible to argue that companies that adopt more advanced injury prevention and disability management techniques should be able to match the performance of companies already using these methods. Analysis of the database collected in our preliminary study (Habeck, Leahy, and Hunt, 1988) provided an intriguing but limited empirical basis to substantiate the importance of particular policies and practices in accounting for company accident and claims incidence. The current study was built on these findings and provides an improved understanding of the prevention of workplace disability through the implementation of a carefully planned, sequential research design.

### **Origins of the Project**

The original proposal conceived of a three-year project to verify and extend the results of a pilot study completed in 1988.<sup>1</sup> This study demonstrated that: (1) There was great variation in workers' compensation claim rates among Michigan firms. In fact, analysis of administrative data revealed that there was at least a ten-fold variation between

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<sup>1</sup>See Habeck, Leahy, and Hunt (1988) and Hunt (1988).

the incidence of claims at the best and worst establishments in each of 29 industries reviewed. (2) The variation in claims incidence could only partially be explained by differences in industry, size, and location. In fact, only 25 percent of the overall variance could be explained by these three factors. (3) A non-random sample of high claim firms had twice as many accidents, but four times as many workers' compensation claims as an equivalent non-random sample of low claim firms. This indicated that two different processes might be involved, one that determines the number of injuries and another that determines the number of disability claims resulting from those injuries. (4) There were a number of self-reported organizational policies and practices that correlated with low claim rates. Among these were an open managerial style and a corporate culture that displayed an obvious human resource orientation. In addition, low claim firms reported that they more frequently engaged in safety and prevention activities than high claim firms. They also more often reported utilizing procedures to prevent and manage disability after an accident had occurred.<sup>2</sup>

The results of the pilot study led the SET Division of the Bureau of Safety and Regulation, Michigan Department of Labor to create a special category of Safety Education and Training (SET) grant for fiscal year 1989-90 that:

Provides for research or demonstration projects that expand or evaluate the findings of the Interstate Cost Comparison Study authored by Rochelle V. Habeck, University of Washington, H. Allan Hunt, Upjohn Institute for Employment Research, Michael J. Leahy, Michigan State University and Edward M. Welch, Bureau of Workers' Disability Compensation (two-part report dated July and October 1988).<sup>3</sup>

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<sup>2</sup>See Habeck, Leahy, Hunt, Chan, and Welch (1991) for an abbreviated report of the findings of the pilot study.

<sup>3</sup>Request for Proposal for the Safety Education and Training Grant Program for Fiscal Year 1989-90, Open Competitive Grant Program, p. 2.

The Upjohn Institute for Employment Research, in partnership with Michigan State University (to which Dr. Habeck had since returned) responded to this RFP with a proposal for a three year empirical study that would extend and refine the results of the pilot study in a number of important ways. First, the analysis of administrative data was to be redone to incorporate two major changes; a multiple year observation period, and a comparison between incurred claim and closed claim incidence measures. Both issues reflected criticisms of the pilot study findings, so these issues were to be addressed empirically. It was also proposed to collect administrative data on workers' compensation indemnity payments rather than simply the number of claims. In addition, a major concentration on injury data (from MIOSHA logs) rather than just workers' compensation claims and payments was proposed to further sharpen the distinction between the incidence of injuries and the development of workers' compensation claims out of those accidents.

Second, to improve the quality of information collected and counter the criticism that self-reported data were of dubious validity, site visits were planned to check self-reported data and allow for greater depth of qualitative data collection. The original project proposal was to include the pilot project firms (n = 124) in the sample for the larger study, for reasons of economy and continuity. It was also proposed that a supplementary sample of small firms (less than 50 employees) would be drawn to enable extension of policy conclusions to this large population of small establishments.

This project proposal was funded under the competitive regime of the SET grants for 1989-90, with the understanding that funding for subsequent years could not be guaranteed, due to administrative requirements. However, a significant reduction in the proposed budget (25 percent) was made to allow the grant to fit within program parameters.<sup>4</sup>

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<sup>4</sup>This also happened in each of the subsequent fiscal years, resulting in a significant shortfall in total resources below the level originally anticipated.

## **SET Project Timeline**

The first year was dedicated to assembling and analyzing existing administrative data from the Michigan Employment Security Commission and the Bureau of Workers' Disability Compensation.<sup>5</sup> Alternative measures for analyzing disability performance at the establishment level were considered. In addition, a sampling methodology and instrumentation appropriate to the employer survey design were developed for use in the second year of the project.

The major second year activity was the conduct of a unique self-administered mail survey of 220 Michigan establishments in 7 industries (SIC 20, 25, 30, 34, 35, 37, 80). The survey was administered between March 5 and July 31 of 1991, and involved a stratified random sample of 477 establishments with at least 100 employees. An overall response rate of 46 percent was obtained with mail and telephone follow-up, yielding a completed analytical sample of 220 employers. Editing and organizing the survey database occupied much of the rest of the second year. In addition, preliminary plans were developed for a set of site visits to extend and deepen the results of the mail survey, particularly in the qualitative dimensions.

The third year focussed on analysis of the employer survey database and completion of 32 site visits across six industries. The site visit establishments were selected to represent the best and worst performers on our overall disability measure (lost work days per 100 employees) in six industries. The site visits, which were conducted between March 25 and July 25, 1992, generally involved two to four respondents per firm and required from three to six hours on site to complete. The observations collected in these site visits are an important supplement to the employer survey data collected in year two. They allow greater depth of observation than the self-administered questionnaire used in the mail survey, and they provide important qualitative data that cannot be gathered in any other way. The

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<sup>5</sup>Thanks to the Commission and Abel Feinstein of MESC and to Ed Welch and Kathy Rademacher of BWDC for making these data available.



analysis and refinement of the data gathered from these two efforts continued throughout year three and halfway through the fourth year. Empirical estimation and modelling revisions continued iteratively throughout this period with dual emphasis on analytical and presentation issues.

An increasing amount of time also was devoted to dissemination activities during the fourth year. A private briefing for employers involved in the study was held in March of 1993 and another for the SET Division in April. A stakeholder briefing and the public release of the study occurred in June 1993.

This report documents the methods and findings of this three and one-half year project. It cannot recount all the details of project activity over this entire period. But it does lay down the research decisions that were made along the way, and the reasons they were made, together with the results that have been obtained. It constitutes the most complete written record that will be produced of the activities under the SET grants.

This report will be supplemented by two other written products. A summary report has been produced for dissemination to most parties interested in the study. It provides less detail on methods, but highlights the major findings of the study in a user-friendly presentation. In 1994 the W.E. Upjohn Institute for Employment Research will publish a research monograph based on the findings from this project.

### **Administrative Data Analysis**

Administrative data were collected from the Bureau of Workers' Disability Compensation (BWDC) and the Michigan Employment Security Commission (MESC), both of the Michigan Department of Labor. BWDC data identified the details about the workers' compensation claims incurred or closed during the calendar years of 1986, 1987 and 1988. MESC data identified the industry (SIC classification), employment level, and total payroll of establishments covered for unemployment insurance purposes in the second quarter of 1986, 1987 and 1988. These data were merged to provide a database to analyze alternative

measures of company performance in disability prevention, as measured through the workers' compensation system.

An extensive series of statistical analyses were conducted on these 1986-1988 administrative data that revealed the following observations.

1. There is considerable variability in the annual claim rate of firms. The performance of firms with workers' compensation claims was compared for the years 1986, 1987 and 1988. Only 55 to 60 percent of companies with over 50 employees remained in the same claim rate category (low, medium or high) in two consecutive years. It was therefore determined that the accuracy of claim rate as a basis for classifying company performance is significantly improved by using a multi-year measure.
2. The annual average incurred claim rate for all employers with more than 50 employees was found to be nearly identical to the average closed claim rate. Using the entire BWDC data base for 1986-1988, company claim rates were calculated and compared using incurred and closed claim data. When companies were assigned to claim rate categories on the basis of their closed claim rate and again on their incurred claim rate, their classifications correlated very highly with each other. This was true both for large (over 50 employees) companies (Spearman correlation coefficient .91) and small companies (.90). It was therefore concluded that closed and incurred claims are essentially measuring the same dimension of employer disability performance. It was decided that the study would focus on incurred data because it has greater face validity and is more easily related to safety and prevention efforts.
3. A claims trend performance variable was developed to be used as a supplementary disability performance measure. The question was whether this internal measure of performance, relative to the company's own historical standard, would yield a more reliable indicator of performance compared to a measure that used industry norms. It was subsequently found that the year-to-year variation was so great at the establishment level, that trends in the data were simply not evident within the time period observed.
4. With the addition of workers' compensation indemnity payment data, a critical outcome measure of disability prevention and management efforts could be assessed. Given a company's claims experience (occurrence of accidents and subsequent claims) how well does the company manage disability when it occurs by effectively restoring work capacity and returning employees to work in a timely manner, thereby reducing indemnity costs? Indemnity costs should be a

valuable indicator of lost work time and company effectiveness in disability management. This variable will be discussed in the empirical results presented below in chapters 3 and 4. Suffice it to say here that the potential value of this measure is significantly flawed by the apparent difficulty in reporting it accurately.

5. Duration of disability was added to claims incidence as an alternative measure of company performance. Improved performance in disability management should reduce the average duration of disability, other things being equal. The database allowed for calculation of average duration of disability for each employer. On the basis of this analysis, this variable was added to the study plan as another indicator of company performance, and will be discussed below. Again, empirical results have been disappointing as it has proven very difficult to predict the average duration of disability.

### **Survey of Employers**

During the first year of the project, when the major focus was on the administrative data from BWDC and MESC, it was determined that the study would have significantly greater credibility if the empirical data collection was from a randomly drawn sample. In the pilot study, the top 15 percent and the bottom 15 percent of firms from each of three industries were drawn as a non-random sample to maximize the contrasts between good and poor performers. However, this design was criticized by other scholars as preventing extrapolation to the broader population of firms. Since there was some confidence among the study team, based on the pilot study results, that there would be measurable differences among employers that would correlate with their disability performance, it was decided that a truly random sample should be drawn to maximize the scientific credibility of the findings.

Therefore, a random sampling design was developed and the MESC universe of establishments in the second quarter of 1988 was used as a sampling frame from which to draw the sample. A second extremely valuable implication of this design change was that firms with no workers' compensation claims were also included in the sample. The previous findings were persuasive that the effect of omitting those firms with zero workers' compensation claims in a particular year would result in a significant bias. This is obvious from the following argument. If a large firm has zero claims in a year, obviously it is doing

a very good job of preventing claims, or is in a very safe industry. If the former is the reason, it would clearly bias the sample if such firms were omitted. On the other hand, because of the relatively low incidence of workers' compensation claims, if a small firm has anything more than zero claims in a year, it either has a significant disability problem or had a bad year. For both these reasons, it is vital to include firms with zero claims in a representative, unbiased sample.

It was determined that with budget constraints and limitations of the study design, firms with less than 100 employees could not effectively be studied. Since firms with under 100 employees would be significantly less likely to engage in the behaviors examined by the study and since small firms' experience is so variable from year to year, they could not be studied adequately with the proposed study design. Therefore, the random sample and subsequent site-visits were limited to firms employing 100 or more persons.<sup>6</sup>

The MESC population of firms was stratified by SIC code and employment size. Size of firm was categorized into three groups; from 100 to 249 employees, from 250 to 499 employees, and over 500 employees. It was determined that the most efficient sampling design would provide for sampling from each industry proportional to the expected hazard rate.<sup>7</sup> This reflected the judgment that variability would be roughly proportional to the mean, and such a sampling plan would allocate more sample points to the industries with the greatest variance. Within an industry, sampling was done equally among firm size classes, subject to the actual number of firms available. Thus, study results reported here represent a random sample of employers of the appropriate size in the sampled industries, with the sample size roughly representative of the degree of hazard.

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<sup>6</sup>According to MESC ES-202 records for the second quarter of 1988. It was subsequently determined that a few firms either had substantially changed their employment level or were incorrectly represented in MESC reports, according to self-reported employment levels in our survey. Such establishments were retained in the study.

<sup>7</sup>We are indebted to Dr. Stephen Raudenbush, Michigan State University, College of Education for this insightful addition to the study design.

The industries selected for study included the original four from the pilot study (SIC 20, Food Production; SIC 34, Fabricated Metals; SIC 37 Transportation Equipment; and SIC 80 Health Services) plus three additional industries selected from among the top MIOSHA hazard rate industries (SIC 25, Furniture and Fixtures; SIC 30, Rubber and Miscellaneous Plastics; and SIC 35, Machinery, except Electrical). With these additions, the study covers six of the eight most hazardous industries according to MIOSHA, plus the most hazardous of the service industries (SIC 80, which ranks 21st overall).<sup>8</sup>

Because of previous experience with inadequacies in workers' compensation data, the project team decided that data collection from surveyed firms should concentrate on MIOSHA log data. While there have been some complaints about the accuracy of these reports as well, they promised more uniformity and consistency than had been found with employer reported workers' compensation data in the pilot study.

Limiting the analysis to injuries involving seven or more lost workdays, i.e., workers' compensation wage loss claims, seemed too restrictive. The collection of MIOSHA log data on the number of "recordable" incidents, the number of lost workday cases, and the total number of lost workdays permitted concentration on the progression of disability from the initial injury onward to the (potential) workers' compensation claim.

Having a range of outcome, or dependent, variables available also facilitated the modelling phase of the project. It enabled a focus on the disability prevention dimension of employer behavior through employing MIOSHA recordables as the outcome variable or the disability management dimension through use of lost workdays per case or total lost workdays.

The study was designed to promote more effective disability prevention and management by providing an empirical basis for explaining to employers the contribution that

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<sup>8</sup>See MIOSHA (1990).

specific employer policies and practices can make in reducing the risks and costs of disability. Therefore, the major empirical challenge for the employer survey, and indeed for the entire study, is to measure the relevant employer policies and practices in a way that is directly interpretable and easy to communicate. This has proven to be a very difficult task and it absorbed a great deal of staff effort and concern. Chapter 2 of this report describes the process that was used for instrument development and chapter 3 presents the final employer policy and practice variables, as quantified for this study. Other technical details of the employer survey methodology will be discussed in chapter 2 as well.

### **Employer Site Visits**

The original project proposal envisioned extensive site visits. However, due to funding limitations and the decision to develop a random sample of employers through a mail survey, the number of site visits was reduced and the mission of the site visits was changed. Site visits became a supplement to the quantitative analysis from the employer survey data. A total of 32 site visits were conducted between March 25 and July 25, 1992 generally involving two to four respondents per firm. Site visits required approximately three to six hours on site to complete. The observations collected were an important addition to the mail survey data which had been collected in the previous year. The site visits allowed greater depth of observation than the self-administered questionnaire used in the mail survey, and they provided important qualitative data that could not otherwise have been collected.

A systematic sample of companies were chosen from the random sample respondents for the on-site visits. The site visit establishments were selected to represent the best and worst performers on our overall disability measure (lost work days per 100 employees) within each size category in six industries. (SIC 20 was eliminated from the site visit phase of the study due to resource constraints.) High and low performance companies were deliberately selected from the three size classifications within each of the industries represented. This allowed for a total of 18 strata, or 36 site visits, of which 32 were actually completed.

Site visits also allowed for obtaining updated performance measures for 1990 and 1991 which provided an extension of the study data base for a small number of firms. Site visits were used to validate mail survey findings and to assess the quality of data provided in the mail survey. But most importantly the site visits allowed the research team to assess the policy and practice environment of the establishment first hand. Qualitative data and specific examples from firms were collected to verify causal linkages between policies and practices and performance improvement. Site visits also provided an understanding at the organizational level of factors that distinguish high performance employers from low performance employers and to gain an operational understanding of how effective policies and practices are actually carried out in the workplace. These issues are discussed in detail in chapter 5.

### **Theoretical Model and Research Hypotheses**

Previous research has demonstrated that successful loss control must encompass both the prevention of accidents and impairments from incurring in the first place, and an effective internal system for responding to injuries that do occur. This study refers to that comprehensive approach as disability prevention and management. Innovative public and private sector firms and labor organizations have been experimenting with various aspects of these workplace strategies to prevent the occurrence and to minimize the negative consequences of occupational injuries.

This research project was formulated to further elucidate the company policies and practices that relate to the effective prevention and management of disability in the workplace and to investigate their contributions in explaining individual company's injury and claims experience. Analysis of the data base collected in our pilot study provided an intriguing but limited empirical basis to substantiate the importance of these factors for predicting and explaining company claims incidence, and eventually for policy interventions to improve their performance. This project was designed to provide specific quantitative estimates of the contributions of various policy and practice factors, controlling for other characteristics of the firm.

Figure 1.1 shows the conceptual model that has guided this project from its inception. The company environment is taken as given, but it is clearly manifested in the degree of orientation to people (people oriented culture) and the involvement of top management in safety and prevention efforts (active safety leadership). There are three general sets of interventions that are studied here. First is safety intervention, that is, the attempt to prevent accidents from happening in the first instance. This is the oldest and most established of the policy and practice areas studied for this project, and our empirical results will show that it is still the most important.

Second comes disability intervention, or the many disability management techniques that are gaining currency among business establishments today. These represent strategies to minimize the disability consequences of a given injury or disease arising from the workplace. Last comes health promotion, which represents an attempt to intervene directly with the individual to encourage more healthy lifestyles, in the expectation that this will reduce the likelihood of an accident or disease developing, or reduce the lost work time resulting from a given injury or disease process. Any of these interventions could reduce the overall incidence of work related disability; the question this study seeks to answer is "by how much?"

The study seeks to measure the marginal impact of each of these three types of interventions on a set of disability performance indicators derived from MIOSHA log and workers' compensation data reported by the employers in the survey described earlier. As shown in the figure, the performance measures include the incidence of accidents (as measured by the MIOSHA recordable rate), the incidence of disability (as measured by the incidence of lost workday cases and workers' compensation claims), the duration of disability (as measured by the average lost workdays per lost workday case), and overall disability performance (as measured by the total lost workday rate and total workers' compensation costs).



The empirical analysis presented in chapter 4 correlates the self-reported levels of achievement of the disability prevention and management interventions with the self-reported performance indicators from the survey. In essence, the methodology tests whether differences among establishments in disability prevention and management practices are reflected in performance differences.

Therefore, the hypotheses that will be tested here concern the relationships between the policy and practice measures and the disability outcome measures, as those are quantified in this study. In conceptual terms, we are testing whether:

- (a) Safety Interventions impact Injury Incidence, Disability Incidence, and Overall Disability Performance;
- (b) Disability Management Interventions impact Disability Incidence, Disability Duration, and Overall Disability Performance;
- (c) Health Promotion Activities impact Injury Incidence, Disability Incidence, Disability Duration, and Overall Disability Performance.

In addition, the influence of company environment (as measured by active safety leadership and people oriented culture) is assessed using the same cross-sectional design.

Overall, this study provides an improved exploration of workplace disability and its prevention through a carefully constructed, scientifically sound, sequential research design. The results are expected to significantly impact the critical problem of disability arising from the workplace by identifying company practices and characteristics associated with effective prevention of disability occurrence and control of the most negative consequences when disability occurs.

### **Limitations to Research Design**

This study is a significant step forward in our understanding of the impact of specific disability prevention and management policies and practices. It provides the most credible empirical findings produced to date on the nature and the degree of association between such

policies and practices and disability outcome measures. However, it does have some remaining limitations. The most basic issue is whether the findings of a study of different establishments (a cross-sectional design) can be extrapolated to behaviors of the same establishment over time (a time series design).

By presenting results as if it is certain that differences in the policy and practice dimensions are causing differences in the outcomes, the study is extrapolating beyond what is actually proved here. Strictly speaking, with the design of this study, all that can be proven (to normal statistical standards) is that there is an association, or correlation, between the two, i.e. that high reported values on a given policy and practice dimension are associated with low reported values on a given outcome measure among the establishments in our sample. Further, the study presumes to estimate the exact degree of relationship by estimating how much the outcome measures change with a given change in policy and practice variables. These estimates are derived from the reported differences among the establishments in our sample.

The maintained hypothesis of this study is that the differences among establishments in their policies and practices have produced the reported differences in disability outcomes. But that cannot be absolutely proven without a formal intervention study, preferably one with a random assignment to treatment or control group. The problem with the cross-sectional design is that one cannot be sure about the temporal relationship between the interventions and the outcomes. For example, if firms respond to disability problems with policy initiatives, one might observe a negative relationship between disability incidence and policy initiatives in a cross-sectional study. This would reflect the fact that it takes time for the policy initiatives to yield results, and in the meantime the firm may report a significant disability incidence problem. The authors are comfortable with asserting that the reported differences among establishments represent policy choices that have been made, consciously or unconsciously, about how diligently the firm is going to pursue disability prevention and management activities. However, it is certainly true that the relationships between policies and practices and outcomes are not nearly so precise as is implied by our results. For that

reason, it is important that the reader think of these results as representing a general range of impact and not read these results as accurate down to the third decimal place, as they are sometimes reported.

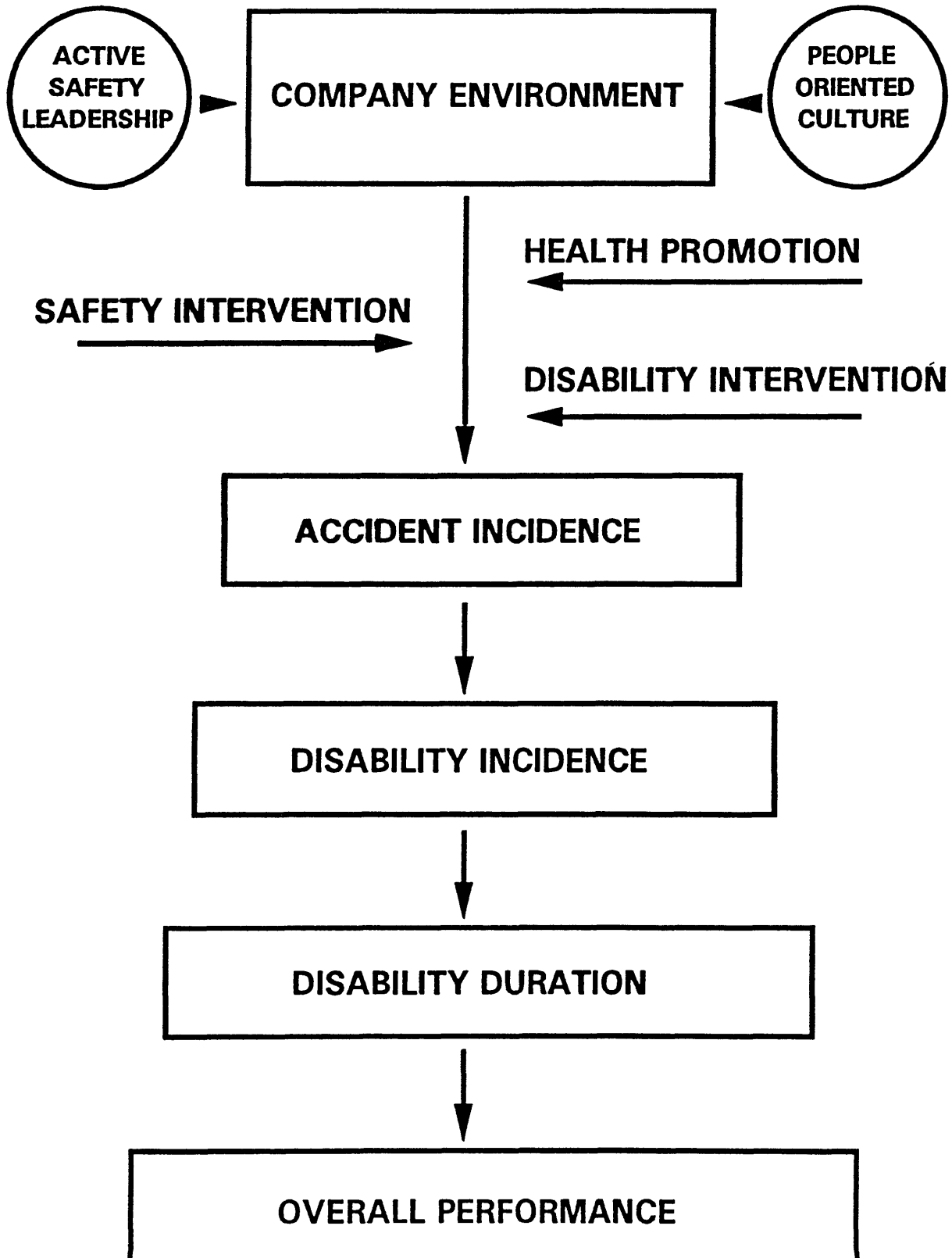
Another issue is the validity of self-reported data from the surveyed establishments. While the discussion in chapter 5 will address this issue formally for the subset of sampled establishments that the study team actually visited in the site-visit portion of the study, it remains a troublesome question. It appears that establishments tended to "regress to the mean." In other words, the good performers tended to underrate themselves on our data collection instrument and the poor performers tended to overrate themselves.

This does not mean that they were trying to mislead the research team, but it does probably reflect their general sophistication in the disability prevention and management areas. A firm that has thoroughly investigated this area and is aware of what the state-of-the-art firms are doing, may feel that their own performance falls far short of this standard, even though we would judge them well above average. On the other hand, the establishment that has not concentrated on this policy area is unlikely to be aware of how far behind today's best practice their own performance may be. So this problem is a natural result of the survey methodology, and the fact that all respondents have their own implicit reference group for their firm's performance.

From the point of view of the empirical findings here, it is heartening that the respondents demonstrated this reporting behavior. It means that the differences in performance (where there is presumed to be less reporting bias because these items are more concrete and relatively objective measurement standards exist) are associated with smaller reported differences in policies and practices than actually exist. Therefore, our statements about the degree of change in performance associated with a given difference in policies and practices will be understatements. The "true" relationship is likely to be larger, given the reporting bias for the less objective policy and practice dimensions.

Figure 1.1 Conceptual Model

# DISABILITY PREVENTION AMONG MICHIGAN EMPLOYERS



## CHAPTER 2 DATA COLLECTION

### Survey Instrument Development

For the 1988 pilot study an original, comprehensive data collection instrument was developed, which utilized a 73 item, self-report questionnaire for investigating disability management factors and organizational practices contributing to the different workers' compensation (WC) claims experiences among Michigan employers. The findings of this pilot study appeared to support the judgment that a significant portion of the variance in WC claims incidence results not just from organizational attributes and workforce characteristics, but also from policy choices and behaviors that are potentially within company control. The 1988 study concluded that a "firms's conscientiousness in managing its internal practices and . . . its willingness to invest in its human resources are significant indicators of good WC claim performance."

However, additional research was needed to better understand exactly how these specific policies and behaviors, and the environment in which they exist, actually impact the employer's experience of WC claims. Thus, for the current study we sought to refine and extend the 1988 findings by: (a) further developing our measures of prevention practices (e.g., safety, ergonomics, health risk prevention), (b) by creating a more complete operational definition for and measurement of corporate culture factors, (c) by incorporating new techniques into our measurement of disability management policies and practices, and (d) by expanding the outcomes used to measure company performance in disability prevention.

Our survey questionnaire was developed over a 15 month period, from October, 1989 to January, 1991. The methodology utilized to design this instrument consisted of seven phases:

1. Literature review
2. Expert consultation
3. Development of construct statements

4. Expert reviewer rating of construct statements
5. Construct classification for scale development
6. Item writing and scale refinement
7. Instrument and finalization

The first three phases were utilized to develop the pool of constructs which are phrases that describe companies' policies or behaviors expected to influence safety and workers' compensation performance. An extensive computer search was conducted to capture sources from key topical areas in relevant literature data bases. An expert consultation process was designed to provide us with knowledge from the SET Division of the Michigan Department of Labor, other safety experts, individuals conducting research on corporate culture and labor relations, and individuals conducting research or experts in the practice of disability management. The final five phases listed above characterize the process by which the actual instrument was developed from the construct statements.

#### Literature Review Process

In this phase, each concept area was further researched within the literature. Sources related to the concepts of disability management and rehabilitation were reviewed to incorporate current research and practice from the rehabilitation literature and to further broaden our understanding of its practice as reflected in the business literature. Various aspects of corporate culture were more extensively reviewed in the literature to enable us to better define the concept and its theoretical and operational components. Furthermore, this second study is attempting a much more detailed focus on the prevention of injuries and disability. Thus, the safety literature was extensively reviewed with respect to the areas of safety training, safety procedures, ergonomics, injury reporting, and legislation.

In June, 1990 a comprehensive computer search of the literature was done. A list of available databases was reviewed and NIOSH, Medline, PsychInfo, and Management Contents were identified as containing information pertinent to this study. Based on information from the first study and on information gathered up to this point, keywords were identified which would capture the topics relevant to the study. These keywords were

searched in the title field and descriptive terms field for the years 1987 through 1990 to identify literature published since the same process was used in the first study. From this search 1,106 titles were produced. These titles were reviewed by the researchers for those whose title content appeared applicable to the study, and their abstracts were then printed out. The abstracts were further reviewed by the researchers and those which proved pertinent to the study were selected and retrieval of the source was attempted. This process resulted in the accumulation of approximately 80 new sources for inclusion. Literature identified subsequent to the instrument's development was incorporated for interpretation of the study's findings.

Furthermore, an additional collection of current literature published by groups known to be conducting research and writing scholarly summaries of exemplary practice, but not widely available through regular acquisition channels, were accessed. These included, for example, reports published by the Washington Business Group on Health, The Menninger Foundation and others. These documents were also abstracted and appear in the bibliography.

#### Expert and Field Consultation Process

The process of expert interviews and field visits was used to augment the literature findings. In many cases, these interviews occurred on site in employer settings so that key points could be demonstrated and observed to illustrate their importance to disability prevention. Notes from these interviews were compiled into narrative documents from which additional construct statements were generated.

#### 1. Michigan Department of Labor, Safety Education and Training Program (SET)

Six SET consultants were identified for assistance with this project based on their areas of expertise and interest in the project:

David J. Luptowski, SET Consultant, Eastern Region  
Gerald E. Medler, SET Consultant, Northern Region  
Connie O'Neill, SET Consultant, Southwestern Region

Micshall Patrick, SET Consultant, Southwestern Region  
Bob Stout, SET Consultant, Metro Region  
W.V. Vandrese, SET Consultant, Northern Region

The SET consultants were interviewed following a semi-structured interview process which enabled comparison across interviews for the identification of key themes. In addition, the consultants were asked to comment on the factors which they believed would be important to this study so that their respective areas of expertise would also be included.

In addition, three of the consultants were accompanied by researchers on field visits to five companies with diverse characteristics. During these field visits various safety practices and issues were pointed out to the researchers by the SET consultants. Representatives from the company were interviewed regarding their safety program, company environment, management commitment, and factors influencing changes in the recent past. All of these companies were being served by the SET consultants and this process enabled direct review of the impacts resulting from specific policy and behavior changes being implemented. It was very useful to refine and develop the constructs for the study.

## 2. Other State and National Experts

Bruce Barge, Ph.D., Director of Human Factors Loss Control, St. Paul Fire and Marine Insurance Company is an organizational psychologist. He and his colleagues developed a series of instruments for company and employee risk assessment. Their Human Factors Audit is an instrument used to rate client companies on their practices related to loss prevention and control. Dr. Barge and his staff reviewed the draft study instrument and provided input relevant to employee health and risk prevention. An insurance perspective on safety and workers' compensation was obtained from Mr. Charles Sparrell, Assistant Vice President of Loss Control, Liberty Mutual Group. Their previous employer survey methods and findings regarding elements of effective safety programs were reviewed and incorporated.



The relationship between disability prevention and corporate culture was explored with consultation from Joel Cutcher-Gershenfeld, Ph.D., Assistant Professor of Labor and Industrial Relations, Michigan State University. From his research on labor-management cooperation, he outlined three domains of organizational culture that were considered in the study: management climate, workplace climate, and human resources/industrial relations practices; along with specific behaviors that might be indicative of a company's performance in each area.

Furthermore, the research on disability in the workplace conducted by David Lewin, Ph.D., Professor of Business at Columbia University and Steven Schecter, President of Human Resource Health Institute, was reviewed in detail. Schecter and Lewin provided access to the instrument used in their study, which related elements of company culture, including employee participation and involvement, to company performance in disability prevention.

Dan Jones, Safety Manager for Steelcase Inc., provided consultation in the physical work environment related to safety and methods of record keeping and accountability, including state and federal regulatory requirements. Safety consultation was also provided during the pilot study by Michael Smith, Ph.D., Professor of Industrial Engineering, University of Wisconsin. His findings regarding specific managerial factors related to effective occupational safety programs and the general methods used in his research were incorporated in this study.

The staff and publications of the Washington Business Group on Health provided valuable input in the areas of prevention, disability management and corporate culture. The extensive publications of their Institute for Rehabilitation and Disability Management were reviewed for factors related to successful company programs in this area. Donald Galvin and Gail Schwartz provided consultation about their work in this area. Miriam Jacobson, Director of the Prevention Leadership Forum identified factors associated with successful worksite health promotion programs and new company initiatives in mental health promotion.

### 3. Research Project's Advisory Committee

The third set of consultants utilized were the members of the project's Advisory Committee. The Committee was consulted on virtually all aspects of the instrument development and study design. The Advisory Committee consisted of experts in safety, risk prevention, disability management, rehabilitation, organized labor, small business and industrial relations; including the following individuals:

- Dr. Bruce Barge, Director, Human Factors Loss Control, St. Paul Fire & Marine Insurance Company;
- Ms. Libby Child, Manager, Workers' Compensation and Medical Services, Steelcase Inc.;
- Mr. Dan Jones, Safety Manager, Steelcase Inc.;
- Mr. Peter Rousmaniere, Vice President, Lynch, Ryan & Associates;
- Mr. Len Sawisch, Office of Disability Management, State of Michigan;
- Ms. Sue Southon, Independent Business Research Office of Michigan, Michigan Department of Commerce;
- Mr. Michael Taubitz, Director, Occupational Safety and Ergonomics, General Motors Corporation;
- Dr. Donald Weatherspoon, Director, Management Services Bureau, Michigan Department of Commerce;
- Mr. Richard Whitwam, Director, Safety and Health Department, Michigan AFL-CIO.

### Scale and Item Development

The objective of the literature review and expert consultation was to identify and record key constructs that would comprise the variables and hypotheses of the study. Constructs were developed from company behaviors or policies that have been empirically or theoretically associated with the prevention or reduction of work-related injuries or illnesses and their negative consequences. The researchers emphasized the development of construct statements from empirical research, and secondarily, from known experts in the field. However, there is a paucity of empirical information about several of the areas under study. Therefore, current, descriptive literature about these developing areas was examined for highly visible, commonly practiced behaviors which were logically related to our outcome variables, although their empirical relationships have not yet been well established.

A preliminary outline of the proposed study variables was created in order to evaluate whether the construct statements collected to date would be adequate to measure each variable. This initial organization identified 14 thematic areas as the major factors to be operationalized from the constructs as variables for the study. (See Appendix 2.1). The first area, Organizational and Employee Characteristics, addressed factual descriptions of the company and its employees, determined in the first study to be important covariates to consider.

The second area, Company Culture, was of particular interest due to the performance of the scale "Management Climate and Culture" in the first study. Although there is little empirical evidence available, there has been a recent surge of descriptive literature which attempts to define "culture" and its relationship to management effectiveness and business outcomes, including safety and workers' compensation performance. By better operationalizing the concept of culture, we hoped to be able to empirically test hypotheses about the impact of various aspects of company culture on company outcomes in injury prevention and disability management. For example, would a more controlled and strict environment produce a better safety record than an environment characterized by employee involvement and self-responsibility?

The next 10 areas described general intervention practices which are utilized in the prevention of accidents and health risks, prevention of claims, and the management of claims. The first five areas deal with injury and disability prevention: Working Conditions, Safety, Wellness Programs, EAPs, and Early Identification of Health and Disability Risks. The specific content in these areas was developed to provide a stronger emphasis on prevention including both environmental factors (e.g., ergonomics) and individual factors (e.g., health risk screening). The next five areas deal with what has traditionally been called disability management: Claim Management, Medical and Vocational Case Management, Return-to-Work Programs, Disability Management Information Systems, and Disability Program Management. The final areas were External Environment, which dealt with

macroeconomic and regulatory influences, and Study Methodology, which captured novel approaches to consider for the new study design and data collection.

Based on this initial review, the construct development process continued in targeted areas of literature and expert input to strengthen and refine the areas needing further definition. In addition, constructs created for the instrument development in the first study were reviewed and those relevant to the current study were added to the construct pool. A final pool of 933 construct statements was obtained from all sources outlined. All 933 construct statements were typed and printed on 4x6 index cards in a uniform format.

The 14 thematic areas were collapsed into 5 basic categories to initially sort the cards for instrument development. Three of the categories; company culture, safety and disability prevention, and disability management, were supported as significant areas of policy and practice in the pilot study. During the literature review and expert consultation, the fourth area, management support of safety, was identified as a distinguishing predictor of a company's achievement of positive outcomes. That is, since state or federal law stipulates many requirements for safety, the presence of some form of safety program and practices exist in virtually all companies. Thus, the distinguishing features are not simply the existence of a safety program, but the level of organizational commitment and accountability to the achievement of safety outcomes. The fifth category, structural characteristics, captured "non-discretionary" aspects of the company operation and its workforce believed to partially impact the outcomes of interest and were retained to guide development of the covariates.

The researchers then examined the content of the constructs in each of the five basic categories to identify the major construct themes of policies and behaviors. This process resulted in 72 construct themes (see Appendix 2.2), believed to adequately categorize the 933 construct statements. Each of the 72 construct theme groupings were examined, merging similar constructs together to form a set of unique concepts within each category. These revised constructs were then rewritten as declarative statements considered to comprise the

variables of interest. A total of 228 variables from the first four categories resulted to be considered for inclusion as the independent variables of the instrument. (Section five, containing items to be used as covariates, was reserved for development as a separate section of the survey.) The 72 themes were disregarded at this point.

A rating form was prepared for these 228 statements, which were organized under the four basic categories, and sent out for expert review to validate and prioritize the content to be included. The rating form asked the reviewer to judge the importance of each statement in relation to the prevention and management of work-related incidents and disability claims. The reviewer pool consisted of individuals from the Advisory Council, selected SET consultants, experts providing consultation to the project, individuals conducting research relevant to the study topics, and employers and practitioners knowledgeable on the study topics. A response was received from 28 of the 31 expert reviewers.

Responses were recorded on a 3-point rating scale where 1 = Essential; 2 = Important; and 3 = Marginal. Also, each reviewer was asked to indicate the five most important statements accounting for a company's performance in the prevention of work-related incidents, the five most important statements in accounting for a company's performance in the prevention of workers' compensation claims, and the five most important statements accounting for a company's performance in controlling the duration of workers' compensation claims. These responses were analyzed to determine which items should be retained in the final scales which would be the independent variables in the study.

The results of the item reviews were compiled to yield a mean and a standard deviation for each item. In addition, the number of times an item was rated as most important for (a) incident prevention, (b) claim prevention, and (c) control of claim duration was also considered. The following decision rules were used to determine which variables to retain for item development.

The mean rating for each item was plotted on a frequency distribution. A natural cutoff point appeared at items with a mean of 1.5 or less. This point is also approximately one standard deviation away from the grand mean. An analysis of these items and all remaining items resulted in the following decision rules for inclusion.

1. At Level 1, all items with a rounded mean of 1.5 or less were automatically included based on their classification as "Essential" items by the expert reviewers. This group consists of 58 items.
2. At Level 2, items with at least two ratings of importance for (a) incident prevention, (b) claim prevention, or (c) claim duration control were automatically included based on their significance as judged by the expert reviewers. This group consisted of 34 items.
3. At Level 3, remaining items were included by the researchers based on their judgement of the items potential importance as revealed in the literature review. This group consisted of 47 items.

Based on these decision rules, a total of 139 of the 228 items were included for scale development.

The next procedure involved initial attempts to develop scales from the included items. Each of three researchers independently sorted the Level 1 cards to identify key content themes. Next, cards from Levels 2 and 3 were sorted into the groups developed from Level 1. New categories were added if researchers felt that a new construct group had emerged. Then solutions of the three researchers were compared to identify the prevailing structural logic in the content of the variables.

In order to gain an independent response to the prevailing structural logic within these constructs, the task of sorting the construct theme areas was also presented to the Advisory Council. Their end product consisted of four general themes: corporate culture, organizational commitment to safety, safety and disability prevention/health promotion, and case management and return to work. The next step taken involved a comparison of the proposed scales with alternative frameworks identified from literature review and expert consultation. This was done in order to ensure that key concepts had not been submerged in

the proposed categorization and to enable some comparison of the findings with available research.

Furthermore, the researchers were not yet satisfied with the specific item content for the scale measuring corporate culture. The proposed scale now contained several different themes used to define corporate culture in the literature, such as employee involvement, management style, and labor relations. Based on consultation with the expert sources cited, salient variables were selected to operationalize each important theme and were grouped together as sub-areas within the scale.

Based on these deliberations the following eight scales were identified:

1. Management Commitment
2. Safety Accountability
3. Safety Intervention
4. Physical Work Environment
5. Disability Claims Management
6. Disability Intervention
7. Employee Risk Management
8. Company Environment

At this point, reduction and refinement of items assigned to each scale was undertaken. Items which entered at the first level were given the most weight and at the third level the least weight for potential inclusion. Each item was carefully reviewed for content and clarity to ensure that each scale had sufficient content, yet with the least number of items necessary. This resulted in 107 items distributed among the eight scales. These eight scales (and the items they contain) represent the raw material for the independent variables of this study.

Once the policy and practice scales had been identified, the next stage involved the formation of the organizational characteristics to be included as covariates in the data analysis. The covariates play a supporting role in the analysis, but are necessary to account for the potential bias that would arise if unmeasured firm characteristics were correlated with

both the key independent variables and the outcomes. The pilot study results had demonstrated the importance of several organizational and workforce characteristics to the outcome variable of workers' compensation claims incidence. These variables were considered along with constructs that were generated in the current study from the literature review and expert consultation and grouped into the fifth major category entitled "structural characteristics." A similar process was applied to the sorting and evaluation of these construct statements. In this case, key organizational studies and investigator judgement were used to generate hypotheses and select constructs to be used as the organizational covariates for this study.

Finally, the performance outcomes of interest were specified to comprise the self-reported dependent variables included in the survey. These included information from the MIOSHA Log and Summary of Occupational Injuries and Illnesses, Form 200 regarding recordable incidents and lost work days as well as specific questions about workers' compensation claim experience and costs. Reference to particular columns of the Form 200 were used to minimize confusion in reporting these performance data.

#### Instrument Finalization and Pretesting

A final review of the entire instrument was undertaken and the structural layout of the instrument was designed. The principles outlined by Dillman (1978) in his book, Mail and Telephone Surveys: The Total Design Method, were utilized to enhance the motivational appeal of the instrument in order to maximize the return rate. Issues such as size, shape, weight, color, paper quality, cover design, question order, and layout were among the key features addressed by his method in the final design process. A draft of the instrument was produced and copies were made for pilot testing.

Further, Dillman (1978) outlined a three pronged process for pretesting which was utilized with this instrument. It involves submitting the instrument to the scrutiny of three types of individuals: colleagues who understand the study's purpose and the hypotheses to be



tested, potential consumers of the study's findings, and individuals drawn from the population to be surveyed.

Thus, the instrument was piloted with individuals from nine companies who were comparable to the constituents of the sample. They were asked to complete the survey, to comment on its appearance, any difficulties encountered, time required for completion, the title of the person in the company to whom it should be sent, and what information would be helpful as feedback to companies returning the completed form. Interviews were conducted by telephone with the person who completed the survey in order to elicit this information, and in one instance a researcher was present at the company to observe the completion of the instrument. The instrument was also sent to nine expert reviewers who represented either colleagues familiar with the study or potential consumers of the findings. They were asked to review the clarity and content of each item, commenting on suggested improvements in item wording and arrangement. The reviewers were also asked to comment on the adequacy of the proposed scale categories and their contents.

Feedback produced from this pretesting was very positive overall. Specific suggestions were implemented to improve particular items, directions to respondents, item content overlap, and wording in the cover letter. Several comments were made about the length of the survey; however, most individuals felt that although it is was very long, it was easy and interesting to complete and that the importance of the issue had been communicated effectively to help capture the interest of the respondent. The pilot-tested employers also commented that the process provided a valuable "company self-assessment" and the length was not a deterrent for them. Some employers felt that the questionnaire had the "feel" of being written for large, manufacturing employers, and that rewording some of the items would make them more applicable to all employers.

The researchers used this information to make a final edit of the instrument resulting in a reduction to 95 items distributed among the eight scales, comprising the section entitled Organizational Self-Assessment. The covariate and dependent variables were refined and

formalized into the section entitled Organizational Summary. The final 9-page survey instrument is included as Appendix 2.3.

### **Survey Methodology**

This section describes the selection of the industries for study. It also provides information on the MESC population of establishments, from which the sampling frame was drawn. Then the stratified random sampling plan is presented, and survey administrative procedures are described. Finally, the completed sample description and an analysis of response bias are presented.

#### Selection of Industries for Study

The industries selected for study included the original four from the pilot study (SIC 20, Food Production; SIC 34, Fabricated Metals; SIC 37 Transportation Equipment; and SIC 80 Health Services) plus three additional industries selected from among the top MIOSHA hazard rate industries (SIC 25, Furniture and Fixtures; SIC 30, Rubber and Miscellaneous Plastics; and SIC 35, Machinery, except Electrical). Table 2.1 reports the data that were available to guide this selection.

The goal was to select industries with substantial numbers of establishments and significant employment levels in Michigan in order to maximize the feasibility and to increase the credibility of the study. Industries that were considered and rejected included SIC 42, Trucking and Warehousing, and SIC 24 Lumber and Wood Products, which were believed to be difficult to study due to remote or mobile operations. SIC 32, Stone, Clay, and Glass Manufacturing was passed over because of a low employment level (only 18,600 employees in Michigan) and relatively low incidence of lost workday cases. SIC 33, Primary Metals, was judged to be less generalizable than the fabrication industries (SIC 34, 35, and 37).

In addition, the need for diversity among industries to maximize the generalizability of the findings was a concern. Thus SIC 20, Food Production, and SIC 80, Health Services,

were important to give the sample more diversity, even though they imposed some special problems. Parts of the Food Production industry were known to be seasonal in their employment pattern, making both drawing a sample and studying policies in these companies somewhat difficult. Health Services was understood to be unique, but was valued for its contrast with manufacturing and familiarity to the general public. This industry also has by far the highest incidence of lost workday cases among the service industries (by a fourfold factor over SIC 73, Business Services).

The final selections give the study coverage of six of the top eight hazardous industries according to MIOSHA, plus the most hazardous of the service industries (SIC 80, which ranks 21st overall). These seven industries contained 23,156 establishments in Michigan employing 955,400 people in 1988. The inclusion of a substantial portion of total employment in Michigan and the diversity of industry representation give the sample substantial face validity.

#### MESC Population of Establishments

The Michigan Employment Security Commission (MESC) is responsible for the administration of the unemployment compensation system and the employment service in Michigan. As part of this responsibility, they collect quarterly reports from covered establishments on the level of employment and salary payments for the previous three months. In the pilot study, a sample was drawn from the Bureau of Workers' Disability Compensation claim files and it was matched to MESC data. The result was that only firms with one or more workers' compensation claims were included in the sample. Moreover, it was discovered that workers' compensation claims among firms were much more rare than anticipated; only about one firm in twelve actually closed a workers' compensation claim in a given year.<sup>9</sup>

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<sup>9</sup>Hunt (1988)

Thus, this earlier sampling strategy contained a systematic bias, particularly for smaller firms that could be expected to incur a claim only rarely. For the purposes of studying the prevention as well as the management of disability, it was especially important to study those firms or establishments that did not incur any workers' compensation claims, since they may well be the best performers of all. Thus, the decision was made to sample from the broadest available population, those establishments covered by the unemployment insurance system. The MESC population of establishments from the second quarter of 1988 was stratified by SIC code (2-digit level) and employment size (less than 100, from 100 to 249 employees, from 250 to 499 employees, or over 500 employees). It was decided that the most efficient sampling design would provide for sampling from each industry proportional to the expected hazard rate.<sup>10</sup> If variation was roughly proportional to the mean, then sample points would be allocated according to the variance. This would provide optimal information per observation.

Study of administrative data demonstrated that incidence rates for small firms were extremely variable from year to year. This reflects the difficulty of observing an infrequent event without sufficient exposure or trials, and the impossibility of distinguishing between levels of performance on a variable that is dominated by stochastic considerations. Thus, establishments with fewer than 100 employees were omitted from the sampling frame on the grounds that it would not be possible to distinguish between good and poor performance in a three year period, given the inherent variability in their performance data.

An overall sampling proportion was determined by comparing the target sample size of 500 to the total number of establishments available in the population, according to MESC data. This target sampling proportion was then modified according to the relative industry risk rates shown in table 2.2, thus allocating more observations to those industries with higher hazard rates. This desired sample size for each industry was spread equally across the

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<sup>10</sup>We are indebted to Dr. Stephen Raudenbush, Michigan State University, College of Education for this insightful addition to the study design.

three size categories, which yielded a target sample size for each industry/size stratum. These were then modified according to the available population, i.e. reduced in those strata where a sufficient number of establishments were not available. In addition, an upper limit of 60 observations per stratum was imposed for small establishments in SIC 34 and an arbitrary minimum sample size of 20 establishments per stratum was adopted for SIC 80, resulting in the sample numbers shown in table 2.2.

Thus, study results reported here reflect a stratified, random sample of employers of the appropriate size in the sampled industries. As shown in table 2.2, sampling proportions ranged from .075 (1 in 13 operationally) to 1.00 (i.e. every establishment), in those strata where the population did not fill the quota. The largest samples were selected in Fabricated Metals (124 establishments), Transportation Equipment (93 establishments), and Rubber and Plastics (89 establishments). The smallest sample was that for Furniture Manufacturing (29 establishments), followed by Food Production (53 establishments) and Health Services (60 establishments). The theoretical sample, based on the exact calculated sampling proportions, was set at 500 establishments. The actual sample drawn, after all adjustments required by real-world constraints, was 517 establishments. As shown in the table, 203 of these establishments had from 100 to 249 employees, while 183 had 250 to 499 employees, and 131 had more than 500 employees.

### Survey Administration

In most cases, the mail survey was addressed to the CEO of the establishment, but in larger establishments to the Director of Human Resources. The sampling frame was nearly three years old by the time of the mailing, and therefore substantial verification research was required to get the appropriate name for each establishment. As shown in table 2.3, the result was that a total of 58 of these establishments were deleted from the sample before the mailing of the survey, because they had gone out of business, were incorrectly identified, or were otherwise unreachable. These "prior deletions" were replaced, where possible, with an alternate establishment that was drawn by the same random process ("prior additions"). This

process of replacement resulted in a mailable sample of 507 establishments, since replacements were not available for all deletions.

The survey was mailed on March 5, 1991 to the sample of 507 establishments in Michigan. Even after the careful screening process, a total of 30 of these establishments were either not reachable or not appropriate for the survey. This means that there were 477 total potential respondents to the mail survey. A return rate of approximately 16 percent was achieved in the first three weeks (81 respondents). A second full mailing occurred on March 26, 1991 to the 426 firms that had not yet responded. During the next 6 weeks, another 20 percent (or 94 additional responses) were received. In May, individual telephone follow-ups began to every firm that had not responded (302 firms).

Procedures recommended by Dillman (1978) were followed in the administration of the survey with a comprehensive plan that was implemented at each phase. Extensive attention was also given to the content of the initial letter, to the follow-up letter, and to scheduled telephone calls to prompt survey response. Incentives were created for responses at each contact, including an information sheet and resource list on disability prevention management. Respondents were promised, and subsequently received, an establishment specific feedback report that showed their ranking on a number of performance variables relative to other members of their industry. These reports were extremely well received, and provided a comparative rating of establishment performance that most had never had access to before.

The survey was declared completed on July 31, 1991. A total of 220 employers had responded, for an aggregate response rate of 46 percent. Table 2.3 indicates the number of survey responses and response rates by strata. The major disappointments were in the very small number of responses among small establishments in the Health Services industry and large establishments in Plastics and Rubber Manufacturing. All cell sizes turned out low in Furniture Manufacturing, but the population was also quite small in those strata. The highest response rate was for large establishments in the Fabricated Metals industry (68 percent) and

the lowest was for small establishments in the Health Services industry (25 percent). The Plastics & Rubber industry and the Transportation Equipment industry had the lowest aggregate response rate at 41-42 percent, while Furniture Manufacturing and Food Production showed the highest response at 54-56 percent. Given the substantial differences in response rate among the strata, the issue of potential non-response bias needs formal investigation.

### **Response Bias Analysis**

Because the SET project used MESC administrative data to prepare the sampling frame, and because workers' compensation (BWDC) administrative data were also gathered for all firms in the universe that could be matched, it is possible to compare the matched MESC/BWDC data for respondents and non-respondents to the SET sample survey. This should provide the most definitive possible test for response bias.

Table 2.4 shows that there are some interesting differences between respondents and non-respondents to the SET survey. In the first place, the respondents are much larger. While both respondents and non-respondents exclude firms with less than 100 employees, the mean employment level for survey respondents was 2,043 employees in the second quarter of 1988, while for non-respondents it was only 549. The huge standard error for respondents prevents this difference from being statistically significant, and also probably indicates that the mean is dominated by a small number of very large firms.

The respondents also have relatively fewer workers' compensation claims, about 3.69 per 100 employees versus 4.68 per 100 for non-respondents, or about 21 percent less. This difference is statistically significant, but not unexpected. Given that the survey was specifically probing establishment's injury and disability prevention activities, it is normal to find higher response rates among firms that are doing a good job than among those doing a poor job.

The table shows that the average duration of workers' compensation wage-loss claims is about the same for both groups at just over 100 days. It also indicates that indemnity payments (wage-loss benefits), like claims, were about 20 percent higher for non-respondents at \$.72 per \$100 versus \$.60 per \$100 for respondents.<sup>11</sup> These comparisons are for the unweighted SET sample, which means that the stratified sampling design contributes to these reported differences. This is because the sampling ratios were designed to be proportional to the hazard rates of the different strata and also because the response rates differ by strata. However, weighted sample results return approximately the same comparisons between respondents and non-respondents.

A probit regression analysis was performed comparing respondents to non-respondents. It yielded the same basic results, with response status being significantly negatively related to the workers' compensation claim rate ( $t = -1.99$ ) and positively related to size of establishment ( $t = 1.90$ ). It is also noteworthy that response status was somewhat geographically specific, with establishments in Grand Rapids (Michigan's second largest city) more likely, and establishments in Detroit less likely to respond to the survey. There were no statistically significant differences by industry.<sup>12</sup>

The conclusion is that the SET sample is not perfectly representative of the underlying population, but that it is sufficiently representative to justify additional analysis. In part this judgment reflects the fact that the biases appear to work in the expected direction when comparing respondents to non-respondents. There also is no other comparable database where information about establishment performance on the full range of MIOSHA outcome measures (recordables, lost workday cases, and total lost workdays) can be combined with data on workers' compensation experience and specific firm characteristics. The sample bias toward large firms will be handled with size controls in our regression models. The bias in

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<sup>11</sup>Note that this represents the wage-loss payments as of the date of report. It does not constitute an estimate of final wage-loss payments when all claims have been closed at some point in the distant future.

<sup>12</sup>The probit regression results are available from the authors.



response by establishments that are already focusing on disability prevention and management (as evidenced in their 21 percent better performance in claims incidence) should mean that our research conclusions are conservative. This reflects the judgment that non-respondents are less likely to be involved in attempts to modify their own disability experience, and we are thus analyzing a slightly restricted range of behavior in our sample compared to the population as a whole.

### **Site Visit Methodology**

The purpose of the site visits was: (1) to validate the mail survey findings and assess the quality of performance data provided in the mail survey, thus improving the credibility of the study; (2) to understand at the organizational level what characteristics, motivational forces and behaviors distinguish high performance employers from low performance employers in injury prevention and management; (3) to add a qualitative supplement to the survey data regarding how effective policies and practices are carried out in the workplace; and (4) to obtain specific company examples that verify the causal linkage between policies and practices and subsequent performance improvement.

### **Sampling Design**

Site selection paralleled the survey sample in that companies were chosen from the three size classifications within six of the seven industries (SIC 20 eliminated due to resource limitations) resulting in 18 total sampling cells. Random selection was not used; high and low performance companies were purposefully selected to represent the extremes from each cell of the sampling framework in order to assure that sufficient contrasts were observed. The rate of lost work days per 100 employees was used as the primary indicator for selecting high and low performance companies. Other dependent variables (recordables, lost work day case rate, workers' compensation claim rate) were used to support decisions in cases where extremes were not immediately evident. When possible, an option company was chosen for each cell as a potential replacement for the initial company selected using the same criteria. This was to ensure that high and low performance employers within the three size

classifications would be represented, even if first choice companies refused participation. Ultimately, site visits were completed for 32 of the 36 industry-size strata.

### Interview Protocol Development

The development of the site visit protocol began with a general review of all information and resources obtained for the study thus far. The following resources were integrated to form an idea bank.

- Individual personal communication with selected SET consultants regarding information to collect on site.
- Information generated at a small work group of SET consultants with the goal of soliciting input on how to make this research better and more useful.
- Ideas/suggestions provided at a full staff workshop for SET consultants. SET consultants were asked to identify how the site visits could add to the value of the study for their work.
- Advisory Committee members were consulted and their suggestions for the site visits were extracted. An extensive consultation and training session with Peter Rousmaniere was held to adopt the study materials and interviewer approach for validity and feasibility within the constraints of the field situation.
- The mail survey was reviewed for inclusion of critical constructs to ensure that the protocol served the purpose of validating self-reported data.
- Literature on qualitative research was reviewed for identification of effective methods, considerations for sample selection, techniques used to obtain qualitative data, and alternative methods for analyzing qualitative data.

The idea bank then served as the content basis for the site visit protocol. After this extensive interview format was developed, a review was performed by the project Advisory Committee. Refinements were made to the protocol and preparations for pilot testing began.

Pilot site visits were conducted to test the instrument, to determine interrator reliability among interviewers, and to practice with the protocol form. Pilot sites were selected with assistance from SET consultants representing the Kalamazoo and Lansing areas. Nine pilot visits were made with interviewers conducting the visits initially in pairs, then individually for comparative analysis. Pilot companies represented small, medium, and large employers, and six of the companies were within the industrial classifications sampled in the study. Conducting pilot tests helped to order the interview questions which ensured a continuous flow during visits. In larger companies it was common to interview 4-5 individuals whereas in small companies 1-2 individuals were typically interviewed. In addition, the original protocol was shortened to make better use of allotted time and still allow collection of critical data.

The final site visit protocol is included as Appendix 2.4. The protocol was divided into seven major areas. For ease of interviewing it was organized to correspond with the way in which responsibilities for the functions are typically assigned within a company.

- Company data: including updated performance data on MIOSHA log data, workers' compensation data, and employment for 1990 and 1991.
- Management interview: including an overview of company, nature of the business, and top management's perspective on safety performance, injury management efforts, and labor-management relations.
- Accident prevention/safety: encompassing the company's accident prevention initiatives and safety efforts.
- Injury management: including the company's initiatives aimed at managing injuries once they occur, and return-to-work efforts.

- Workers' compensation: encompassing the company's initiatives aimed at managing workers' compensation claims.
- Human resources: consisting of a description of the company's environment, including risk prevention activities.
- Other significant observations: interviewers guide to observing the physical work environment and company culture.

### Site Visit Procedures

Based on the pilot phase a decision was made to implement the site visit study industry by industry. It was felt this would optimize learning efficiencies and reduce the lag time between the mailing of the selection letter and the time of telephone contact and subsequent visit. Each industry was assigned to a single interviewer to maximize familiarity with the unique risk factors and policy dimensions in each industry.

Selection letters were sent to companies in waves by industry. The first letters were sent on March 19, 1992 and the last letters were mailed on April 16, 1992. Approximately one week after selection letters were sent, telephone contact was initiated. The individual named by the company as the contact for the original mail survey was the initial target of the telephone contact. A telephone protocol was developed to guide this phase of contact. The telephone protocol informed the contact person that their company was selected for a site visit and explained some of the benefits to participation. Detailed information on what the site visit entailed and the length of time needed was provided along with the specific informational areas to be covered on site. Companies agreeing to participate were then scheduled for an on-site visit. After scheduling site visits by telephone, the company received a confirmation letter verifying site visit date, time, and an agenda for the day. The data to be collected on site were reiterated.

Most companies were receptive to the site visits. Twenty-four of 36 (67 percent acceptance) first choice companies agreed to participate. Most frequent reasons cited for non-participation were organizational restructuring, economic problems, and overload of

relevant staff. Four of 12 option companies refused participation (also 67 percent acceptance) which resulted in a total of 32 site visits completed.

In preparation for each site visit interviewers carefully reviewed the completed mail survey and company data sheet. The individual performance feedback report mailed to each survey respondent was also reviewed to determine the company's standing relative to other employers in the study. The interviewer noted trends in performance data, and any other interesting information for verification or follow-up on site. Individuals performing key functions within the company were identified and tentatively assigned to content areas consistent with the protocol form. This assignment was verified on site.

Typical procedures on site included meeting the contact person and refining the day's agenda. For larger companies where a number of individuals were involved in the interview, it was often necessary to stick to a fairly structured time frame. In smaller companies, where fewer individuals were involved, the time was less structured. However, on many occasions it was necessary to condense the site visit protocol for smaller companies due to time constraints imposed by the availability of key personnel.

Before beginning the interview, a description of the study was provided along with pertinent background information. The company's individual performance feedback report was reviewed with company representatives and any questions answered. The site visit protocol was then followed to obtain necessary information and data. Company tours were provided when time permitted, with special attention paid to ergonomics, housekeeping, and employee use of personal protective equipment. Upon completion of the site visit, employers were thanked for their participation and plans for dissemination of the study results were discussed.

### Qualitative Data Reporting

The site visit report form was developed as a guide for the interviewers to organize the information obtained on site. (See Appendix 2.5) The report form was divided into

sections to correspond with the interview protocol and to organize data gathered and interviewer judgments into a consistent format. The following elements were included:

1. Data Confirmation, Completion, and Quality Assessment

MIOSHA log data were verified from 1986 through 1989, including the number of recordables, lost work day cases, and total lost work days. Workers' compensation data were verified for 1989, including the number of new claims, divided into medical and indemnity claims, and total costs incurred, separated into medical costs and wage loss costs. The probable accuracy of MIOSHA and workers' compensation data was assessed and comments were solicited regarding any significant trends. Both MIOSHA log data and workers' compensation data were then updated through 1991 and more recent trends discussed. Workforce data from 1986 through 1991 were also collected including the number of full time, part time, and temporary employees and any observations regarding the company's workforce or trends in employment recorded.

2. Business Context

This section asked the interviewer to describe the nature of the business, the structure of the organization, union representation, the economic outlook and business climate as perceived by the firm, and any obvious implications for human resource policies.

3. Accident Prevention/Safety Efforts

In this section the interviewer provided a description of the company's special problem areas, unique risk factors, most frequently occurring accidents and injuries, and a description of how these problem areas were identified. Specific methods employed to prevent accidents and address problem areas were reported, together with motivations for implementing specific strategies. The perceived impact that given strategies/methods have had from a quantitative or measurable perspective was probed, as well as the qualitative impact perceived by the firm. Finally, the perception of the method or the strategy which has most significantly impacted the company's accident experience was gathered and reported.

Interviewers also rated the company in the following areas using a 5-point scale, with 5 representing excellent performance and 1 representing the absence of these factors.

- a. Organizational commitment to safety and accident prevention;
- b. Quality of implementation of accident prevention efforts;

- c. The interviewer's perception of the impact that accident prevention methods have had on performance measures.

In addition, interviewers were asked to record comments regarding a critical incident or exemplary model displayed by the company.

4. Disability Prevention/Injury Management Interventions

This section followed the same format as accident prevention and safety. However, descriptions and ratings of the company's efforts to manage injuries and prevent disability subsequent to the incident were documented.

5. Company Environment

Ratings and descriptions of the company's efforts to solicit general involvement and participation from employees, along with the company's efforts to promote a positive work environment were outlined in this section. Interviewers also assessed the compensation and benefits package, any wellness initiatives, the quality of labor-management relations, and the physical work environment of the company.

6. Additional Study Objectives

This final section of the report responded to questions that cannot be answered from the survey results alone, such as the validity of the mail survey self-reported ratings, the quality and apparent impact of policies and practices on the performance outcomes of interest, and descriptions of any loss control services received and their impact.

Subsequent to the interview, descriptive reports were dictated using the site visit report form as an outline and missing data were identified. Attempts were made to collect these data by telephone/fax where possible and any additions were made to the report. Reports were then transcribed and edited before serving as the basis for the qualitative analysis reported in chapter 5.

Table 2.1 Michigan Establishment Population by Industry, 1988

Industry	SIC	MIOSHA Hazard Rank	No. of Establishments	Total Employment (000s)	Total Cases (000s)	Lost Workday Cases		
						Number	Away From Work	Per 100 Employees
<b>Manufacturing</b>								
Food & kindred products	20	4	559	44.8	8.5	4,159	2,606	9.28
Lumber & wood products	24	14	1,036	14.8	2.2	1,108	920	7.49
Furniture & fixtures	25	8	341	33.7	6.9	2,972	1,142	8.82
Printing & publishing	27	25	1,638	42.3	2.2	1,208	1,112	2.86
Rubber & misc. plastics	30	2	744	47.5	9.9	5,178	3,656	10.90
Stone, clay, glass	32	10	508	18.6	3.3	1,489	888	8.01
Primary metals	33	7	503	47.0	9.0	4,412	3,099	9.39
Fabricated metals	34	1	2,258	117.4	27.4	11,989	7,942	10.21
Machinery, except electrical	35	5	4,041	119.3	18.2	6,752	4,836	5.66
Transportation equipment	37	6	750	314.1	56.4	19,310	9,353	6.15
<b>Transportation, utilities</b>								
Trucking and warehousing	42	3	2,683	45.7	5.0	3,149	3,070	6.89
Communication	48	na	na	35.0	1.1	606	446	1.73
Electric, gas, sanitation	49	26	500	34.4	2.4	1,562	702	4.54
<b>Wholesale and retail trade</b>								
Wholesale trade - durables	50	30	10,245		7.1	3,229	2,521	
Wholesale trade - nondurables	51	17	4,362		6.8	3,862	3,463	
General merchandise stores	53	12	797	102.8	7.6	4,249	3,286	4.13
Food stores	54	18	4,831	102.2	7.5	3,869	3,132	3.79
Automotive dealers & service	55	31	5,295	77.8	5.3	2,260	1,987	2.90
Eating & drinking places	58	22	10,535	237.4	12.2	4,057	3,461	1.71
<b>Services</b>								
Hotels, other lodging	70	19	1,469	30.6	2.8	1,514	1,186	4.95
Personal services	72	na		41.7	0.9	500	360	1.20
Business services	73	33	9,984	186.3	3.3	1,618	1,359	0.87
Auto repair services	75	32	4,404	29.0	1.7	665	613	2.29
Miscellaneous repair	76	27	2,005	13.4	1.0	516	444	3.85
Health services	80	21	14,463	278.6	12.2	7,097	5,505	2.55
Educational services	82	na	na	35.5	0.5	172	140	



Table 2.2 Sampling Strategy

MESC Universe from MESC Establishment List

		SIC 20 Food Prod.		SIC 25 Furniture		SIC 30 Rubber & Plastics		SIC 34 Fab. Metals		SIC 35 Machinery		SIC 37 Trans. Equip.		SIC 80 Health Servs.		Totals	
Firm Size	Class	# Firms	Total Emplmt	# Firms	Total Emplmt	# Firms	Total Emplmt	# Firms	Total Emplmt	# Firms	Total Emplmt	# Firms	Total Emplmt	# Firms	Total Emplmt	# Firms	Total Emplmt
(6)	100-249	47	6,103	29	4,458	84	11,715	158	21,944	137	17,174	88	9,598	265	33,154	808	104,146
(7)	250-499	29	8,322	16	4,709	37	11,561	42	13,545	35	9,068	58	13,996	46	16,530	263	77,731
(8)	500+	15	23,043	7	19,052	13	11,241	22	15,676	25	31,082	92	345,767	60	106,910	234	552,771
	Totals	91	37,468	52	28,219	134	34,517	222	51,165	197	57,324	238	369,361	371	156,594	1,305	734,648

Industry Risk Rates - MIOSHA

	SIC 20 Food Prod.	SIC 25 Furniture	SIC 30 Rubber & Plastics	SIC 34 Fab. Metals	SIC 35 Machinery	SIC 37 Trans. Equip.	SIC 80 Health Servs.	Average
Industry Risk Rate*	9.28	8.82	10.9	10.21	5.66	6.15	2.55	7.65 Unweighted

\*Lost workday cases per 100 employees from MIOSHA data for 1988

Sampling Proportional to Risk - Industry Specific Samples\*\*

		SIC 20 Food Prod.		SIC 25 Furniture		SIC 30 Rubber & Plastics		SIC 34 Fab. Metals		SIC 35 Machinery		SIC 37 Trans. Equip.		SIC 80 Health Servs.		Total
Firm Size	Class	Ratio	Sample	Ratio	Sample	Ratio	Sample	Ratio	Sample	Ratio	Sample	Ratio	Sample	Ratio	Sample	Total
(6)	100-249	0.404	19	0.379	11	0.464	39	0.380	60	0.168	23	0.352	31	0.075	20	203
(7)	250-499	0.655	19	0.688	11	1.000	37	1.000	42	0.657	23	0.534	31	0.435	20	183
(8)	500+	1.000	15	1.000	7	1.000	13	1.000	22	0.920	23	0.337	31	0.333	20	131
	Totals	0.582	53	0.552	29	0.683	89	0.640	124	0.355	69	0.385	93	0.160	60	517

\*\*This method uses the proportional risk factor to allocate sample points among industries and then allocates equally across size classes, subject to universe size, within an industry.

Table 2.3 Survey Administration Details

	Original Universe	Theory Sample	Prior Deletes	Prior Adds	Mailed Sample	Post Changes	Adjusted Sample	Adjusted Universe	Survey Responses	Response Percent
<b>SIC 20 Food Production</b>										54.3%
Size 6 (100-249 empl)	47	19	-1	1	19	-2	17	47	9	52.9%
Size 7 (250-499 empl)	29	19	-1	1	19	-4	15	29	9	60.0%
Size 8 (> 500 empl)	15	15	-1		14	0	14	15	7	50.0%
<b>SIC 25 Furniture Mfg</b>										55.6%
Size 6 (100-249 empl)	29	11	-1	1	11	-2	9	29	7	77.8%
Size 7 (250-499 empl)	16	11	0	0	11	0	11	16	5	45.5%
Size 8 (> 500 empl)	7	7	0		7	0	7	7	3	42.9%
<b>SIC 30 Plastics &amp; Rubber</b>										41.3%
Size 6 (100-249 empl)	84	39	-3	3	39	-6	33	84	12	36.4%
Size 7 (250-499 empl)	37	37	-1		36	-1	35	37	17	48.6%
Size 8 (> 500 empl)	13	13	0		13	-1	12	13	4	33.3%
<b>SIC 34 Fabricated Metals</b>										46.6%
Size 6 (100-249 empl)	158	60	0	0	60	-2	58	158	24	41.4%
Size 7 (250-499 empl)	42	42	-2		40	-1	39	42	17	43.6%
Size 8 (> 500 empl)	22	22	-3		19	0	19	22	13	68.4%
<b>SIC 35 Machinery Mfg</b>										44.4%
Size 6 (100-249 empl)	137	23	-3	3	23	-1	22	137	9	40.9%
Size 7 (250-499 empl)	35	23	-2	2	23	-2	21	35	12	57.1%
Size 8 (> 500 empl)	25	23	-5	2	20	0	20	25	7	35.0%

	Original Universe	Theory Sample	Prior Deletes	Prior Adds	Mailed Sample	Post Changes	Adjusted Sample	Adjusted Universe	Survey Responses	Response Percent
<b>SIC 37 Transportation Equipment</b>										41.9%
Size 6 (100-249 empl)	88	31	-8	8	31	-2	29	77	11	37.9%
Size 7 (250-499 empl)	58	31	-9	9	31	-4	27	45	11	40.7%
Size 8 (> 500 empl)	92	31	-7	7	31	-1	30	77	14	46.7%
<b>SIC 80 Health Services</b>										49.2%
Size 6 (100-249 empl)	265	20	-5	5	20	0	20	265	5	25.0%
Size 7 (250-499 empl)	46	20	-4	4	20	-1	19	46	11	57.9%
Size 8 (> 500 empl)	60	20	-2	2	20	0	20	60	13	65.0%
<b>TOTAL - ALL INDUSTRIES</b>										
Size 6 (100-249 empl)	808	203	-21	21	203	-15	188	797	77	41.0%
Size 7 (250-499 empl)	263	183	-19	16	180	-13	167	250	82	49.1%
Size 8 (> 500 empl)	234	131	-18	11	124	-2	122	219	61	50.0%
<b>GRAND TOTAL</b>	1,305	517	-58	48	507	-30	477	1,266	220	46.1%

Prior deletes were establishments that were discovered to be unavailable for survey prior to mailing the survey instrument. Prior adds represent substitutions for prior deletes, where available. Post changes represent establishments that were discovered to be unavailable for survey after mailing the survey instrument.

Table 2.4 Comparison of Respondents with Non-Respondents

SET Survey Sample

	<u>Respondents</u>			<u>Non-Respondents</u>			<u>t-statistic</u>
	<u>n</u>	<u>Mean</u>	<u>Std. Error</u>	<u>n</u>	<u>Mean</u>	<u>Std. Error</u>	
Employment, 1988:II	196	2,043	1,018.3	214	549	172.9	-1.45
WC Claim Rate, 1986-88	196	3.69	.194	215	4.68	.278	2.92**
Claim Duration, 1986-88 (days)	195	104.2	3.76	214	101.4	4.29	-0.49
Average Indemnity/Payroll, 1986-88 (\$)	196	\$.60	0.41	215	\$.72	.045	1.81

## Appendix 2.1 Thematic Areas

### Construct Organization

1. External Environment
  - Legislation
  - Economy
  - Health Care Costs
  - Workers' Compensation Factors
2. Structural Characteristics
  - Size
  - Industry Type
  - Occupational Types and Distribution
  - Insurance Source
3. Employee Characteristics
  - Age
  - Job Tenure
  - Education
4. Company Culture
  - Labor-Management Relations
  - Unionization
  - Human Resource Orientation
  - Managerial Style
5. Working Conditions
  - Physical Environment
  - Work Expectations and Incentives
  - Supervision
6. Safety
  - Administration and Program Objectives
  - Specific Practices
  - Ergonomic Design
7. Wellness Programs
  - Availability and Eligibility
  - Fitness
  - Health Promotion

8. EAPs
  - Administration and Program objectives
  - Usage
  - Services
9. Early Identification of Health and Disability Risks
  - Preplacement Evaluation
  - Supervisor Training
  - Systematic Screening
10. Claim Management
  - Administration and Program Objectives
  - Procedures and Policies
11. Medical and Vocational Case Management
  - Administration and Program Objectives
  - Provider Relations and Management
  - Procedures and Services Coordination
  - Case Selection Criteria
12. Return-to-Work Program
  - Administration and Program Objectives
  - Supportive Policies and Incentives
  - Individual Planning and Job Accommodation Procedures
13. Disability Management Information System
  - Incidence and High Risk Pattern Analysis
  - Disability Duration and Benefits Utilization Review
  - Evaluation of Program Costs and Outcomes
14. Program Management
  - Organizational Commitment and Policy Support
  - Program Structure and Administration
  - Education and Participation
  - Coordination and Accountability
  - Compensation and Benefit Policies

## Appendix 2.2 Construct Themes

### I. Company Culture

1. Invests resources in people
2. High touch management style
3. Quality management
4. Employee ownership of mission and participation
5. Managerial/supervisor communication skills
6. Open communication
7. Labor management relations
8. Profit sharing and wage incentive programs
9. Quality of worklife
10. Positive supervision approach

### II. Management Support of Safety

11. Top management attitudes/commitment toward safety
12. Top management participation/modeling in safety
13. Top management knowledge about safety
14. Accountability for safety at all levels
15. Open communication on safety issues
16. Supervisors are made key to safety performance
17. Supervisor safety practices
18. Supervisor safety responsibilities
19. Company invests in safety commitment
20. Written safety policy and rules
21. Safety as a working condition

### III. Safety and Disability Prevention

22. Employee input and involvement in safety
23. Safety investigations and inspections
24. Safety-related recordkeeping
25. Evaluation and measurement of safety program

26. Enforcement of safety
27. Safety manager and staffing
28. Safety committee
29. Union role
30. Employee attitudes and perceptions
31. Incentives and reinforcement for safety
32. General safety training content
33. New/transfer worker safety training
34. Temporary worker safety training
35. Supervisor safety training
36. Safety training methods
37. Physical environment
38. Equipment
39. Ergonomics
40. Personal protective equipment
41. Safety program elements
42. External forces for safety actions
43. Job rotation
44. Working conditions
45. First aid/medical facilities
46. Pre-employment screening
47. Health promotion, prevention and incentives
48. Health promotion components and programs
49. Mental health education and intervention
50. Employee Assistance Program role and effective use

#### IV. Disability Management

51. Company policies and management support of disability management
52. Company incentives for RTW and disability management
53. Disability management responsibility and coordination
54. Early identification and intervention



55. Disability claim management policies
56. Medical care coordination
57. Disability management process for injured workers
58. RTW policies, program, and procedures
59. Rehabilitation intervention and service approaches
60. Selecting and using case management services and rehabilitation providers
61. Recordkeeping and data analysis for disability management
62. Insurance carrier services and coordination


V. Structural Characteristics

63. Production requirements
64. Growth
65. Size
66. Temporary workers
67. Subcontract requirements
68. Employee characteristics related to RTW or accidents
69. Employee characteristics related to safety
70. Correlation of work climate, labor relations, unionization
71. Labor market conditions
72. Insurance related incentives



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 actually 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.

\_\_\_\_\_

\_\_\_\_\_

Q2. Number of employees at this facility:

Full time

Part time

Temporary or Contract

1986      1987      1988      1989

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- 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.

**SITE VISIT PROTOCOL****TOP MANAGEMENT INTERVIEW**

I'd like to begin by briefly asking you some questions about the nature of your business.

- M 1**      **What does your company manufacture? [or] What service does your company provide?**
- M 2**      **Can you describe the organizational structure/ownership of the business?**  
[ownership?]  
[number of locations/basis for interview?]
- M 3**      **How has the current economic climate impacted your business?**  
[growth, decline, stable]
- M 4**      **What is the business outlook for your industry/company?**  
[growth, decline, stable]
- M 5**      **Given the nature of your business, what are the major accident risks and safety hazards present within your company?**  
  
1.  
2.  
3.
- M 6**      **How are you informed about these hazards and risks?**  
[example]
- M 7**      **What is your company doing to prevent or reduce accidents?**
- M 8**      **What does your company do to manage injuries after an accident has occurred?**

**M 9      What kinds of problems are your company experiencing in managing injuries and return-to-work?**

**M 10     What role does management play in supporting safety efforts within the company?**

[participation]

[resources?]

[rewards?]

**M 11     Is there an example in your plant (facility) where safety and production demands conflict?**

How do you deal with this?

**M 12     What role does management play in supporting return-to-work efforts within the company?**

**M 13     In the organization's structure,**

**Where does safety fit in?**

**Injury management?**

**Return-to-work?**

**Workers' compensation?**

**How do you achieve coordination among these areas?**

[how effective]

**M 14     Are safety and return-to-work a part of supervisor and plant manager responsibilities?**

[of their evaluation?]

**M 15** How would you characterize the relationship between the company and its employees?

[example]

**M 16** How would you say your company's relationship with employees effects your accident prevention and injury management efforts?

**M 17** How would you characterize the relationship between the company and the union?

**M 18** How does the union impact your accident prevention and injury management efforts?

**M 19** From your experience, what is the single most important thing that an employer can do to reduce the costs of accidents and disability?

## **ACCIDENT PREVENTION/SAFETY**

- S 1      What is the company doing to prevent or reduce accidents and injuries?**  
[anything else?]
- S 2      What has been the result of these efforts?**
- S 3      Do the results show up in any measurable way?**  
[MIOSHA log? WC claims? WC costs?]
- S 4      In particular, what has had the most significant impact on reducing accidents and injuries within your company?**  
[How did you achieve this?]
- S 5      What are the major accident/injury problems here?**  
[frequency, severity, cost?]  
[highest risk departments? jobs?]  
[basis for answer?]
- S 6      What types of accident and injury information do you monitor and analyze?**  
**How do you use this data?**
- S 7      How are accidents investigated?**  
[formality, timeliness, action taken?]  
**What about a near miss?**
- S 8      Does your company conduct safety tours/ audits/inspections? How?**  
**What happens to the results?**



**S 9** Are there any particular safety improvements your company has identified that it would like to make?

**S 10** Do you have any particular problems in your work process or workstation design that are contributing to injuries?

[ergonomic issues?]

[specific causes? jobs? equipment?]

**S 11** Have you attempted to modify this problem area?

[how?]

[example of situations which has been identified then corrected?]

**S 12** Please describe your company's safety training efforts?

[how is content determined?]

[is content tied to data/problems?]

[how is it assured that training does occur?]

[how is the quality of training assured?]

**S 13** Has your company received loss control services from an outside source?

[from what source(s)?]

[services rendered?]

**S 14** Do you feel that these services have impacted your accident and injury experience?

[in what way?]

[do you have any measurable evidence?]

**S 15 Has your company utilized consulting services from the Safety, Education and Training Division of the Department of Labor also known as SET?**

**S 16 What services have you received from SET?**

**S 17 Do you feel that these services have impacted your accident and injury experience?**

[in what way?]

[do you have any measurable evidence?]

**S 18 How would you characterize top management's investment in accident prevention efforts?**

[how well does top management support safety efforts?]

[is safety considered equally with production?]

**S 19 Does your position in the organization allow you to achieve your goals?**

[access, coordination, influence, support]

**S 20 How would you characterize supervisor's investment in accident prevention efforts?**

[what do you do to gain the commitment of supervisors?]

[do supervisor's have specific safety goals for their department?]

[are supervisor's evaluated on their department's safety performance?]

**S 21 How would you characterize employee's investment in accident prevention efforts?**

[what do you do to gain the commitment of employees?]

[how does your company encourage safe behavior?]

**S 22      What are the consequences of safety violations?**

[how are they handled?]

**S 23      What system or procedure exists for employees to report risks and hazards?**

[how often, how freely is system used?]

**S 24      How would you characterize the relationship between the company and employees?**

[how does this impact your accident prevention efforts?]

**S 25      If union, how does the union influence the relationship between the company and its employees?**

**What role/impact does the union play in your accident prevention efforts?**

## **INJURY MANAGEMENT**

- IM 1**      **What is your company doing to manage injuries after they occur?**
- IM 2**      **What has been the result of these efforts?**
- IM 3**      **Do the results show up in any measurable way?**  
[MIOSHA log, WC claims, WC costs]
- IM 4**      **What are the major problems you experience in managing injuries and disability after accidents have occurred?**
- IM 5**      **What information do you monitor on your injury cases?**  
**How do you use this data?**
- IM 6**      **What has had the most significant impact on your efforts to manage injuries?**  
[how did you achieve this?]
- IM 7**      **Please describe how the process would work in a typical case from the time of injury to return-to-work?**
- IM 8**      **What specific procedures do you have for selecting and coordinating medical services for injured workers?**  
[formal process? designated provider?]  
[goal of medical service coordination?]  
[information requested/received from medical providers?]
- IM 9**      **How does your company manage and track cases involving lost work time?**  
[responsibility assigned to specific person?]  
[formality of claim management activities?]

[frequency of contacts made with injured employees?]

[what is the quality of these contacts?]

[does the company regularly monitor potential for RTW?]

**IM 10 Does the company have specific procedures for returning injured employees to work?**

[responsibility assigned to specific person?]

[formality of RTW procedures?]

[types of RTW strategies used?]

[other methods of accommodation?]

[support or assistance to supervisors?]

[methods to resolve lengthy cases?]

**IM 11 How is RTW coordinated between departments within the company?**

**IM 12 Does your position in the organization allow you to achieve RTW goals?**

[access, coordination, influence, support?]

**IM 13 Are there any incentives for the various parties to participate in the return-to-work program?**

[plant manager?]

[supervisors?]

[injured workers?]

[department level incentives?]

[union influence on RTW?]

**IM 14** Specifically, do you have any measurable evidence of the impact these strategies have had?

[MIOSHA log, WC claims, WC costs]

**IM 15** How would you characterize the commitment/support of top management in bringing injured employees back to work?

**IM 16** How would you characterize the relationship between the company and employees?

[How does this relationship impact your injury management efforts?]

**IM 17** If union, how does the union influence the relationship between the company and its employees?

What role/impact does the union have on injury management efforts?

**WORKERS' COMPENSATION**

**WC 1 What is being done to manage your workers' compensation claims?**

[medical coordination]

[case management]

[RTW]

**WC 2 Is there any measurable evidence of the impact of these efforts?**

**WC 3 How invested/involved is top management in efforts to improve your workers' compensation experience?**

**WC 4 What has had the most significant impact on reducing losses?**

**WC 5 What lessons have you learned about effective management of WC claims that might be useful to other employers?**

**WC 6 How are you insured for workers' compensation?**

[self, commercial, group]

Carrier \_\_\_\_\_

Administrator \_\_\_\_\_

**WC 7 What information do you monitor on your workers' compensation claims?**

[how is this information used?]

**WC 8 What information does your insurer provide regarding your workers' compensation coverage?**

[number/duration of claims; current year, all active?]

[costs of claims; wage loss, medical?]

[reserve]

**WC 9 Do you feel that you receive sufficient information regarding your workers' compensation claims to manage them effectively?**

[why/why not?]

**WC 10 Is your company generally satisfied with your workers' compensation coverage and services received?**

[why/why not?]



## **HUMAN RESOURCES**

**HR 1      How would you characterize your company's approach to human resources?**

[company's philosophy or attitude toward employees]

**HR 2      What does your company do to attract and retain employees?**

[opportunities for promotion]

[employee development training]

[benefits]

[wage level relative to local market]

[other compensation/pay incentives/bonuses]

**HR 3      How would you describe the quality of working relationships within the company?**

**HR 4      How would you characterize the relationship between management and employees?**

**HR 5      If union, how would you characterize the relationship between management and the union?**

**HR 6      What does your company do to promote a positive work environment?**

[What is the impact of these efforts on your work environment?]

[any measurable evidence of the impact?]

**HR 7      How would you describe the level of employee involvement/participation within the company?**

[opportunities for involvement]

[joint management - employee participation on committees]

[level of control over their own job]

- HR 8**      **How would you characterize the flow of information within the company?**  
[top down, bottom up]  
[bottom up]
- HR 9**      **What types of information does the company share with the employees?**
- HR 10**     **What methods of communication are used within the company?**  
[openness? frequency?]
- HR 11**     **How would you characterize the general job satisfaction of employees here?**  
[do you have any measurable evidence of this?]  
**Turnover rate?**  
**Absenteeism rate?**  
**Average tenure?**
- HR 12**     **What is the company doing to promote employee health and prevent illness and disability? [Determine types of incentives, frequency of use]**  
[health promotion]  
[Employee Assistance Program]  
[substance abuse treatment]  
[health screening]
- HR 13**     **What has been the impact of these efforts?**  
[any measurable evidence of the impact of this?]
- HR 14**     **How do you feel your company's approach to human resources has impacted your company's experience in safety and disability?**

## **Other Significant Observations**

### **OSO 1 Physical Surroundings:**

[appearance of the building outside]

### **OSO 2 Physical Work Environment:**

[overall cleanliness and maintenance in relation to work performed]

[cafeteria]

[restrooms]

[work areas]

[does the environment convey respect for employees]

### **OSO 3 Visible signs of company culture:**

[interactions between employees]

[interactions across levels]

[aesthetic quality of surroundings]

### **OSO 4 Visible indicators of Safety:**

[hazard signs]

[posters]

[bulletin board]

[MIOSHA Summary Log]

[evidence of PPE being used]

[improvements pointed out during the tour]

### **OSO 5 Visible signs of health promotion efforts:**

### **OSO 6 Other significant observations:**

**SITE VISIT REPORT FORM**

Firm ID  
 Date of Visit  
 Interviewer

Interviewer Rating Scale 5 = Excellent 4 = Good 3 = Adequate, has the idea 2 = Poor 1 = Not present
--

**1. Data Confirmation, Completion, and Quality**

**MIOSHA**

	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
Recordables . . . . .						
LWD cases . . . . .						
LWDs total . . . . .						
Restricted days .						
Days away . . . . .						

Comments regarding adequacy of MIOSHA data (quality of records, validity/reliability of data):

Observations: (trends, changes, problem areas):

**Workers' Compensation**

	<u>1989</u>	<u>1990</u>	<u>1991</u>
New claims . . . . .			
Claims w/ Medical. . . . .			
Claims W/ Indemnity. . . . .			
Total costs incurred . . . . .			
Medical costs . . . . .			
Wage loss costs . . . . .			
Litigated claims . . . . .			

Comments regarding adequacy of MIOSHA data (quality of records, validity/reliability of data):

Observations about data (trends, changes, problem areas):

**Workforce Data**

	1986	1987	1988	1989	1990	1991
Total Employment .	_____	_____	_____	_____	_____	_____
Full Time . . . .	_____	_____	_____	_____	_____	_____
Part Time . . . .	_____	_____	_____	_____	_____	_____
Temp/Cont . . . .	_____	_____	_____	_____	_____	_____

Observations about workforce data:

**2. Business Context**

Describe:

- a. Nature of business/operation.
- b. Organizational structure/ownership.
- c. Unions represented, relations.
- d. Economic outlook/business climate.

Describe or infer:

- e. Implications for human resource policies.

**3. Accident Prevention/Safety Efforts**

Describe:

- a. Problems (risks) identified; how identified.
- b. Problems addressed; specific methods employed.
- c. Reasons for action or inaction.
- d. Impact (company perceived) quantitative and qualitative.
- e. Company's perception of method(s) having significant impact.

Evaluate:

- a. Organizational commitment. [1-2-3-4-5]
- b. Quality of implementation. [1-2-3-4-5]
- c. Impact (interviewer perceived) on dependent variables (and other linkages). [1-2-3-4-5]
- d. Critical Incident / Exemplary Model.

#### **4. Disability Prevention / Injury Management**

Describe:

- a. Problems (risks) identified; how identified.
- b. Problems addressed; specific methods employed.
- c. Reasons for action or inaction.
- d. Impact (company perceived) quantitative and qualitative.
- e. Company's perception of method(s) having a significant impact.

Evaluate:

- a. Organizational commitment. [1-2-3-4-5]
- b. Quality of implementation. [1-2-3-4-5]
- c. Impact (interviewer perceived) on dependent variables (and other linkages). [1-2-3-4-5]
- d. Critical Incident / Exemplary Model

#### **5. Company Environment**

Describe and evaluate:

- a. Employee involvement and participation. [1-2-3-4-5]
- b. Cooperation and trust. [1-2-3-4-5]
- c. Openness of information. [1-2-3-4-5]
- d. Openness of communication. [1-2-3-4-5]

- e. [If unionized, labor management relations and impact.]  
[1-2-3-4-5]
- f. Compensation and benefits. [1-2-3-4-5]
- g. Wellness orientation. [1-2-3-4-5]
- h. Physical environment. [1-2-3-4-5]

**Evaluate:**

- i. Impact (interviewer perceived) of CE on dependent variables (and other linkages, e.g., turnover, absenteeism, tenure).  
[1-2-3-4-5]
- j. Critical Incident / Exemplary Model.

**6. Additional Study Objectives**

- a. Assess the quality, comprehensiveness, and integration of data monitoring and analysis in this company.
- b. Assess the consistency of information and perceptions obtained from different sources within the company.
- c. Assess the consistency of the mail-survey data with the site visit data.
  - 1. Policies/practices
  - 2. Data
- d. Assess the validity of the company's ranking as a high/low performance employer.
- e. Assess the consistency of the policies/practices with performance outcomes.
- f. Assess the linkages between measured performance and causal factors under investigation, other factors.
- g. Document feedback to SET regarding consultative services received.
- h. Document consultative services requested from SET.
- i. Document recommendations/consultation/resources/information/training company would benefit from using/implementing

## CHAPTER 3 SURVEY EMPIRICAL ANALYSIS

### **Introduction**

This chapter will report the findings of the stratified random sample survey of 220 establishments described in the previous chapter. It describes the database to be used in the multivariate analyses to be presented in chapter 4, and provides simple bivariate analyses of correlations among the variables from the survey. The data will generally be presented in weighted terms since unweighted means would provide biased and misleading estimates of the population means. This results from the differential sampling proportions by strata described in chapter 2. However, it means that the weighted means and medians presented in this chapter will differ from the unweighted data used for the multivariate analysis in chapter 4.

The chapter will present the performance measures, or dependent variables, first. The emphasis will be on the great variation in employer performance when compared at a point in time. Then the intercorrelations among the dependent variables will be examined. Next, the covariates, which essentially serve as control variables, will be reviewed. Their correlation with the outcome variables will also be reported. Then the policy and practice, or independent, variables will be presented. Initially, the raw scale scores collected through the mail survey instrument will be described. Then, these raw responses will be refined into the set of independent variables that represent the policy and practice dimensions of employer behavior for this study. The variation in these variables will also be highlighted; then their intercorrelation and their correlation with the outcome variables will be discussed.

### **Performance Measures (Dependent Variables)**

Table 3.1 enables comparison of the average incidence of MIOSHA Recordables, Lost Work Day Cases, Wage-Loss Claims, Lost Work Days Per Case, Total Lost Work Days, and Workers' Compensation Losses for the 220 establishments that responded to our mail survey. Explaining these performance, or outcome, levels across establishments is the basic challenge of this research project. The table shows the mean and standard deviation of each



outcome variable for the seven industries included in the study and for the full weighted sample for calendar year 1989.

MIOSHA Recordables Per 100 Employees is the most basic measure of the number of injuries occurring in an establishment. It is defined as the number of injuries which result in transfer to another job, termination of employment, require medical treatment (other than first aid), or involve loss of consciousness or restriction of work motion. The average establishment in the sample had 20.4 MIOSHA Recordables Per 100 Employees in 1989.

The Lost Work Day (LWD) Case Rate Per 100 Employees represents the number of injuries that involved at least one full day lost from work.<sup>13</sup> It is presumed that, since Lost Work Day Cases are measured with an objective standard (i.e. one full day away from work), this variable may be measured with more precision than MIOSHA Recordables. In particular, it is less likely that local practices, or industry standards would produce differences in reporting behavior. The average establishment in the sample had 6.0 Lost Work Day Cases Per 100 Employees in 1989.

Wage Loss Claim Rate is the number of Workers' Compensation Wage-Loss Claims reported by the establishment per 100 workers. In Michigan, there is a 7-day waiting period for wage loss benefits. This means that a worker injured on the job must be off work for seven days before s/he begins receiving weekly wage replacement payments. Thus, every wage loss claim involves at least seven lost work days, which makes this measure of disability performance more reflective of serious injuries than that for Lost Work Day Cases. The average establishment in the sample reported 3.4 Wage-Loss Claims Per 100 Employees in 1989.

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<sup>13</sup>For the purposes of the study, Lost Work Day Cases were defined to include only full days away from work and exclude restricted workdays. This definition is narrower than what is generally reported.

Lost Work Days Per Case indicates the average duration (in days) of the establishments' Lost Work Day Cases. It is one measure of how severe the typical lost work day injury proved to be. One problem with this measure is that it is very susceptible to distortion by a few long duration cases, thus comparison of means is less reliable than for some of the other performance variables. Table 3.1 indicates that the average establishment reported 26.2 Lost Work Days Per Case in 1989.

Workers' Compensation Losses Per Employee represents the total wage loss and medical payments made to injured workers on the employer's behalf during a given year. This should be a useful summary measure of overall disability prevention and management performance, but reporting irregularities reduce its usefulness. In particular, Workers' Compensation Losses Per Employee did not track well with other performance measures. This probably reflects confusion over whether payments in a given year or payments to cases incurred in a given year should be reported.

Last is the broadest measure of performance, Lost Work Days Per 100 Employees. It represents all the work-time lost due to occupational injuries and illnesses as reported on the MIOSHA log. Conceptually it represents both the incidence of injuries and their severity and it is the most reliable overall measure of disability performance in this study. The average establishment reported 131.4 Lost Work Days Per 100 Employees for 1989.

Table 3.1 shows the weighted means and standard deviations of the six dependent, or outcome, variables by industry for 1989. However, these data are more effectively displayed in figures which characterize their overall distribution, particularly the median and the interquartile range. The median, or 50th percentile, observation reduces the influence of extreme observations and therefore is preferred as a measure of central tendency among establishments. The interquartile range represents the variability among the "middle" 50 percent of establishments.

Figure 3.1 displays the weighted distribution for the outcome variable MIOSHA Recordables Per 100 Employees organized by 2-digit SIC code. It is obvious that there are substantial differences in the median rates of injury by industry, with SIC 80, Health Services, the lowest at 8.3 recordables per 100 employees and SIC 34, Fabricated Metals, the highest at 23.5 recordables per 100 employees. This means that there is a threefold difference in the average injury incidence among the seven industries included in the study.

However, the main message of figure 3.1 is that there is considerably more variation within each industry than there is across the seven industries. With the exception of SIC 80, the interquartile range (25th percentile to 75th percentile) is at least two to one, sometimes three to one. Further, since this excludes the best and worst 25 percentiles, it only represents the experience of the middle of the distribution, or the "average" establishments. This is an impressive demonstration of the incredible diversity of disability experience among Michigan employers, and the degree of challenge represented in any attempt to explain this diversity in performance.

Figure 3.2 reports the performance data for Lost Workday Cases Per 100 Employees. The distributions for this variable are even more disparate, although the medians are closer together than in the case of MIOSHA Recordables. So the conclusion that there is more variation among establishments within an industry than among industry averages is even more true here.

Figure 3.3 displays the incidence of Workers' Compensation Wage-Loss Claims as reported by the employer-respondents to our survey. The story is the same with this performance measure, although the incidence of claims in SIC 80 is significantly lower than in the manufacturing industries. SIC 20 also appears to be typified by lower claims frequency; this may reflect the presence of seasonal workers in this industry category. However, there is more variability within industries than between industry averages even in this case.

This is also apparent in figure 3.4, which shows Workers' Compensation Losses Per Employee by SIC. However, we have little confidence in the accurate measurement of this variable, as employers had considerable difficulty in responding to this question. Table 3.1 indicated that only 172 employers responded to this question (22 percent missing) and review of the establishment data suggest that sometimes those that responded were not responding accurately. It is easy to understand how confusion could arise between: (1) the amount paid out this year on new claims; (2) the amount paid out this year for all claims incurred in the past; or (3) the amount paid in insurance premiums this year, with or without allowance for dividends or other rebates from previous years experience. It is also understandable that there might be substantial reporting differences between self-insured employers and those who purchase commercial workers' compensation insurance in the market. In addition, as will be discussed in chapter 5, the site visits convinced the research team that employers were often confused about what their workers' compensation costs really were.

Given these cautions, figure 3.4 indicates that the relative rankings by industry also change substantially with this performance measure. SIC 80, Health Services, now rises to near the top of the distribution with reported Workers' Compensation costs of \$260 per employee in 1989. SIC 30, Plastics and Rubber Manufacturing, on the other hand, sinks to the bottom of the distribution, with Workers' Compensation reported losses of only \$105 per employee. SIC 34, Fabricated Metals also makes a surprising recovery, looking very average in figure 3.4, as opposed to the high rates of Recordables, Lost Work Day Cases, Workers' Compensation Wage-Loss Claims, and Lost Work Days Per 100 Employees. Whatever confidence can be placed in the reported Workers' Compensation loss figures, the message of figure 3.4 is familiar. There is incredible variation in reported experience among establishments in the same 2-digit industry, and these differences surpass the differences in industry medians.

Figure 3.5 shows the distribution of Lost Work Days Per 100 Employees by SIC code. This is the broadest measure of disability performance available in the study, as it includes both the frequency of injuries and their severity. There is less variation evident

here across industries, but, once again, tremendous variation among the sampled establishments within each industry. While there is approximately a twofold difference between the average for the highest industry (SIC 34) and the lowest (SIC 80), there is always much greater variation evident in the industry interquartile range. This suggests that risk due to industry type is mediated partially by different responses to these risks at the firm or establishment level. This questions will be addressed in chapter 4 when we perform the multivariate analysis.

Table 3.2 shows the correlation between the six outcome measures for the completed sample of establishments. We will employ an arbitrary standard that two variables are "highly correlated" if more than 25 percent of the variance is common between them ( $r \geq .50$ ). They are "slightly correlated" if less than 10 percent of the variance is common between them ( $r \leq .32$ ), and "moderately correlated" if they fall in between these two thresholds.

High correlation coefficients are shown between the incidence of MIOSHA Recordables and the Lost Workday Case Rate ( $r = .63$ ), and between the Lost Work Day Case Rate and both the Wage Loss Claim Rate ( $r = .66$ ) and the number of Lost Work Days Per 100 Employees ( $r = .62$ ). There is also substantial correlation between the Wage Loss Claim Rate and the Total Lost Work Day Rate ( $r = .52$ ). In addition, moderate correlations are shown between the MIOSHA Recordable Rate and both the Wage Loss Claim Rate ( $r = .40$ ) and the aggregate Lost Work Day Rate ( $r = .35$ ). The Lost Work Day Rate correlates moderately with the number of Lost Work Days Per Case ( $r = .40$ ) as well. Workers' Compensation Losses Per Employee correlate only slightly with the Lost Work Day Case Rate ( $r = .23$ ), the Wage Loss Claim Rate ( $r = .22$ ), and the aggregate Lost Work Day Rate ( $r = .25$ ). This reinforces doubts about the accuracy of reporting of Workers' Compensation Losses Per Employee.

*A priori*, one would expect that events more closely related in time would show higher correlations. Thus, the MIOSHA Recordable Rate should correlate more highly with

Lost Work Day Case Rate than with Wage Loss Claim Rate. It is also true that the farther outcomes are in time from the original injury, the more they are subject to other influencing factors, including the policy and practice dimensions that are the subject of this study.

There is no significant correlation between Lost Work Days Per Case and MIOSHA Recordables ( $r = .02$ ) or the Wage Loss Claim Rate ( $r = -.02$ ). Workers' Compensation Losses Per Employee are also not correlated with MIOSHA Recordables ( $r = .10$ ) or Lost Work Days Per Case ( $r = .00$ ). Lost Work Days Per Case are actually slightly negatively correlated with the Lost Work Day Case Rate ( $r = -.14$ ). Thus, there is some indication that those establishments reporting more Lost Work Day cases may report less serious injuries or that they more effectively manage injuries at the time of their occurrence.

### **Covariates (Control Variables)**

Table 3.3 shows the weighted mean values for the covariates gathered in the mail survey that will be used in the multivariate analysis in chapter 4. A total of 58.5 percent of the establishments in the sample were part of multiple plant firms, ranging from 42 percent in SIC 80 to 86 percent in SIC 30. This statistic may have implications for an establishment's ability to mount a disability prevention and management effort. Those establishments that have corporate or other centralized staff to call upon for help are likely to have significant resource advantages over the single plant firm, either in money, in staff, or both.

The table also shows that a significant number of sample establishments have some type of safety standards imposed by an outside entity, ranging from only 18 percent in SIC 30 to 86 percent in SIC 80. In the latter case this requirement is imposed by the licensing or accrediting agency, whereas in the manufacturing concerns it is presumed to be imposed by a customer. Rotating shifts are not a major issue for sampled firms, except in SIC 20, where 24 percent of establishments have 20 percent or more of their employees working rotating shifts. For the entire sample, only 6 percent of establishments have rotating shift schedules.

The experience of the workforce is indicated in table 3.3 by the percentage of the establishment's workforce with tenure of less than one year.<sup>14</sup> The weighted average for the 220 establishments is 12 percent, ranging from 7 percent in SIC 35 to 16 percent in SIC 80. This variable is a good indicator of the presence of new, inexperienced workers who are more vulnerable to injury. These new hires may result from growth or from high turnover; both leading to higher proportions of workers with less than one year of tenure. Thus this variable could reflect very different overall employment conditions of the establishment. In either case, the net effect of more new workers was presumed to be negative in our model.

The percentage of the workforce that are salaried personnel was collected to serve as a correction for possible variation in the number of production workers at a given establishment.<sup>15</sup> The average figure was 20 percent salaried, with industry averages ranging from 11 percent in SIC 80 to 35 percent in SIC 35. However, it will be shown later that these differences are not significant in the multivariate analyses, apparently indicating that this was not an effective control variable.

The next three variables on table 3.3 relate to the establishment's workers' compensation insurance status. The table indicates that 36 percent of sample establishments are self-insured, ranging from 17 percent in SIC 25 to 55 percent in SIC 37. In addition, group self-insurance is allowed in Michigan where groups of small employers are allowed the privilege of pooling their workers' compensation experience through a trade association or other affinity grouping. The table indicates that 18 percent of the sample are affiliated with group self-insurance arrangements, ranging from 3 percent in SIC 35 to 37 percent in SIC

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<sup>14</sup>The questionnaire also asked about the percentage with over 10 years tenure, but the low tenure percentage had more diagnostic value in our models.

<sup>15</sup>Percentage managerial, supervisory and support, and production workers were also gathered. See questionnaire in Appendix 2.3.

80.<sup>16</sup> The remaining establishments are insured with commercial workers' compensation insurance carriers, ranging from 34 percent in SIC 80 up to 77 percent in SIC 35.

The unionized variable in table 3.3 indicates the representation of at least some of the establishment workforce by an organized union. The presence of a union was reported by 55 percent of the weighted sample, ranging from a low of 40 percent in Furniture Manufacturing to 88 percent in Food Production.

The loss control services variable represents an attempt to detect the impact of the existing sources of loss control services available to employers. These sources would include insurance carriers, third party administrators, other private consultants, and the Safety, Education and Training Division of the Michigan Department of Labor. Approximately two-thirds of our sample reported that they had received some loss control services previous to the survey, ranging from 51 percent in Health Services to 92 percent in Food Production.

The final covariate is the average hourly wage for production workers. This variable represents the general quality of the employment situation, as wages have been demonstrated to correlate with fringe benefits and other amenities. In addition, the wage level will serve to standardize somewhat for different occupational mixes at the various establishments. Table 3.3 shows that the average hourly wage for the full, weighted sample was \$9.59 in 1989. Industry averages ranged from \$8.18 in Health Services to \$11.39 in Non-Electrical Machinery.

Table 3.4 displays the correlation coefficients between the covariates and the six outcome variables from the survey. There are only six significant coefficients in the entire table. This finding will be reflected in the multivariate analyses as well; the covariates are generally not strongly associated with the disability prevention and management performance

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<sup>16</sup>Michigan Bureau of Workers' Disability Compensation data indicate that 44.9 percent of indemnity payments during 1991 were made by self-insured employers. Our sample would show a higher percentage because of the elimination of establishments with less than 100 employees.



measures. Four of the significant coefficients in table 3.4 relate to the MIOSHA Recordable Rate. The measure of privately imposed safety standards is negatively correlated with the MIOSHA Recordable Rate ( $r = -.19$ ), individual self-insurance status is positively correlated with MIOSHA Recordables ( $r = .15$ ), and commercial carrier status is negatively correlated ( $r = -.14$ ) with MIOSHA Recordables. The former is believed to reflect the high incidence of accreditation requirements among establishments in SIC 80, and thus is likely an artifact of the lower injury reporting levels found in SIC 80 (See table 3.1 or figure 3.1). This is especially likely since no other performance variable is correlated with this covariate. The self-insurance finding is somewhat counter-intuitive and is subjected to testing in the multivariate model before further discussion.

In addition, the average hourly wage for production workers is negatively correlated with MIOSHA Recordables Per 100 Employees ( $r = -.17$ ). This is also true for the correlation of the wage level with Lost Work Day Case Rate ( $r = -.19$ ). Presumably this is due to a combination of forces. First, higher paid workers may simply be exposed to different risks than lower paid workers. Second, higher wages may induce employers to invest more in disability prevention and management strategies to try to avoid the production losses associated with injuries to more highly paid employees. Third, perhaps more highly paid workers demand higher standards of industrial hygiene.

The last significant correlation coefficient in table 3.4 is that for the correlation of unionized status with Workers' Compensation Losses Per Employee ( $r = .21$ ). It is interesting to note that the Wage Loss Claim Rate also is positively correlated with unionized status ( $r = .14$ ), although not quite statistically significant. We have no available explanation for why unionized status is correlated with workers' compensation costs and claims, but not with MIOSHA Recordables.

## **Policy and Practice Measures (Independent Variables)**

### Refinement of Original Scales

Table 3.5 reports the survey results on the employer policy and practice scales, as they were originally gathered from the employer/respondents. This table reflects the raw data, before any development or refinement, and they are reported here primarily for the sake of completeness. The original 95 behavioral items were organized into 8 scales according to the research team's *a priori* judgment, as guided by the literature review and empirical results of the pilot study.<sup>17</sup> The subsequent refinement of these scales into the independent variables that were actually used in the analyses will be presented here.<sup>18</sup>

The results from the survey scales were examined by looking at the means and standard deviations of the eight scales as well as each individual item. As indicated in table 3.5, there was substantial variation in the scale scores, suggesting that the survey questions were successful in eliciting meaningful responses that differentiated the behaviors achieved within and across companies. At the individual item level there was even more variation, and establishment respondents seemed to array themselves across the available responses in meaningful ways. There were virtually no missing values at the item level, indicating that the five point frequency response did not cause a problem for the respondents.

Next the reliabilities of the scale scores were computed using Cronbach's alpha to evaluate the internal consistency of the scales. Further, the scale intercorrelations were examined to determine the extent to which the *a priori* scales were measuring distinct content. The scale reliabilities are provided in table 3.6. The reliability coefficients for all of the scales are at highly acceptable levels with only the reliability for safety accountability falling below .8. The scale intercorrelation matrix is provided in table 3.7. As expected

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<sup>17</sup>See Habeck, Hunt, et.al. (1988). Also see discussion in chapter 2 and the questionnaire at Appendix 2.3 for the original layout of the items.

<sup>18</sup>The research team generally worked with standardized scores to promote comparability of establishment scores across scales. However, these data will be reported in raw, unstandardized form here for the sake of description.

there was significant intercorrelation among the scales related to safety and among those related to disability management. But the major feature of the intercorrelation analysis is the extent to which company environment is intercorrelated with almost all other scales. Only one scale correlated below .95 with company environment.

The scales were judged to have performed adequately. Nevertheless, the investigators conducted a factor analysis as a data reduction technique to determine whether a more parsimonious grouping of the items might be achieved that still met the *a priori* theoretical assumptions of the study. This seemed appropriate based on the moderately high level of intercorrelation among the scales and the potential to reduce the number of independent variables that would enter into the multivariate analysis. In addition, the factor analysis was viewed as a means of validating the *a priori* theoretical framework of the investigators and potentially increasing the interpretability and operational validity of the independent variables for those who would ultimately utilize the study results.

The factor analysis was conducted using principal components analysis with replacement of the diagonal. No imputed values were calculated for missing data. The rotated factor pattern loadings using oblique rotation were used for interpreting the factor solution. A scree analysis of the eigenvalues of the factor solutions was used to determine the optimum number of factors to retain. Using these criteria, solutions at 4, 5, 6, and 8 factors were considered. (The 10-factor solution was also examined to see the impact of further specificity in the factor content.) Each of the factor solutions was systematically analyzed and interpreted relying on those items within each factor with simple structure (i.e. items loading primarily on one factor).

The general meaning of each factor was interpreted based on the major concepts held in common by those items having simple structure. This procedure was used to interpret the factors obtained in each of the acceptable solutions. The factor solutions were then compared to determine which had superior interpretability and coherence with the theoretical assumptions on which the survey was based. The two solutions which emerged as preferred

were the 4-factor and 8-factor results. Although the 4-factor solution had the advantage of parsimony in providing a reduced number of independent variables for the analysis, the interpretability of these global factors for operational purposes was not deemed to be adequate for moving beyond the pilot study findings that had already substantiated the relevance of these general concepts. Thus, the 8-factor solution was chosen for further data analysis and analyzed to determine its psychometric properties.

As a second step in interpreting the factor results, the remaining items within each factor were analyzed to determine an empirical cutoff in the coefficients of those items that appeared to belong to the factor, even though they lacked simple structure and may have loaded highly on other factors. These additional items were added to improve the interpretability of the factors and the reliability of their performance in the subsequent analyses. This procedure was followed until all items meeting the appropriate cutoff levels had been assigned to their appropriate factor(s). At the conclusion of this process 18 items had been deleted from the original scales, based on the results of the factor analysis at this level.<sup>19</sup>

The content of the refined factors was determined to be highly consistent with the *a priori* theory on which the development of the independent variables was based. Further, the factor analysis procedures resulted in the reassignment of some items from one scale to another and the deletion of 18 items. The resulting eight factors were believed to be superior to the original assignment of items to factors because of their greater conceptual clarity and operational relevance.

Next, the resulting factors and their constituent items were subjected to a confirmatory analysis to assess their reliability and determine the appropriate scoring procedures to use with the items. Each factor was subjected to a principal components analysis with prior

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<sup>19</sup>MC 7, SI 11, SI 1, SI 8, PWE 5, DCM 5, DCM 10, DI 1, DI 2, ERP 1, ERP 2, ERP 3, ERP 4, ERP 9, ERP 10, CE 1, CE 8, CE 9.

commonality estimates equal to one, and no rotation used. The item coefficients obtained from the first factor of the principal components analysis were analyzed to determine their correlation with the factor, whether they should be retained, and how their coefficients should be weighted in subsequent analyses. The results of the confirmatory factor analysis were very favorable, indicating a high degree of internal consistency within each of the eight factors.

However, in seven of the eight factors there was one item, and two items in the case of the remaining factor, having a considerably lower coefficient than its member items and reducing the overall reliability of the factor. This resulted in the elimination of a net of eight additional items from the final independent variable specification. The coefficients of the remaining items indicated that unit weighting, or simple summation of the factor items, would be appropriate. A reliability analysis to compute the internal consistency of the refined factors was then performed, and the intercorrelation of the factors was examined. These results are contained in table 3.8 and table 3.9 respectively.

In general, these independent variables have considerable similarity to the original scales, but place their emphasis in somewhat different ways. The final factors have high reliability and provide fairly specific interpretation of the findings. They are also less intercorrelated and clearly more distinct and focussed in their content than the original scales. However, the final three factors (SAFETY TRAINING, ERGONOMIC SOLUTIONS, and WELLNESS ORIENTATION) contain relatively few items, thereby reducing their reliability and making it more difficult to capture results in these areas. Because of this, it is important that non-significant findings in these areas are not dismissed, but rather addressed in terms of their measurement deficiencies. On the other hand, the factor solutions allow the study to capture the specific contributions of interventions with important policy implications including the specific dimension of SAFETY TRAINING and a composite factor regarding safety practices (e.g. SAFETY DILIGENCE). Further, with the item omissions indicated from the factor analysis and the confirmatory analysis, the scope of each of the factor scales

was found to have more operational relevance and clarity in terms of the typical distribution of responsibilities and actions within a firm.

Thus, the 8-factor solution was judged to be preferable to the original *a priori* scales and to the 4-factor solution, despite potential threats from the unreliability of the small factors and the burden to the analysis of carrying 8 independent variables. This judgment was based on the belief that the interpretability, theoretical cohesion, and operational specificity of this final solution outweighed disadvantages. It was especially important that the independent variables possess good interpretability for a business audience, since that was the intended final use of the research findings.

Before proceeding with the interpretation of the final independent variables, it is interesting and important to consider the implications of the intercorrelation among the factors. It is evident from table 3.9 that the variable PEOPLE ORIENTED CULTURE correlates moderately (between .40 and .46) with all of the other factors except ACTIVE SAFETY LEADERSHIP ( $r = .53$ ) and DISABILITY CASE MONITORING ( $r = .28$ ). This would clearly suggest that there is an underlying dimension characterized in the variable PEOPLE ORIENTED CULTURE that is shared in common with at least six other factors. One would expect that this underlying dimension of the work environment is a critically important, yet perhaps difficult to distinguish, aspect of those work places which are also highly active in the related areas of ACTIVE SAFETY LEADERSHIP, SAFETY DILIGENCE, PROACTIVE RETURN-TO-WORK, WELLNESS ORIENTATION, ERGONOMIC SOLUTIONS, and SAFETY TRAINING. However, this variable may be unlikely to contain enough unique content to be a significant contributor to the analysis on its own, beyond the core content that is also represented in the other six factors. Therefore, it is important to remember the significant dimension of this factor in interpreting results later.

The intercorrelations also demonstrate moderate to high relationship among the components of ACTIVE SAFETY LEADERSHIP, SAFETY DILIGENCE, ERGONOMIC SOLUTIONS, and SAFETY TRAINING. SAFETY TRAINING and SAFETY DILIGENCE

are highly correlated with each other ( $r = .55$ ), and SAFETY DILIGENCE is highly correlated with ACTIVE SAFETY LEADERSHIP and ERGONOMIC SOLUTIONS. Only slight correlation exists between SAFETY DILIGENCE and the disability management variables of DISABILITY CASE MONITORING and PROACTIVE RETURN-TO-WORK PROGRAM. Thus the clusters of variables into disability prevention and disability management dimensions seems to hold up through the factor analysis.

Similarly, the high intercorrelation ( $r = .72$ ) demonstrates the overlap between the concepts measured in DISABILITY CASE MONITORING and PROACTIVE RETURN-TO-WORK PROGRAMS. However, DISABILITY CASE MONITORING has only slight correlation with all other independent variables and clearly measures some unique dimension that is only captured partially in the PROACTIVE RETURN-TO-WORK variable. On the other hand, the PROACTIVE RETURN-TO-WORK variable also correlates at a moderate level with PEOPLE ORIENTED CULTURE, ACTIVE SAFETY LEADERSHIP, ERGONOMIC SOLUTIONS, SAFETY TRAINING, and WELLNESS ORIENTATION. It would appear that PROACTIVE RETURN-TO-WORK is a demonstration of the company's positive human resource philosophy. It is therefore consistent with other study variables, but also contains some dimension of managerial oversight that overlaps with DISABILITY CASE MONITORING. In contrast, DISABILITY CASE MONITORING seems to have little in common with the other study variables.

Similarly, the WELLNESS ORIENTATION factor does not correlate with many other factors except for a modest correlation with PEOPLE ORIENTED CULTURE and PROACTIVE RETURN-TO-WORK. This would suggest that WELLNESS ORIENTATION is a somewhat distinct dimension but probably also a partial reflection of a company's human resource philosophy. ERGONOMIC SOLUTIONS is correlated moderately as expected with other safety factors, and also with factors related to human resource orientation. Surprisingly, it correlated lowest with WELLNESS ORIENTATION suggesting that the prevention motivation that should be shared by these two factors is not contained in these factors as measured. Thus, caution should be used in interpreting the results of

ERGONOMIC SOLUTIONS as it may convey a very specific component reflected in the four items by which it is measured.

### Presentation of the Final Independent Variables

The eight factors as refined and used as independent variables for subsequent data analysis are listed below with their constituent items. The original scale membership of each item is indicated in parentheses at the end of its listing.

#### Factor 1: PEOPLE ORIENTED CULTURE

1. The company demonstrates concern about retaining and developing personnel through its human resource policies and programs. (CE 2)
2. Job satisfaction among employees at this company is high. (CE 3)
3. Working relationships are collaborative and cooperative in this company. (CE 4)
4. There is a high level of trust in the employee/employer relationship at this company. (CE 5)
5. Skills in team building, coaching, problemsolving, and communication are important factors in the selection of supervisors and managers at this company. (CE 6)
6. Supervisors and managers are training in interpersonal skills such as effective communication and conflict management. (CE 7)
7. Employees are formally included in the company's goal setting and planning process. (CE 10)
8. The company achieves open communications where employees feel free to raise issues and concerns, or make suggestions. (CE 11)
9. The company shares information with employees about the financial status and productivity needs of the company. (CE 12)
10. Management seeks and considers employee input in company decisions. (CE 13)
12. Employee involvement programs, such as quality circles and labor-management participation teams, are used to generate employee participation in company operations. (CE 14)
13. Workers have some control over work process and productivity demands. (CE 15)



## Factor 2: ACTIVE SAFETY LEADERSHIP

1. Top management provides leadership and actively participates in managing the safety process. (MC 1)
2. Top management supports the safety program by attending safety meetings and training sessions. (MC 2)
3. Management allocates staff time of specific individual(s) for safety responsibilities. (MC 4)
4. The safety management receives support from top management. (MC 5)
5. Management has direct knowledge of the potential hazards in the workplace. (MC 6)
6. The company commits funds to address unsafe conditions and equipment. (MC 8)
7. The company strives for continuous improvement in safety performance. (MC 9)
8. Supervisors have established goals for safety and receive regular feedback on their performance. (SA 4)
9. Safety performance is evaluated as part of supervisors' performance appraisal. (SA 5)
10. Meaningful safety audits involving supervisors, line employees, and senior management are conducted at regular intervals. (SA 8)
11. The company identifies specific jobs and departments with high accident incidence and lost work time. (SA 9)
12. The company uses occupational health and accident data to analyze patterns and trends that indicate risk situations. (SA 10)
13. The safety program or committee has the responsibility, authority and resources to identify and address safety problems. (SI 2)

## Factor 3: SAFETY DILIGENCE

1. Violating safety rules results in disciplinary action. (SA 2)
2. Supervisors complete accident records promptly. (SA 6)
3. Supervisors document even minor accidents and violations for review and consideration. (SA 7)
4. Supervisors confront and correct unsafe behaviors and hazards when they occur. (SI 7)
5. Identified hazards are corrected on a timely basis. (SI 10)
6. Accident records are complete, identifying causes and including recommendations for corrective action. (SI 11)
7. The company achieves excellent housekeeping. (PWE 1)
8. Equipment is well maintained. (PWE 2)
9. Workers use personal protective equipment where indicated. (PWE 3)
10. Safety guards and equipment are used in hazardous operations. (PWE 4)

11. Existing equipment and tools at this plant have been modified to minimize safety hazards. (PWE 6)
12. Safety is considered equally with production and quality goals in management thinking and plant operations. (MC 10)
13. Someone capable of handling work related disability claims is accessible to employees during all working hours. (DCM 1)

#### Factor 4: DISABILITY CASE MONITORING

1. Disability claims are evaluated early and accurately to determine their validity. (DCM 2)
2. Employees with continuing disability are reevaluated through an assessment of their medical recovery and potential for returning to work. (DCM 6)
3. Duration of disability is evaluated to identify claims needing case management and rehabilitation services. (DCM 7)
4. Rehabilitation professionals are used to evaluate work capacity and develop individualized rehabilitation plans when injured workers are unable to resume employment. (DCM 8)
5. Responsibility for disability claim management and return-to-work coordination is assigned to a specific individual in the company. (DCM 11)
6. The treating physician is asked to identify worker restrictions and capacities as well as a target date for return-to-work. (DI 5)
7. The company monitors employees off work due to disability and their projected return-to-work date. (DCM 4)
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. (DCM 9)
9. Claim management is well coordinated from initial injury to claim resolution. (DCM 12)
10. The company maintains regular communication with the injured employee's attending physician. (DI 6)

#### 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. (DI 4)
2. The company maintains a detailed inventory that quantifies the physical demands of its jobs. (DI 7)
3. The company develops alternative placement options and modified job duties to return disabled employees to work. (DI 8)
4. The company uses resources such as assistive devices and flexible work scheduling to facilitate placement of restricted workers. (DI 9)
5. Assistance is provided to supervisors to make job accommodations or purchase special services needed to assist return-to-work. (DI 10)

6. Follow-up contact is made with the employee and supervisor after successful return-to-work to deal with any needed adjustments. (DI 12)
7. Return-to-work assistance is clearly organized with assigned responsibilities. (DI 13)
8. There is cooperation and coordination among departments in efforts to return injured employees to work. (DI 14)
9. Top management is committed to maintaining workers in employment when injuries or disabilities occur. (MC 11)
10. The company monitors employees off work due to disability and their projected return-to-work date. (DCM 4)
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. (DCM 9)
12. Injured employees are contacted by a designated person within the company immediately following medical treatment. (DI 3)
13. The company maintains regular communication with the injured employee's attending physician. (DI 6)
14. When an injured worker is unable to resume prior duties the company provides job retraining for reassignment in a productive capacity. (DI 11)

#### **Factor 6: WELLNESS ORIENTATION**

1. The company commits resources to support health promotion or wellness programs. (ERP 6)
2. Top management supports and participates in health promotion (wellness) activities. (ERP 7)
3. Employees are provided with personal data about their specific health risk factors. (ERP 8)

#### **Factor 7: ERGONOMIC SOLUTIONS**

1. Jobs are modified to keep heavy and repetitive lifting to a minimum. (PWE 7)
2. Strategies are used to reduce repetitive movements. (PWE 8)
3. Ergonomic strategies are used to improve workstation design and work flow. (PWE 9)
4. Position rotation or job enlargement is used where jobs cannot be further ergonomically corrected. (PWE 10)

#### **Factor 8: SAFETY TRAINING**

1. Employees are informed about possible hazards of their jobs and are trained in safe work practices for their jobs. (SI 3)
2. New and transferred employees are given training regarding specific hazards for their particular job before being placed on the job. (SI 4)

3. Temporary or temporarily assigned employees are given training on-site before being placed on a job or working with new equipment. (SI 5)
4. Supervisors are informed about possible hazards and trained in safe work practices for jobs they supervise. (SI 6)

### Interpretation of the Independent Variables

The interpretation of the factors relied first on the common content of those items containing simple structure. Then the contribution of other items with high coefficients and apparent consistency with the general meaning of the factor were considered. A narrative summation of this content was then prepared. These interpretations were submitted to the members of the Advisory Committee for their review and feedback. The interpretations of the factors were modified to reflect these improvements.

### PEOPLE ORIENTED CULTURE

This factor represents behaviors and policies that stem from conscious decisions on the part of management to cultivate and involve its human resources in positive ways. These decisions are reflected in:

- positive work relationships and employee morale
- attention to interpersonal skills and open communication
- regular and meaningful involvement of employees in company operation and decisions
- sharing and seeking information

It is unlikely that a culture of this type could be achieved without formal means in a large organization; it is likely to be an articulated management value with structure and process mechanisms to support and realize these aims. In small organizations, where the operational manager has direct involvement with all employees, it may reflect sheer force of personality of key leaders.

### ACTIVE SAFETY LEADERSHIP

This factor refers to the personal responsibility and participation that top management and company leaders at all levels assume for safety. Such leadership includes:

- implementing a system of accountability for safety at all levels to assure participation
- modeling vigilance in the investigation of identified risks and hazards
- continually identifying risks through a comprehensive system of data analysis and reporting
- committing resources to address and respond to safety needs

- seeing that he/she is personally knowledgeable of safety risks
  - demonstrating support of designated leaders in safety initiatives
- ACTIVE SAFETY LEADERSHIP operationalizes the concept of management commitment that is identified by practitioners as an essential aspect of successful safety efforts in any company.

## SAFETY DILIGENCE

This factor describes the rigorous behaviors of companies that act on their stated safety goals and put their safety measures into practice. Safety diligence is evident in:

- excellent housekeeping and continuous equipment maintenance
  - timely investigation of risks and accidents that uses problemsolving for immediate correction and future prevention
  - constant compliance with company safety measures and the use of disciplinary action for violations
  - emphasis on safety in all aspects of plant operations
- Mastering these behaviors requires that managers, supervisors, and employees accept safety as a central part of work operations and have integrated critical behaviors, work processes, and safety procedures as a regular part of their functions.

## ERGONOMIC SOLUTIONS

This is a small factor of four items that represent strategies used to address problems of repetitive motion and stress and strain injuries. These include:

- reducing lifting demands
- reducing repetitive movements
- improving work flow
- modifying assigned tasks

As measured in this factor, the strategies reflect corrective ergonomic solutions that would be utilized after a workplace problem is recognized, in contrast to ergonomic strategies designed into the original work environment to prevent ergonomic risks from occurring.

## SAFETY TRAINING

This factor consists of four items that address the timely provision of pertinent safety information to all key personnel. Such training includes:

- all regular employees, temporarily assigned and new employees, and supervisors
- all relevant hazards and applicable safe work practices
- provision prior to undertaking duties and on an ongoing basis

## DISABILITY CASE MONITORING

This factor describes administrative procedures and a managerial process for monitoring disability cases on a consistent basis by a designated representative of the company. Such procedures include:

- monitoring the validity, progress, and outcomes of lost time cases
- evaluating the disability process at critical points
- consulting with providers of health care, case management, and rehabilitation services

However, the manner in which these functions are carried out can vary greatly according to the human resource philosophy of the firm and/or the interpersonal skills of its representatives. When employees perceive the motivation of these procedures to be directed solely at achieving control and cost containment, they may in fact promote an adversarial climate.

## PROACTIVE RETURN-TO-WORK (RTW) PROGRAM

This factor describes supportive, company-based interventions for personally assisting the parties involved in an injury or disability, from the beginning of the incident to its positive resolution. In a proactive program the actions and responsibilities of individuals within the company and external providers are spelled out and related to the goal of resumption of employment. Specific aspects include:

- active involvement of the injured employee and his/her supervisor throughout the RTW process
- creative placement strategies to accommodate and accomplish RTW
- cooperative involvement across departments in the firm to achieve RTW
- timely and continuous coordination of external providers with the RTW goals

Taken together, the items describe a planned and coordinated effort by the organization for the return-to-work of injured employees.

## WELLNESS

This factor contains three items that indicate a company's orientation to health promotion as measured by:

- commitment of resources to support health promotion or wellness
- top management support and participation
- provision of data about health status and risk factors to employees

These indicators suggest a company that has gone beyond expressing interest in wellness and has begun to operationalize this commitment as a part of its corporate culture and its benefit programs.

Table 3.10 reports the weighted independent variable means by industry. The highest level of overall achievement reported among these independent variables was for **DISABILITY CASE MONITORING** with an average score of 4.24, or well over 75 percent achievement according to the survey self reports. **SAFETY DILIGENCE** was achieved about 75 percent of the time, with a mean value of 4.06. On the other end of the spectrum, **WELLNESS ORIENTATION** behaviors were only achieved 50 percent of the time, with a mean value of 3.06, and **ERGONOMIC SOLUTIONS** were only slightly more frequently achieved, with a mean value of 3.29. These results will be used to quantify the payoff to different disability intervention strategies in the next chapter when the multivariate analyses are presented.

By way of introduction of the independent variables, a graphical presentation will be provided that parallels that given earlier to the performance, or dependent, variables. The median and interquartile range (25th percentile to 75th percentile) by industry for the weighted sample will be presented to provide some feel for the degree of variation present in the sample.

Figure 3.6 shows the median and interquartile distribution of **PEOPLE ORIENTED CULTURE**. The data are presented in weighted format to preserve the appropriate differences between industries. Figure 3.6 shows that SIC 34, Fabricated Metals, reported the highest degree of achievement of **PEOPLE ORIENTED CULTURE**, with SIC 20, Food Production, and SIC 30, Rubber and Plastics, the lowest median. While the dispersion is substantially lower here than with the dependent variables presented earlier, the overall message is still that there is substantively more variation within establishments in an industry than between industries in our sample.

Figure 3.7 reports the same data for **ACTIVE SAFETY LEADERSHIP**. There is somewhat more dispersion apparent in this figure, so it is even clearer that there is more variation within an industry than between industries. The odd results for SIC 80, Health Services, reflect the weighting system and the very high weights given to small

establishments in this industry, which brings the median and the 25th percentile very close together. Figure 3.8 shows the distribution of SAFETY DILIGENCE. The medians are higher and the distributions tighter than for the previous independent variables. Presumably, this is a manifestation of the degree to which most firms share the safety goal and understand the importance of SAFETY DILIGENCE in preventing disabilities. Figure 3.9 shows the self-reported values for SAFETY TRAINING. There is some variation by industry, and Health Services is again an outlier. But the basic message is one of variation at the individual establishment level, with little central tendency evident.

The same is true of DISABILITY CASE MONITORING, shown in figure 3.10. The medians are all over 4.0, meaning that the typical establishment reported that it achieved these behaviors more than 75 percent of the time. Figure 3.11 indicates that firms are less frequent in their achievement of PROACTIVE RETURN-TO-WORK PROGRAM. About half of establishments in sampled industries reported that they achieved these behaviors between 50 percent and 75 percent of the time.

An entirely different picture emerges from figure 3.12 for WELLNESS ORIENTATION. Medians range from 2.0 in SIC 20, Food Production to 3.3 in SIC 35, Non-Electrical Machinery. Furthermore, the interquartile ranges are larger than any we have seen in this group of variables. This indicates a wide variety of employer experience, and substantial differences across industries. ERGONOMIC SOLUTIONS, displayed in figure 3.13 is intermediate in dispersion. There is substantial variation across industry medians, but considerable variation within each industry as well. SIC 80, Health Services shows particularly wide variation in part because the weighted results overemphasize the smaller establishments.

Table 3.11 reports the correlation of these independent variables with the dependent, or outcome, variables in the study. The correlations in this table are substantially smaller than any shown heretofore and most are not significantly different from zero. The Wage Loss Claim Rate correlates negatively with PEOPLE ORIENTED CULTURE, ACTIVE



SAFETY LEADERSHIP, SAFETY DILIGENCE, PROACTIVE RETURN-TO-WORK PROGRAM, and SAFETY TRAINING, but all would be characterized as slight correlations by the arbitrary standard adopted here. Lost Work Days Per 100 Employees correlates with almost the same variables and at almost the same levels as does Wage Loss Claim Rate, except that it also is slightly correlated with WELLNESS ORIENTATION.

Lost Work Day Case Rate is negatively correlated with ACTIVE SAFETY LEADERSHIP, PROACTIVE RETURN-TO-WORK PROGRAM, and SAFETY TRAINING, but all would be characterized as slight correlations. No independent variables are significantly correlated with MIOSHA Recordables or Lost Workdays Per Case. Only WELLNESS ORIENTATION is significantly correlated with Workers' Compensation Losses Per Employee. The general characterization of table 3.11 is that the correlations between the dependent, or outcome, variables and the independent, or causative, variables are very modest. Based on these bivariate results, this project's attempt to link independent variables to outcome variables may be very difficult. From the evidence presented here, it seems clear that it will be a challenge to predict MIOSHA Recordables, Lost Work Days Per Case, and Workers' Compensation Losses Per Employee. The situation is somewhat more promising for Lost Work Day Case Rate, Wage Loss Claim Rate, and Lost Work Days Per 100 Employees where at least some significant correlations exist with the independent variables.

With this descriptive and developmental material in place, we turn in the next chapter to the multivariate analysis. We will attempt to demonstrate that the behavioral differences measured by the independent variables developed in this chapter are correlated with the outcome measures in systematic and predictable ways.

Table 3.1 Weighted Dependent Variable Means by Industry, 1989

Variable		Food Production (SIC 20)	Furniture (SIC 25)	Rubber & Plastics (SIC 30)	Fabricated Metals (SIC 34)	Non- Electrical Machinery (SIC 35)	Trans- portation Equipment (SIC 37)	Health Services (SIC 80)	Full Sample
MIOSHA Recordables Per 100 Employees	Mean	21.2	17.6	25.1	31.3	16.3	23.7	13.5	20.4
	S.D.	11.3	5.1	13.6	22.6	11.2	16.6	19.4	17.7
	N	24	13	32	49	26	35	27	206
LWD Case Rate Per 100 Employees	Mean	7.0	4.8	7.5	7.2	5.9	5.2	5.2	6.0
	S.D.	4.5	2.5	5.3	5.6	5.7	3.7	8.0	5.4
	N	24	13	32	50	25	35	27	206
Wage Loss Claim Rate	Mean	3.4	3.4	3.0	4.2	3.8	3.3	3.0	3.4
	S.D.	2.9	2.5	2.1	3.2	4.3	3.6	6.1	3.7
	N	21	13	29	49	25	33	26	196
Lost Work Days Per Case	Mean	19.5	19.1	23.4	32.2	21.3	31.4	25.9	26.2
	S.D.	11.9	16.1	23.7	44.8	14.5	30.6	48.6	33.2
	N	23	14	32	50	24	35	27	205
WC Losses Per Employee	Mean	\$357	\$259	\$254	\$501	\$561	\$470	\$625	\$495
	S.D.	272	140	228	872	782	691	1180	738
	N	19	10	26	43	23	29	22	172
Lost Work Days Per 100 Employees	Mean	115.3	95.9	162.6	158.0	145.6	124.2	111.4	131.4
	S.D.	86.8	61.1	165.8	133.9	210.4	85.5	188.9	144.5
	N	24	13	32	49	25	35	27	205

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Table 3.2 Dependent Variable Correlations

		MIOSHA Recordables Per 100 Employees	LWD Case Rate Per 100 Employees	Wage Loss Claim Rate	Lost Work Days Per Case	Lost Work Days Per 100 Employees	WC Losses Per Employee
MIOSHA Recordables Per 100 Employees	Corr. N	1.0 206	0.63** 205	0.40** 193	0.02 202	0.35** 204	0.10 169
LWD Case Rate Per 100 Employees	Corr. N	0.63** 205	1.0 206	0.66** 194	-0.14* 203	0.62** 205	0.23* 169
Wage Loss Claim Rate	Corr. N	0.40** 193	0.66** 194	1.0 196	-0.02 191	0.52** 193	0.22* 167
Lost Work Days Per Case	Corr. N	0.02 202	-0.14* 203	-0.02 191	1.0 205	0.40** 203	-0.01 166
Lost Work Days Per 100 Employees	Corr. N	0.35** 204	0.62** 205	0.52** 193	0.40** 203	1.0 205	0.25** 168
WC Losses Per Employee	Corr. N	0.10 169	0.23* 169	0.22** 167	-0.00 166	0.25** 168	1.0 172

\* Significantly different from zero at 95% level of confidence

\*\* Significantly different from zero at 99% level of confidence

Table 3.3 Weighted Covariate Means by Industry, 1989

Variable		Food Production (SIC 20)	Furniture (SIC 25)	Rubber & Plastics (SIC 30)	Fabricated Metals (SIC 34)	Non- Electrical Machinery (SIC 35)	Trans- portation Equipment (SIC 37)	Health Services (SIC 80)	Full Sample
Total Firms		25	15	33	54	28	36	29	220
Multiple Plants (%)	Mean	74.1	67.3	85.9	58.7	53.6	66.7	41.7	58.5
	S.D.	35.9	37.5	29.7	42.0	56.2	46.9	74.8	49.5
	N	24	14	33	54	28	36	29	218
Required Safety Standards (%)	Mean	26.7	23.3	17.7	17.8	27.1	25.9	85.7	41.5
	S.D.	35.9	34.3	32.6	32.7	50.1	43.4	53.1	49.5
	N	25	13	33	54	28	35	29	217
Rotating Shifts (% with 20% or More)	Mean	24.0	0	11.2	7.6	3.6	0	4.8	6.3
	S.D.	34.8	0	26.8	22.4	20.4	0	33.7	24.4
	N	24	14	31	51	27	32	26	205
Tenure Less Than 1 Year (%)	Mean	11.1	13.4	12.9	13.3	7.3	10.0	16.0	12.4
	S.D.	10.5	14.6	8.8	17.7	11.0	13.3	11.6	13.5
	N	24	13	33	51	28	35	26	210
Workforce Salaried (%)	Mean	14.4	21.9	20.3	22.4	35.0	22.1	11.4	20.1
	S.D.	5.7	8.8	9.2	9.6	20.2	15.1	14.7	14.7
	N	25	14	33	54	27	36	28	217
Individual Self-Insurance (%)	Mean	45.5	16.8	41.2	42.5	19.8	55.5	28.9	36.1
	S.D.	40.4	29.7	42.0	42.2	44.8	49.4	68.8	48.2
	N	25	13	33	54	28	36	29	218
Group Self-Insurance (%)	Mean	9.3	16.8	20.5	8.2	3.3	7.6	36.8	17.5
	S.D.	23.6	29.7	34.5	23.4	20.1	26.4	73.2	38.1
	N	25	13	33	54	28	36	29	218
Commercial Carrier (%)	Mean	45.2	66.4	38.3	49.3	77.0	36.9	34.3	46.4
	S.D.	40.4	37.6	41.5	42.7	47.4	48.0	72.0	50.0
	N	25	13	33	54	28	36	29	218
Unionized (%)	Mean	88.4	40.4	45.6	58.4	77.0	63.1	45.7	54.6
	S.D.	26.0	39.3	42.5	42.0	47.4	48.0	76.5	50.0
	N	25	14	33	54	28	36	28	218

Variable		Food Production (SIC 20)	Furniture (SIC 25)	Rubber & Plastics (SIC 30)	Fabricated Metals (SIC 34)	Non- Electrical Machinery (SIC 35)	Trans- portation Equipment (SIC 37)	Health Services (SIC 80)	Full Sample
Loss Control Services (%)	Mean	91.7	79.8	87.9	70.2	68.4	63.2	51.4	67.2
	S.D.	22.3	32.1	27.8	39.0	52.3	47.9	77.7	47.1
	N	25	14	33	54	28	36	27	217
Average Hourly Wage (\$)	Mean	10.01	8.77	8.33	10.09	11.39	11.00	8.18	9.59
	S.D.	2.16	1.15	1.48	2.01	2.95	2.97	3.22	2.69
	N	23	13	33	53	25	35	26	208

Table 3.4 Dependent Variable Correlations With Covariates

		MIOSHA Recordables Per 100 Employees	LWD Case Rate Per 100 Employees	Wage Loss Claim Rate	Lost Work Days Per Case	Lost Work Days Per 100 Employees	WC Losses Per Employee
Multiple Plants	Corr. N	-0.05 206	0.02 206	-0.02 196	0.11 205	0.08 205	0.07 172
Safety Standards/Accred.	Corr. N	-0.19** 204	-0.09 204	-0.06 194	-0.06 203	-0.09 203	-0.06 170
Rotating Shifts	Corr. N	-0.07 193	0.02 193	-0.01 186	-0.05 192	0.01 192	-0.03 162
Tenure Less Than 1 Year	Corr. N	0.09 199	0.02 199	0.00 191	0.08 198	0.04 198	-0.02 168
Workforce Salaried (%)	Corr. N	-0.10 205	-0.06 205	-0.08 196	0.01 204	-0.02 204	-0.10 172
Individual Self-Insurance	Corr. N	0.15* 206	0.07 206	0.07 196	0.05 204	0.10 205	0.15 172
Group Self-Insurance	Corr. N	-0.02 206	0.03 206	-0.02 196	-0.11 204	-0.07 205	-0.07 172
Commercial Carrier	Corr. N	-0.14* 206	-0.09 205	0.14 196	0.03 204	-0.05 205	-0.10 172
Unionized	Corr. N	0.01 205	0.09 205	0.14 196	-0.07 204	0.09 204	0.21** 172
Loss Control Services	Corr. N	0.07 204	0.04 204	0.06 194	-0.11 203	-0.01 203	0.02 170
Average Hourly Wage	Corr. N	-0.17* 196	-0.19** 196	-0.007 187	-0.01 195	-0.07 195	0.10 164

\* Significantly different from zero at 95% level of confidence

\*\* Significantly different from zero at 99% level of confidence

Table 3.5 Weighted Summary Scale Score Means by Industry

Variable		Food Production (SIC 20)	Furniture (SIC 25)	Rubber & Plastics (SIC 30)	Fabricated Metals (SIC 34)	Non- Electrical Machinery (SIC 35)	Trans- portation Equipment (SIC 37)	Health Services (SIC 80)	Full Sample
Management Commitment	Mean	3.85	4.03	4.22	4.08	3.99	4.16	4.16	4.10
	S.D.	0.75	0.47	0.45	0.48	0.71	0.53	0.76	0.59
	N	25	15	33	54	28	36	29	220
Safety Accountability	Mean	3.44	3.37	3.52	3.38	3.25	3.43	3.49	3.42
	S.D.	0.68	0.55	0.58	0.60	0.81	0.74	0.86	0.69
	N	25	15	33	54	28	36	29	220
Safety Intervention	Mean	3.69	3.63	3.79	3.87	3.83	3.75	4.04	3.86
	S.D.	0.49	0.59	0.58	0.53	0.54	0.55	0.79	0.59
	N	25	15	33	54	28	36	29	220
Physical Work Environment	Mean	3.73	3.93	4.06	3.90	4.03	3.94	3.84	3.92
	S.D.	0.54	0.46	0.42	0.48	0.56	0.48	1.13	0.61
	N	25	14	33	54	28	35	29	218
Disability Case Monitoring	Mean	3.80	3.66	3.79	3.81	3.61	3.79	3.78	3.76
	S.D.	0.63	0.74	0.52	0.46	0.52	0.54	0.78	0.58
	N	25	15	33	54	28	36	29	220
Disability Intervention	Mean	3.62	3.56	3.50	3.42	3.36	3.55	3.46	3.47
	S.D.	0.61	0.57	0.64	0.69	0.79	0.69	1.04	0.73
	N	25	14	33	54	28	36	29	219
Employee Risk Prevention	Mean	3.08	3.16	3.19	3.39	3.24	3.43	2.98	3.20
	S.D.	0.79	0.63	0.69	0.72	0.84	0.77	1.16	0.82
	N	25	14	33	54	28	36	29	219
Company Environment	Mean	3.27	3.49	3.62	3.68	3.46	3.60	3.45	3.52
	S.D.	0.62	0.58	0.66	0.60	0.60	0.55	1.11	0.69
	N	25	14	33	54	28	36	29	219

Table 3.6 Reliability Coefficients for Survey Scales Using Cronbach's Alpha

Scale Name	Number of Items	Reliability Coefficient
Management Commitment	11	.871
Safety Accountability	11	.747
Safety Intervention	12	.871
Physical Work Environment	10	.948
Disability Claims Management	12	.917
Disability Intervention	14	.929
Employee Risk Prevention	10	.840
Company Environment	15	.959



Table 3.7 Intercorrelation Matrix for Survey Scales\*\*

		Management Commitment	Safety Accountability	Safety Intervention	Physical Work Environment	Disability Claims Management	Disability Intervention	Employee Risk Prevention	Company Environment
Management Commitment	Corr. N		0.699 220	0.603 220	0.530 218	0.363 220	0.397 219	0.340 219	0.531 219
Safety Accountability	Corr. N	0.699 220		0.691 220	0.555 218	0.397 220	0.485 219	0.359 219	0.514 219
Safety Intervention	Corr. N	0.603 220	0.691 220		0.658 218	0.403 220	0.476 219	0.323 219	0.580 219
Physical Work Environment	Corr. N	0.530 218	0.555 218	0.658 218		0.397 218	0.428 218	0.334 218	0.535 218
Disability Claims Management	Corr. N	0.363 220	0.397 220	0.403 220	0.397 218		0.673 219	0.321 219	0.335 219
Disability Intervention	Corr. N	0.397 219	0.485 219	0.476 219	0.428 218	0.673 219		0.460 219	0.463 219
Employee Risk Prevention	Corr. N	0.340 219	0.359 219	0.323 219	0.334 218	0.321 219	0.460 219		0.515 219
Company Environment	Corr. N	0.531 219	0.514 219	0.580 219	0.535 218	0.335 219	0.463 219	0.515 219	

\*\* All correlation coefficients are significant at the .01 level

Table 3.8 Reliability Coefficients for Independent Variables Using Cronbach's Alpha

Independent Variable	Number of Items	Reliability Coefficient
ACTIVE SAFETY LEADERSHIP	13	.880
SAFETY TRAINING	4	.722
SAFETY DILIGENCE	13	.890
ERGONOMIC SOLUTIONS	4	.865
DISABILITY CASE MONITORING	10	.927
PROACTIVE RETURN-TO-WORK	14	.916
WELLNESS ORIENTATION	3	.871
PEOPLE ORIENTED CULTURE	12	.958

Table 3.9 Intercorrelation Matrix for Independent Variables

		People Oriented Culture	Active Safety Leadership	Safety Diligence	Disability Case Monitoring	Proactive RTW Program	Wellness Orientation	Ergonomic Solutions	Safety Training
PEOPLE ORIENTED CULTURE	Corr.	1.0	0.53**	0.46**	0.28**	0.42**	0.46**	0.44**	0.40**
	N	219	219	219	219	219	219	218	219
ACTIVE SAFETY LEADERSHIP	Corr.	0.53**	1.0	0.57**	0.28**	0.38**	0.29**	0.41**	0.43**
	N	219	220	220	219	220	219	218	220
SAFETY DILIGENCE	Corr.	0.46**	0.57**	1.0	0.27**	0.27**	0.20**	0.51**	0.55**
	N	219	220	220	219	220	219	218	220
SAFETY TRAINING	Corr.	0.40**	0.43**	0.55**	0.25**	0.35**	0.20**	0.37**	1.0
	N	219	220	220	219	220	219	218	220
DISABILITY CASE MONITORING	Corr.	0.28**	0.28**	0.27**	1.0	0.72**	0.20**	0.31**	0.25**
	N	219	219	219	219	219	219	218	219
PROACTIVE RTW PROGRAM	Corr.	0.42**	0.38**	0.27**	0.72**	1.0**	0.32**	0.40**	0.35**
	N	219	220	220	219	220	219	218	220
WELLNESS ORIENTATION	Corr.	0.46**	0.29**	0.20**	0.20**	0.32**	1.0	0.17*	0.20**
	N	219	219	219	219	219	219	218	219
ERGONOMIC SOLUTIONS	Corr.	0.44**	0.41**	0.51**	0.31**	0.40**	0.17*	1.0	0.37**
	N	218	218	218	218	218	218	218	218

\* Significantly different from zero at 95% level of confidence

\*\* Significantly different from zero at 99% level of confidence

Table 3.10 Weighted Independent Variable Means by Industry

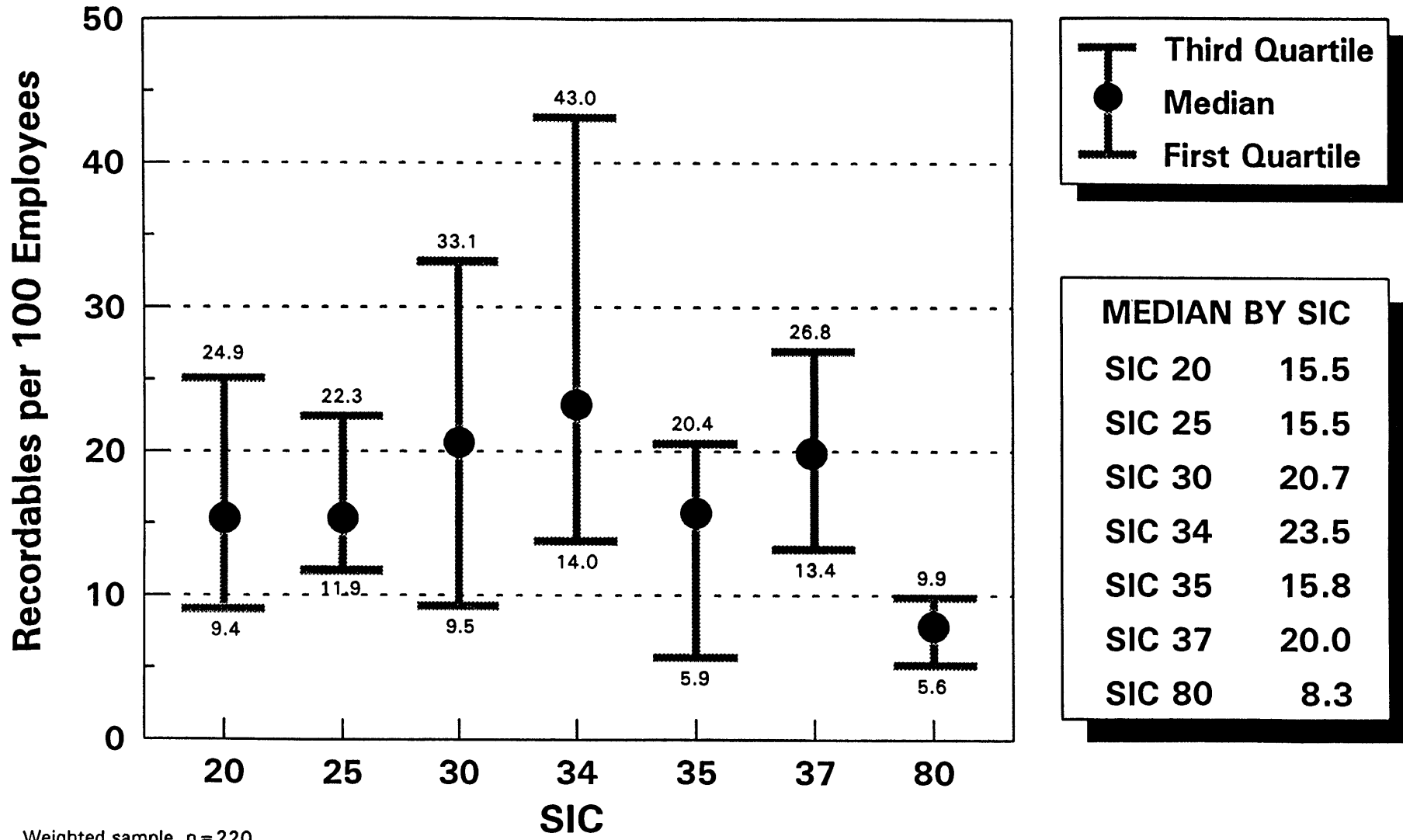
Variable		Food Production (SIC 20)	Furniture (SIC 25)	Rubber & Plastics (SIC 30)	Fabricated Metals (SIC 34)	Non- Electrical Machinery (SIC 35)	Transportation Equipment (SIC 37)	Health Services (SIC 80)	Full Sample
PEOPLE ORIENTED CULTURE	Mean	3.16	3.44	3.53	3.64	3.42	3.54	3.39	3.46
	S.D.	0.63	0.64	0.69	0.61	0.63	0.57	1.24	0.74
	N	25	15	33	54	28	36	29	219
ACTIVE SAFETY LEADERSHIP	Mean	3.57	3.62	3.85	3.73	3.55	3.88	3.82	3.75
	S.D.	0.83	0.54	0.62	0.58	0.83	0.72	0.90	0.72
	N	25	15	33	54	28	36	29	220
SAFETY DILIGENCE	Mean	4.01	3.84	4.08	4.06	4.11	3.92	4.13	4.06
	S.D.	0.50	0.62	0.44	0.39	0.52	0.44	0.70	0.50
	N	25	15	33	54	28	36	29	220
SAFETY TRAINING	Mean	3.75	3.76	3.70	3.94	3.84	3.78	4.43	3.99
	S.D.	0.58	0.71	0.69	0.66	0.87	0.71	0.85	0.77
	N	25	15	33	54	28	36	29	220
DISABILITY CASE MONITORING	Mean	4.27	4.36	4.20	4.26	4.07	4.30	4.28	4.24
	S.D.	0.66	0.41	0.57	0.49	0.67	0.60	0.85	0.61
	N	25	14	33	54	28	36	29	219
PROACTIVE RTW PROGRAM	Mean	3.70	3.75	3.60	3.52	3.44	3.65	3.55	3.57
	S.D.	0.60	0.63	0.61	0.69	0.79	0.76	1.04	0.74
	N	25	15	33	54	28	36	29	220
WELLNESS ORIENTATION	Mean	2.81	3.01	2.81	3.16	3.40	3.24	2.88	3.06
	S.D.	1.20	1.12	1.01	1.19	1.38	1.33	2.07	1.36
	N	25	14	33	54	28	36	29	219
ERGONOMIC SOLUTIONS	Mean	3.14	3.41	3.61	3.24	3.58	3.43	2.99	3.29
	S.D.	0.91	0.67	0.63	0.76	0.96	0.79	2.02	1.06
	N	25	14	33	54	28	35	29	218

Table 3.11 Dependent Variable Correlations with Independent Variables

		MIOSHA Recordables Per 100 Employees	LWD Case Rate Per 100 Employees	Wage Loss Claim Rate	Lost Work Days Per Case	Lost Work Days Per 100 Employees	WC Losses Per Employee
PEOPLE ORIENTED CULTURE	Corr. N	0.12 117	-0.03 176	-0.12 $\rho$ 196	-0.06 187	-0.13 $\rho$ 175	-0.00 172
ACTIVE SAFETY LEADERSHIP	Corr. N	0.00 117	-0.13 $\rho$ 176	-0.13 $\rho$ 196	-0.09 187	-0.19* 175	0.04 172
SAFETY DILIGENCE	Corr. N	0.02 177	-0.10 176	-0.25** 196	0.02 187	-0.18* 175	-0.02 172
SAFETY TRAINING	Corr. N	-0.06 177	-0.17* 176	-0.13 $\rho$ 196	0.00 187	-0.12 175	0.05 172
DISABILITY CASE MONITORING	Corr. N	0.04 177	-0.05 176	-0.08 196	0.01 187	-0.07 175	0.06 172
PROACTIVE RTW PROGRAMS	Corr. N	-0.03 177	-0.18* 176	-0.18* 196	-0.01 187	-0.27** 175	-0.00 172
WELLNESS ORIENTATION	Corr. N	0.05 177	-0.05 176	-0.04 196	0.00 187	-0.15* 175	-0.21** 172
ERGONOMIC SOLUTIONS	Corr. N	0.08 176	-0.05 175	-0.10 195	-0.07 186	-0.09 174	0.03 172

$\rho$  = Significantly different from zero at 90% level of confidence  
 \* = Significantly different from zero at 95% level of confidence  
 \*\* = Significantly different from zero at 99% level of confidence

# MIOSHA Recordables per 100 Employees, by SIC

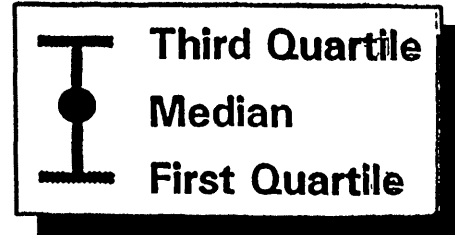
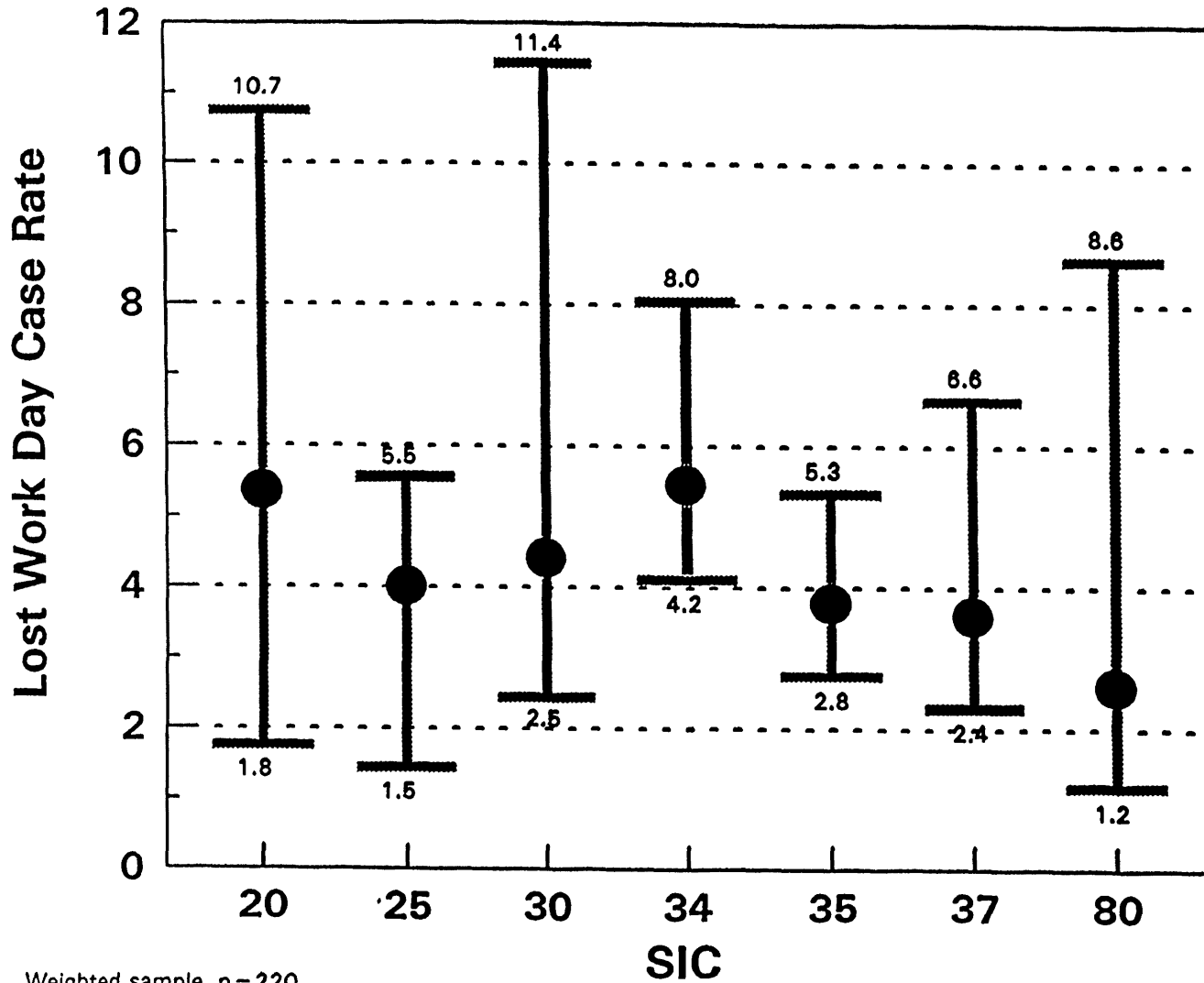


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Weighted sample, n=220

Figure 3.1

# Lost Work Day Cases per 100 Employees, by SIC

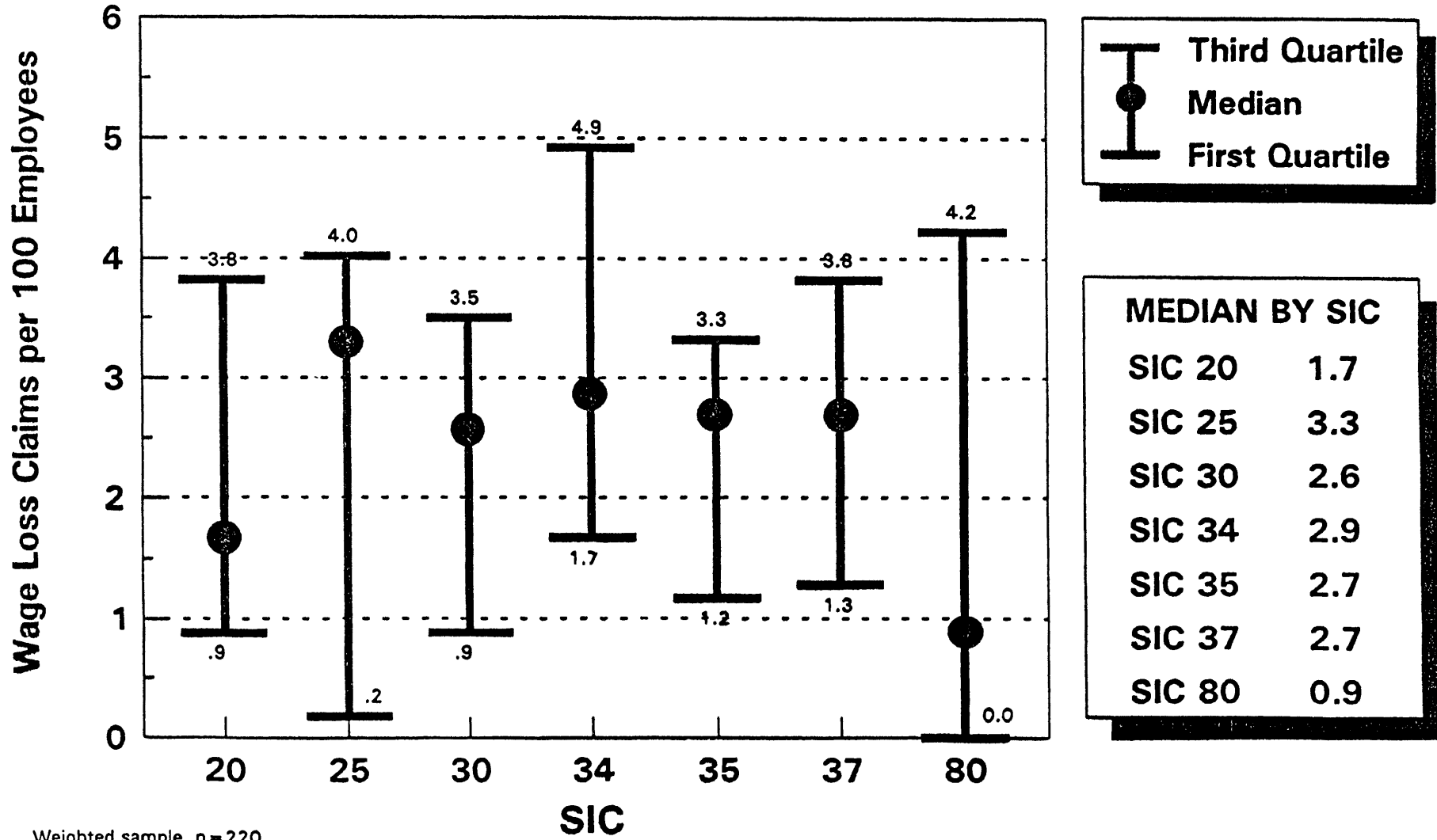


MEDIAN BY SIC	
SIC 20	5.4
SIC 25	4.0
SIC 30	4.4
SIC 34	5.5
SIC 35	3.8
SIC 37	3.6
SIC 80	2.6

Figure 3.2

Weighted sample, n = 220

# Wage Loss Claims per 100 Employees, 1989, by SIC



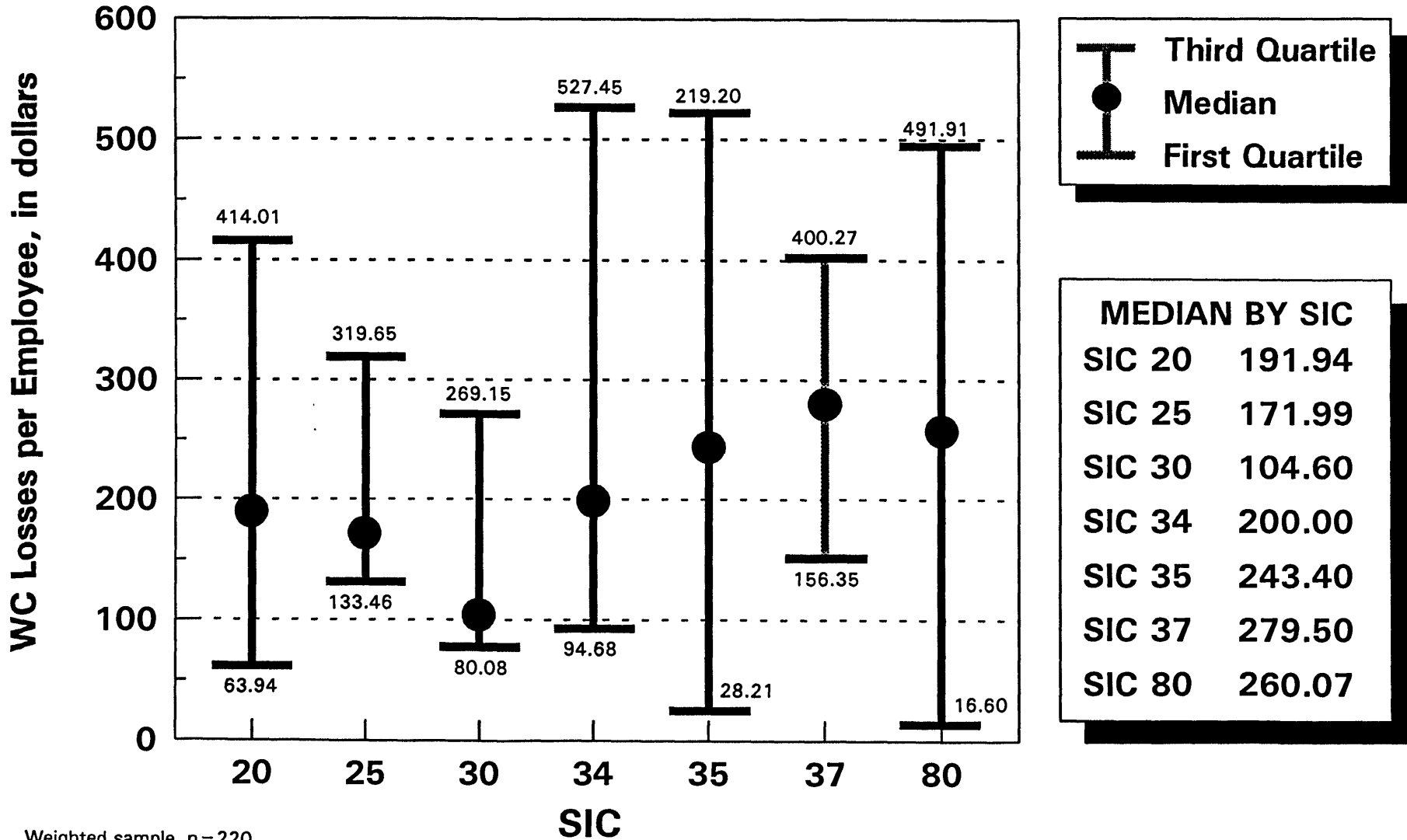
**MEDIAN BY SIC**

SIC 20	1.7
SIC 25	3.3
SIC 30	2.6
SIC 34	2.9
SIC 35	2.7
SIC 37	2.7
SIC 80	0.9

Weighted sample, n = 220



# WC Losses per Employee, 1989, by SIC

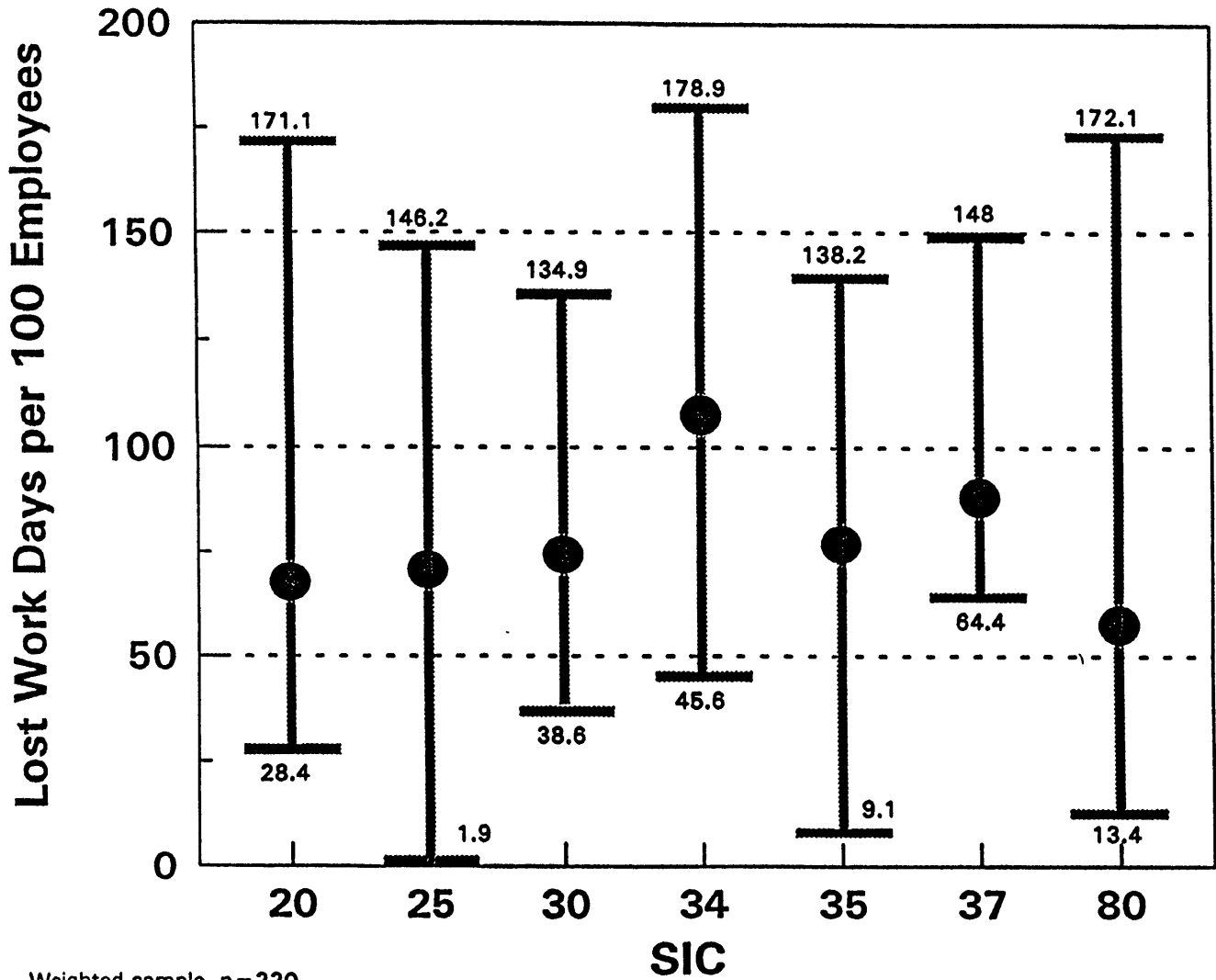





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Weighted sample, n=220

Figure 3.4

# Lost Work Days per 100 Employees, 1989, by SIC



 Third Quartile  
 Median  
 First Quartile

MEDIAN BY SIC	
SIC 20	68.7
SIC 25	71.1
SIC 30	74.1
SIC 34	108.2
SIC 35	77.4
SIC 37	88.6
SIC 80	57.4

Weighted sample, n=220

# People Oriented Culture

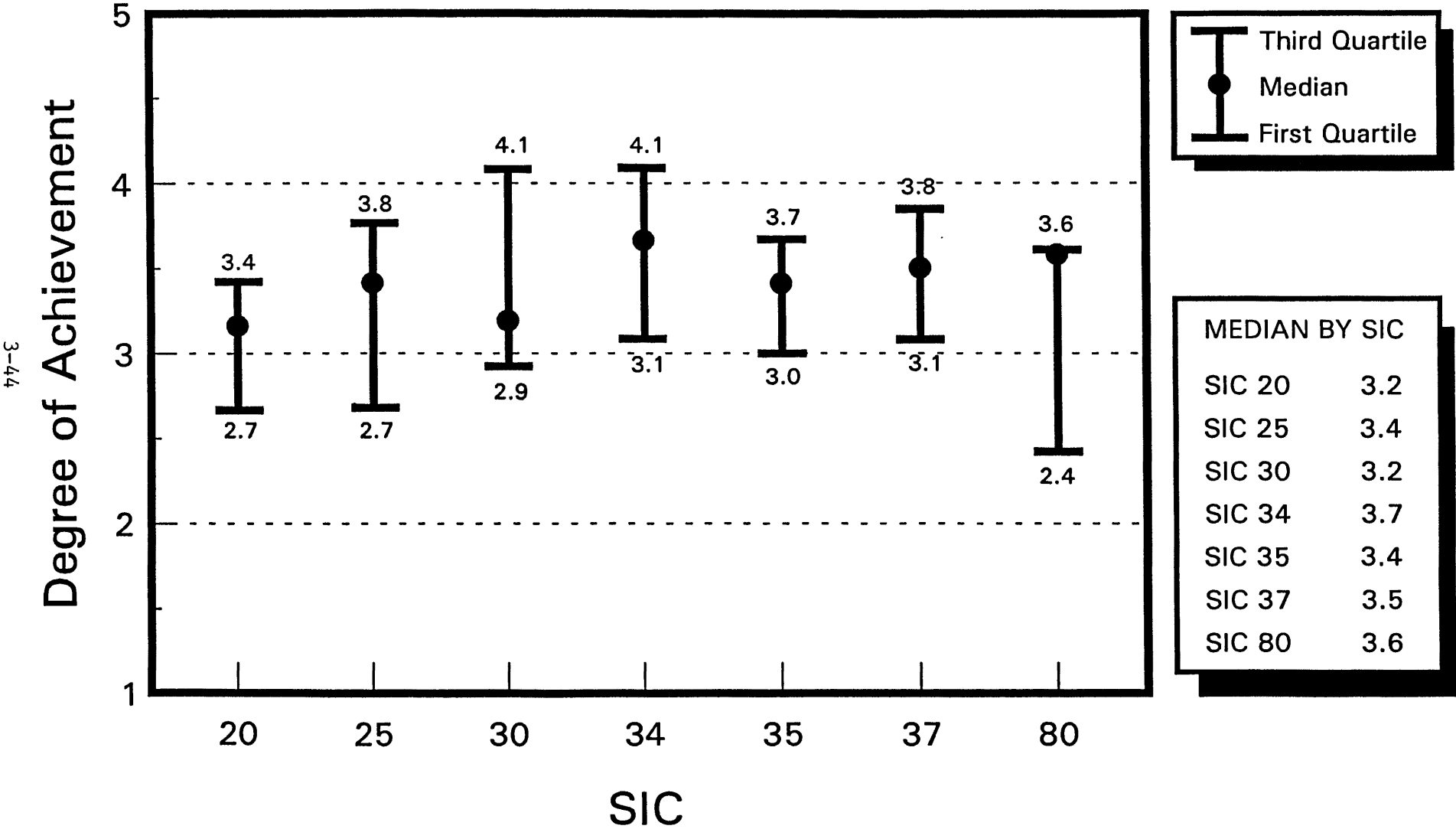


Figure 3.6

Weighted sample, n = 220

# Active Safety Leadership

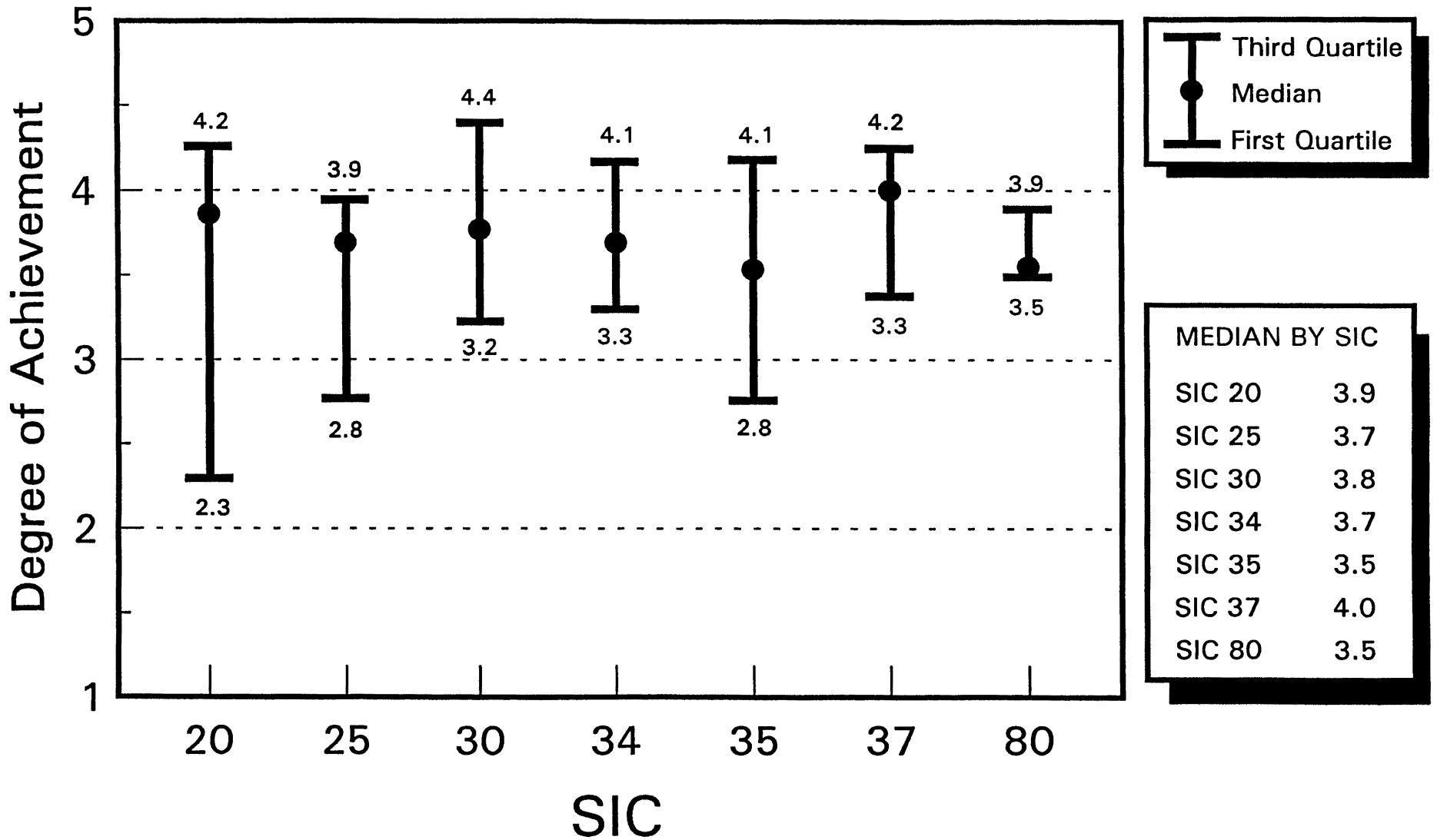


Figure 3.7

# Safety Diligence

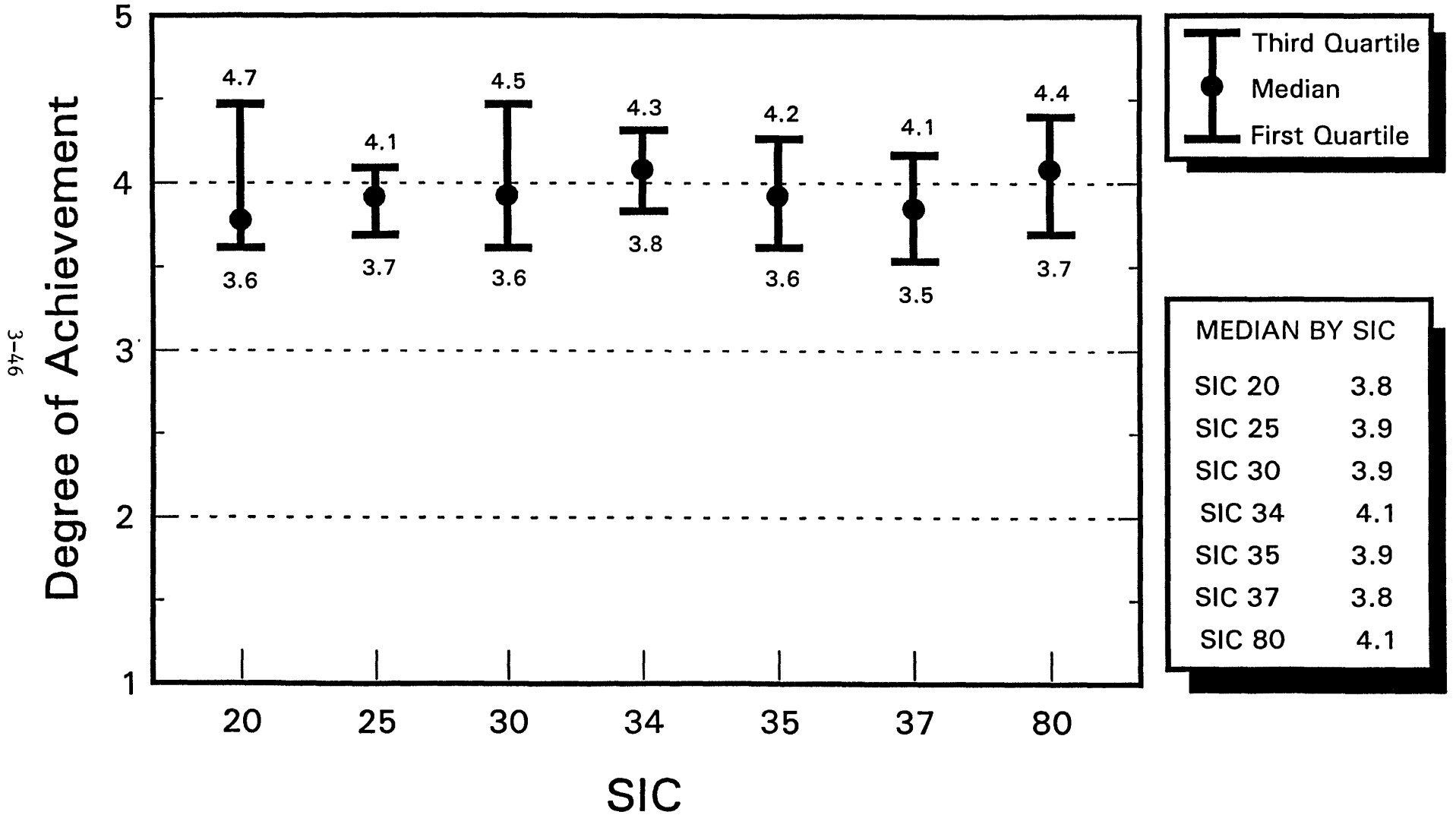


Figure 3.8

# Safety Training

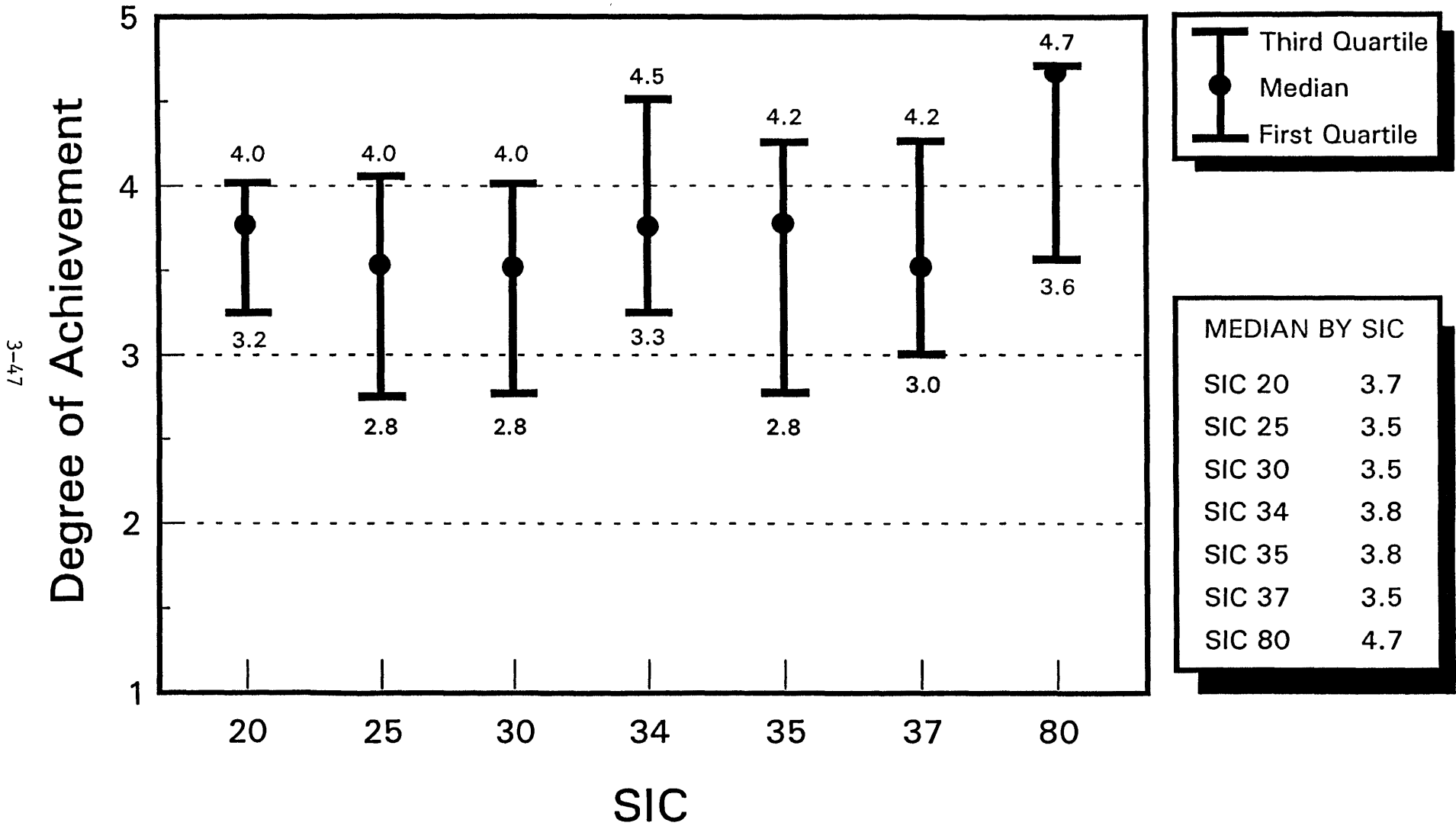
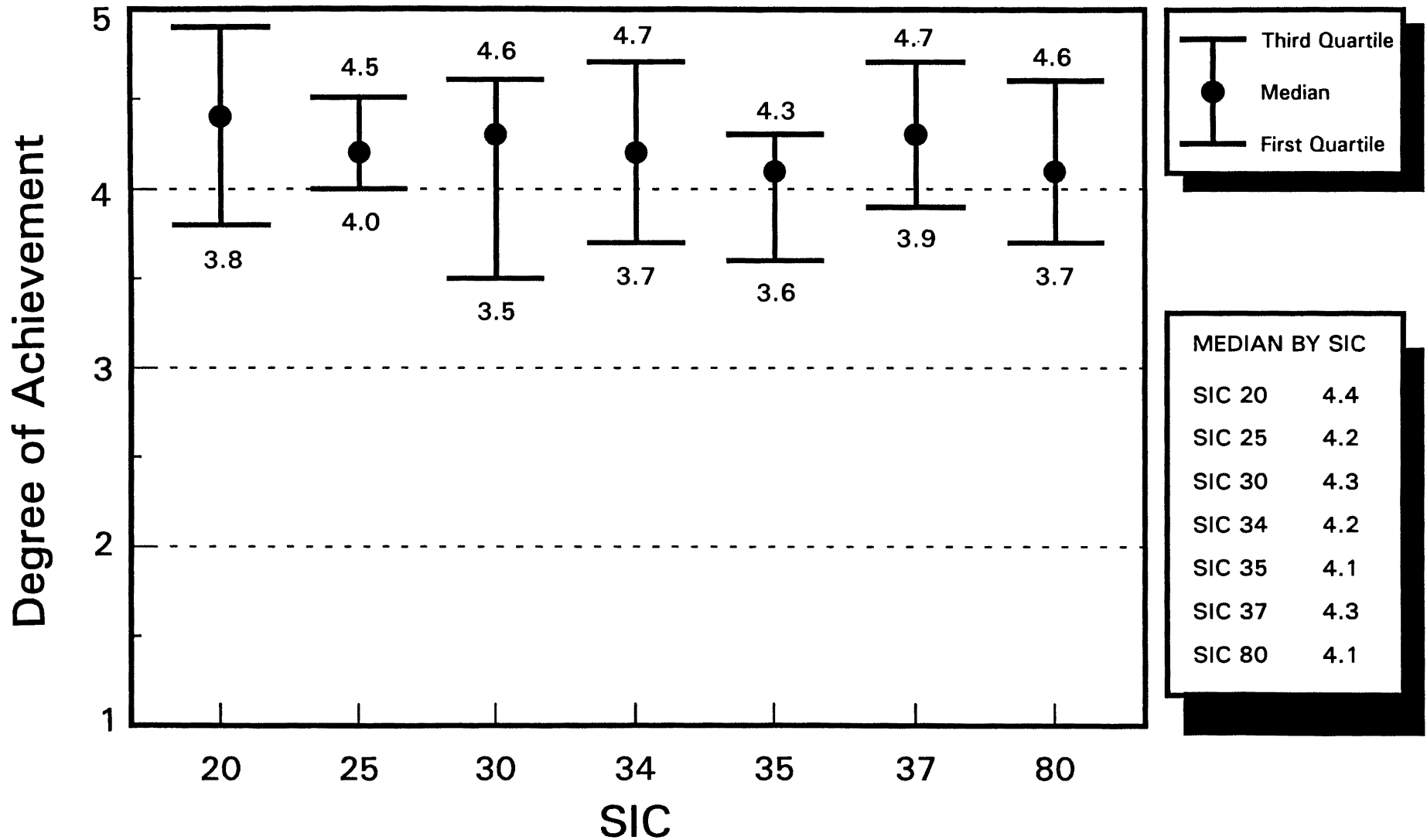


Figure 3.9

# Disability Case Monitoring



Weighted sample, n = 220

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Figure 3.10

# Proactive RTW Program

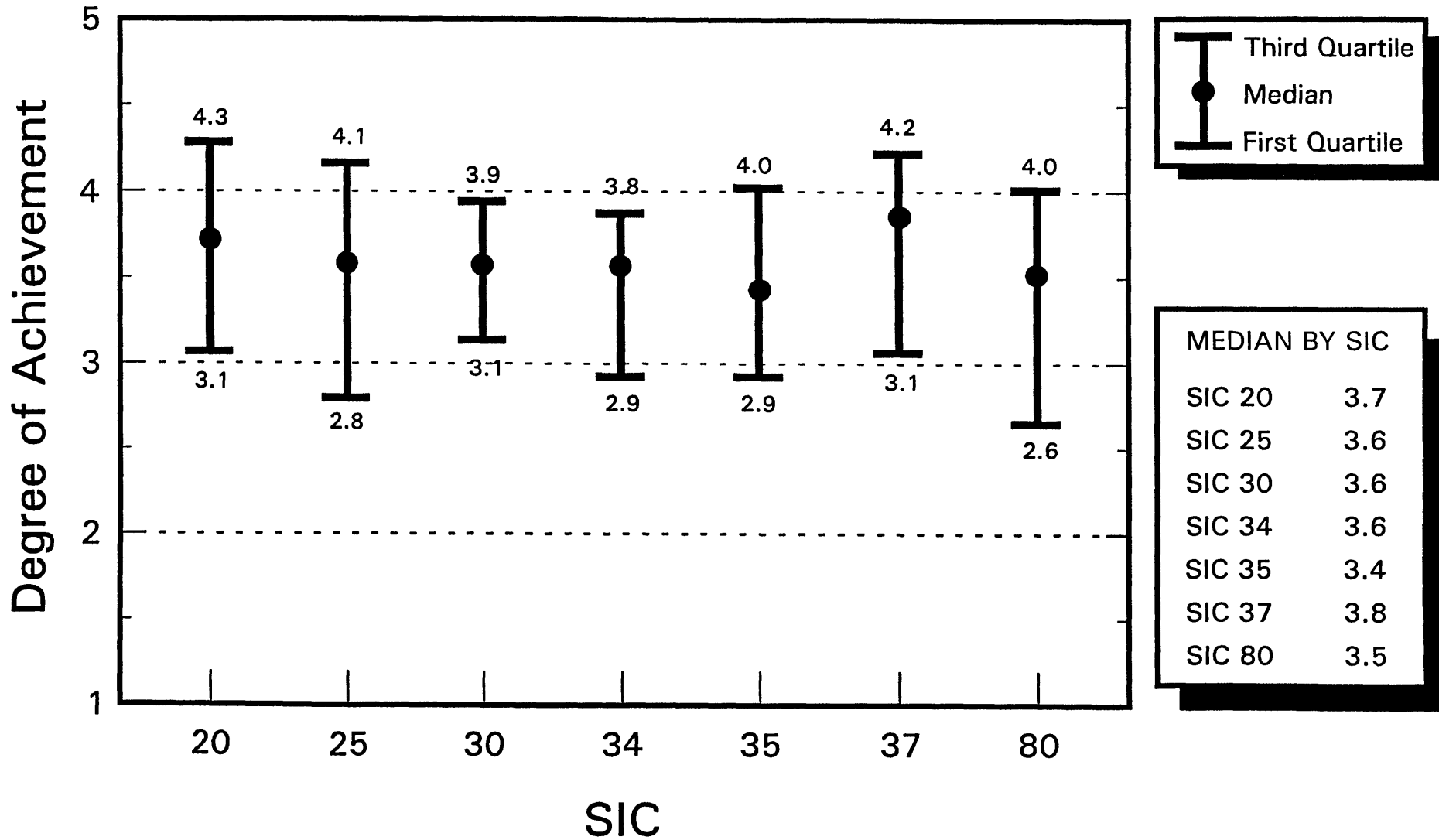


Figure 3.11



# Wellness Orientation

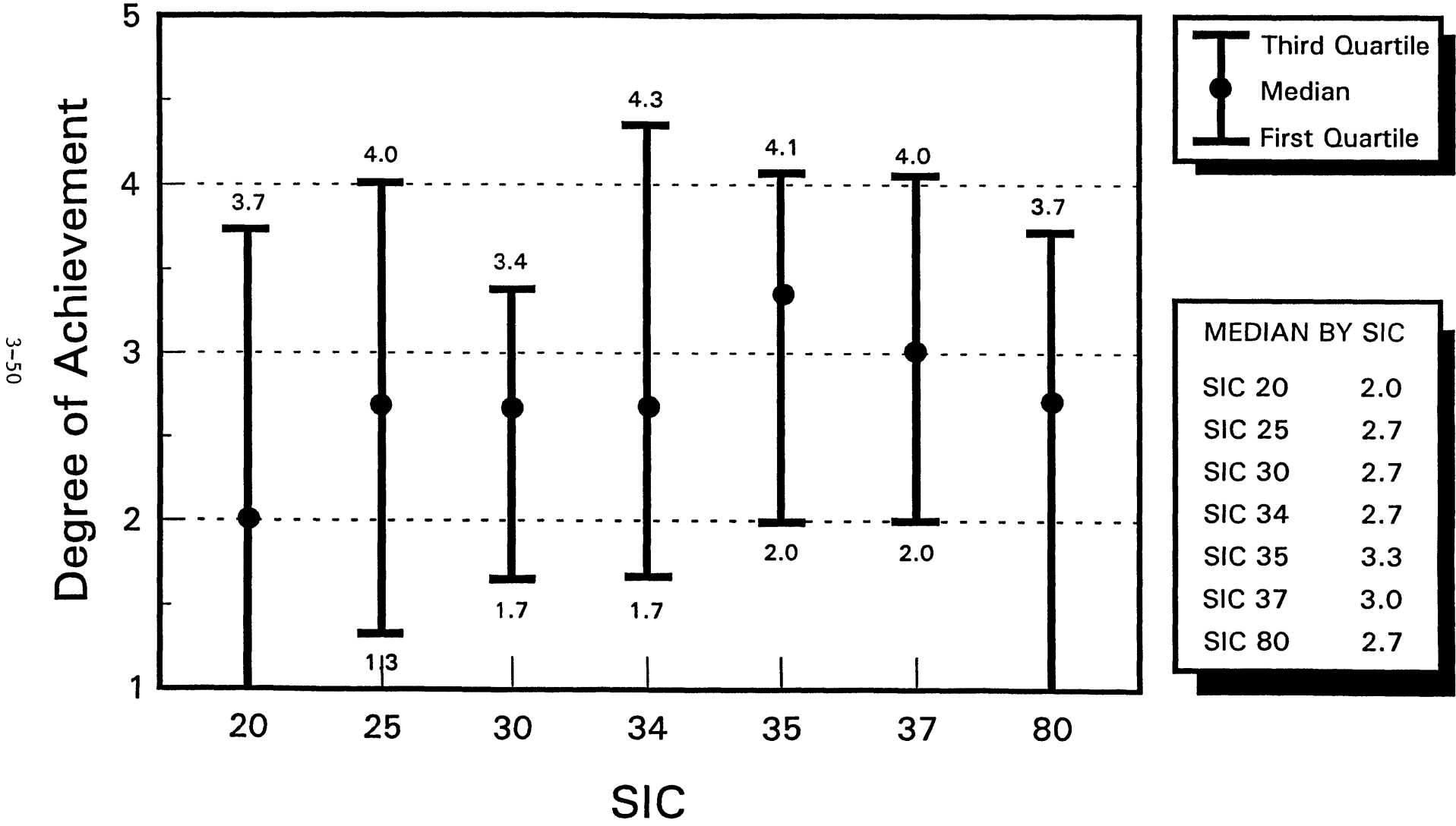


Figure 3.12

Weighted sample, n = 220

# Ergonomic Solutions

IS-8

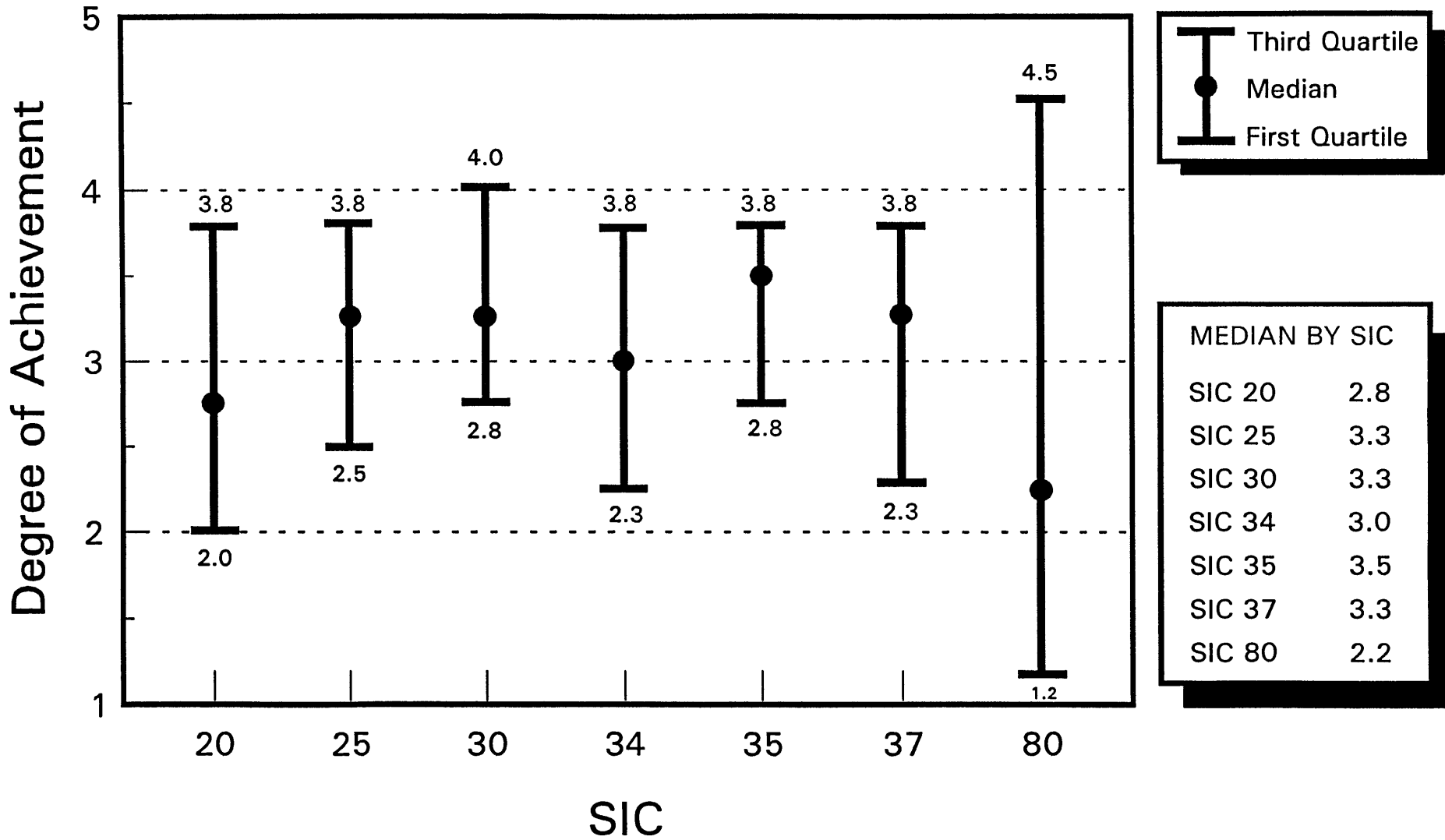


Figure 3.13



## CHAPTER 4 MULTIVARIATE ANALYSIS

### **Introduction**

This chapter reports the findings from our survey of 220 Michigan employers. The previous chapter described the data themselves, and outlined how they were refined for further analysis. This chapter reports the actual empirical analyses that were performed. We will describe our models and their empirical estimation. Thus, this chapter contains the central quantitative research findings of the project. The quantitative results presented here will be supplemented by the qualitative findings from the site visits in the next chapter.

Figure 4.1 presents the empirical plan of analysis. We are attempting to explain the performance outcomes shown at the bottom of the figure for the individual establishments in our sample. In general terms, these performance outcomes include injury incidence, disability incidence, disability duration, and overall outcomes and costs. In specific terms, we measure these as MIOSHA Recordables, Lost Workday Cases, Workers' Compensation Wage-Loss Claims, Lost Workdays per Case, total Workers' Compensation Payments, and Total Lost Workdays.

We have information available about the overall company environment and their specific disability prevention and management policies and practices, as gathered in the survey. These will be the explanatory variables in the multivariate regression analyses. The company environment is made up largely of external factors, such as the legislative or regulatory environment, the economy, and market forces bearing upon the firm, over which the firm has no control whatsoever. Some of these elements, particularly those relating to the nature of the work environment or the characteristics of the workforce, are included in the models as control variables, or covariates. But these variables are not thought to be subject to policy manipulation. They are included here to prevent misallocating their influence to some policy variable with which they may be correlated.

However there is also a component of the company environment that is consciously or unconsciously determined by the management of the firm, those we refer to as managerial factors. These managerial factors, which constitute an important component of the corporate culture of the firm, are measured in the study by two of our independent variables, PEOPLE ORIENTED CULTURE and ACTIVE SAFETY LEADERSHIP. We believe that these particular dimensions of company environment are under management influence or control and therefore are appropriate subjects for study, since they could represent additional dimensions of policy variation.

These two managerial factors, together with the relevant structural and control variables and covariates, constitute our Managerial Model of the determinants of disability performance outcomes. As explained in the previous chapter, these managerial factors are related to other operational policy and practice dimensions included in the study. Thus, it is not possible to measure their impact simultaneously with operational factors. For that reason we will estimate and report their influence separately.

In the middle of figure 4.1 are the operational factors. These are the policy and practice dimensions of company operations that are hypothesized to specifically impact disability prevention and management performance. As developed in the last chapter, they are SAFETY DILIGENCE, SAFETY TRAINING, and ERGONOMICS, which constitute the independent variables for our Prevention Model; and PROACTIVE RETURN-TO-WORK PROGRAMS, DISABILITY CASE MONITORING, and WELLNESS ORIENTATION, which constitute the independent variables for our Disability Management Model. This chapter presents specific estimates of the impact of these policy and practice behaviors on disability performance outcomes.

We will first utilize the Prevention Model to explore the determinants of disability performance. The discussion will be organized by each outcome measure within each empirical model. For instance, we will use the Prevention Model to determine the impact of the three relevant policy and practice variables on MIOSHA Recordables, Lost Work Day

Cases, and Workers' Compensation Wage-Loss Claims in turn. In each case, the impact of the three prevention variable (SAFETY DILIGENCE, SAFETY TRAINING, ERGONOMIC SOLUTIONS) on the outcome variables will be reported and their statistical significance assessed, holding constant the influence of other predictors in the model. In addition, a graphical representation of the relationship between the prevention variables and the outcome variable will be presented in each case. Then we will turn to the Disability Management Model and estimate the impact of the three disability management variables (PROACTIVE RETURN-TO-WORK PROGRAMS, DISABILITY CASE MONITORING, AND WELLNESS ORIENTATION) on performance outcomes.

The models are estimated only for those outcome measures theoretically judged to be relevant to that empirical model. For instance, we do not estimate the Disability Management Model on MIOSHA Recordables, since it is not anticipated that disability management techniques would influence the number of recordable injuries. However, disability management techniques might well prevent an injury from becoming a lost workday injury (one full workday lost), or a wage-loss compensable injury (seven workdays lost), so it is appropriate to estimate the Disability Management Model on Lost Work Day Cases, Lost Work Days Per Case, and Wage-Loss Claims.

After these results are presented, we will report the Managerial Model estimates for the summary performance measures of Workers' Compensation Payment Rate and Lost Workdays Per 100 Employees. This will provide an assessment of the importance of the underlying corporate culture of the firm in determining the level of overall performance in disability prevention and management. Finally, a Summary Model will be reported that combines the successful elements from the Prevention Model and Disability Management Model. This model will be estimated on the Lost Work Day Rate. These estimates provide the best guidance on the overall marginal returns that employers can expect if they improve their disability prevention and management performance, since both prevention and disability management elements are included in the same estimation.

## Measurement Issues

Before discussing the empirical estimates that are the main quantitative findings of the study, some digression is necessary to describe the very important measurement issues that arise in this chapter. The specific measurement of the variables is critical to interpreting the estimated regression coefficients that are reported later in the chapter. During the analysis phase of the project, all variables were carefully reviewed for their optimal metric, with the dual goals of validity and interpretability always in mind.

### Dependent Variables

All dependent (performance outcome) variables are measured in log transformation. Table 4.1 shows the means and standard deviations of these variables in the log transform metric. The individual distributions of variables were reviewed graphically in both original and log transform metric. The log transformation was much preferred for regularity and symmetry. This transformation also has the effect of minimizing the influence of outliers on parameter estimates. Further, the regression models used an actual dependent variable specification of  $\log(1 + r)$ , where  $r$  represents the incidence rate for the specific measure, to accomplish two different goals.

First, since the log of zero is undefined, and zero was a legitimate value for some variables, it was desirable to retain those observations for analysis and not let them become missing values by virtue of a variable transformation. Second, this transformation of the dependent variable makes the regression coefficients interpretable as percentage changes in the dependent variable associated with a one unit change in an independent variable. As will become clear later, this transformation aids greatly in interpretation of regression coefficients.

### Independent Variables

Independent (policy and practice) variables are measured in standardized form (with mean zero and standard deviation equal to one). The raw means and standard deviations of the independent variables are shown in table 4.2. For regression analysis, each value is

expressed in standard deviation units from the mean of the sample distribution. This greatly facilitates comparisons across variables, since they are all measured in the same way. Thus, a one unit difference in the value of any independent variable refers to one standard deviation of its own distribution.

This transformation makes measurement of the policy and practice variables more distribution based, an advantage given the relatively abstract nature of employer responses on these items. When combined with the specification of the dependent variables described above, the regression coefficients from our estimated models will represent the percentage change in the dependent variable associated with a one standard deviation change in the independent (policy and practice) variable.

#### Covariates

The covariates have various measurement properties according to their individual characteristics. The means and standard deviations of these variables, as they are measured for the models, are shown in table 4.3. Most are measured as dichotomous variables, taking the values of either 1 or zero. This is true of Multiple Plants, Required Safety Standards, Individual Self-Insurance, Group Self-Insurance, Commercial Carrier, Unionized, and Loss Control Services. These variables have the attribute that they are either present in a given establishment or not, hence the dichotomous treatment is appropriate.

In some cases where the dichotomous variables represent categories, as in the case of workers' compensation insurance coverage, respondents must have one status, but not the others. In these instances, one category is dropped from the estimated model to avoid overdetermination. This will be indicated by the presence of two of the three categories for insurance status (Individual Self-Insurance and Group Self-Insurance), with the non-listed category (Commercial Insurance) as the omitted one. As indicated in table 4.3, the mean of such a variable is the proportion of the sample possessing the particular characteristic. In the regression models, when combined with the dependent variable metric described above, the estimated covariate coefficients will give the percentage change in the dependent variable



associated with the presence of the characteristic, either on its own or compared to the influence of a reference category.

One other covariate is measured as a truncated dichotomous variable. The Rotating Shift variable was originally collected as the continuous percentage of employees working rotating shifts, but the responses to this question did not have enough variability to justify such a specification. Therefore, Rotating Shift was converted to a dichotomous variable with a threshold level of 20 percent. In other words, if the establishment reported that 20 percent or more of its workers were on rotating shifts, the variable takes the value of 1, otherwise 0. In the regression models, the existence of at least 20 percent participation in rotating shifts will be associated with a percentage difference on the dependent variable.

Another group of covariates were measured in continuous terms. The percentage of workers with Tenure Less than 1 Year, the Percent Workforce Salaried, and the Average Hourly Wage were collected as continuous variables. To facilitate their reporting and to reduce the influence of outliers, they are used in the models in logarithmic transformation. Thus, regression estimates will report the percentage impact on the dependent variable of a one percent change in these variables.

#### Time Period of Observation

Dependent variables from MIOSHA logs (MIOSHA Recordables, Lost Work Day Cases, Lost Work Days Per Case, Lost Work Days) were collected for three years (1987 through 1989) in the mail survey. Analysis of 1989 data indicated that there was a heavy random component in single year values, so the three years were pooled to make one observation. The relativity to appropriate employment levels was retained (i.e. annual rates were combined to get the 3-year rate), so the only effect of this modification should be to reduce the random component of the inherent variance by increasing the period of observation from one year to three years.

## Statistical Significance

The last measurement issue is that of the statistical significance of the findings of the study. Regression results reported here are subjected to one-tailed tests of significance. This reflects the researchers confidence that, based on previous research, it was possible in advance to predict the direction of influence of most variables on the outcome measures. One-tailed tests are appropriate where that reflects the null hypothesis. There are a few variables, like industry, where there was no such hypothesis, but where a one-tailed test was used anyway for consistency in reporting results.

Based on the relatively small sample size, the difficult measurement problems for some key variables, and the large number of explanatory variables included in our models, this analytical decision may call attention to variables that would not receive attention under a more demanding statistical regime. In all cases, we report estimated coefficients, standard errors, and t statistics so the reader can use his or her own decision rules in evaluating our results.

## Reverse Causation

There is one remaining issue that arises from the measurement methodology, but has wider implications. In essence, this study seeks to correlate employer's self-reported policies, practices, and characteristics (reported as of early 1991) with their previous disability prevention and management performance (1987-89 for MIOSHA log data, 1989 for workers' compensation data). Thus, the expected sequence of this causation chain is not ideally measured.

The study observes that differences between establishments in disability performance for 1987-89 are correlated with differences in self-reported disability prevention and management behaviors reported in 1991. It then suggests that these policy and practice differences may be causative of the (earlier) differences in performance. But it is also clearly possible that the disability problems of the firm (reflected in disability performance figures) constituted a stimulus to action rather than a response, thus reversing the causation.

With a cross-sectional research design and retrospective data collection, there is little that can be done to escape this problem. To be certain that the policy and practice initiatives are producing performance improvements, it would be necessary to do a prospective study. This would guarantee that the proper causation sequence was observed. However, with the addition of the site visits to corroborate our empirical findings, we are fairly confident that the findings reported here have sufficient support to constitute reliable policy conclusions. In short, we believe that the performance differences reported here reflect the influence of the policy and practice initiatives we have measured.

### **Prevention Model**

#### MIOSHA Recordables Per 100 Employees

Table 4.4 presents the regression model estimates for the MIOSHA Recordable Rate for the period 1987 through 1989, as reported by the employer respondents. A total of 163 establishments are included in the regression, which means they had no missing data for any of the items included in the model. The unweighted mean (translated from log firm) for this group of firms was 17.8 Recordables Per 100 Employees per year for the observation period. This means that the establishments available for the regression are slightly better performers than the sample as a whole (mean of 23.5 Recordables Per 100 Employees). The summary statistics indicate that the regression equation accounts for slightly better than 21 percent of the variation in the recordable rate (adjusted  $R^2 = .213$ ). The  $\hat{\beta}$  (beta) column reports the estimated coefficient for each variable in the regression equation. The standard error (s.e.) column reports the standard error of the estimate and the t column reports the t statistic for the coefficient and indicates its statistical significance based on a one-tailed test.

The structural variables include the employment size of the establishment and the 2-digit SIC industry. In each instance one classification is arbitrarily omitted to serve as the reference group. Thus, the medium employment size (250-499 employees) is the reference group against which small establishments (100-249 employees) and large establishments (over 500 employees) are measured. The industry variables are reported in the same basic way as the size variables with SIC 20, Food Production, as the reference group, or omitted category.

There are no particular *a priori* hypotheses about the impact of industry, however it is important to control for these influences to avoid ascribing the influence of industry to other variables. Only SIC 80, Health Services, shows significantly lower MIOSHA Recordable Rates when compared to SIC 20.

For the MIOSHA Recordable Rate both small and large firms have significantly lower incidence per 100 employees than the medium sized reference group. The coefficient indicates that large firms have 26.4 percent fewer recordables per 100 employees, and small firms have 19.8 percent fewer recordables per 100 employees when controlling for other establishment characteristics. The t statistic shows that the large establishment coefficient is significant at the 95 percent level and the small establishment coefficient is significant at the 90 percent level, both are one-tailed tests.<sup>20</sup> This finding supports the conventional wisdom that medium size firms have relatively the most accidents and the most injuries. Large firms are more likely to have established programs in place to prevent and manage disabilities, and small firms are more likely to have sufficient direct managerial attention to attain good performance.

The control variables have been selected for each empirical model considering efficiency of estimation and consistency of interpretation. Thus, the attempt is to minimize the number of variables and maximize their consistency across the different models. Each of these variables will be discussed in this first instance so that they are all introduced. The percent salaried variable controls for the variation across firms in the balance of hourly and salaried employees. Table 4.4 indicates that the effect of this variable was not significantly different from zero for the MIOSHA Recordable Rate estimates. The estimated coefficient for tenure less than one year indicates that for each 1 percent additional workers with tenure less than one year .186 percent more recordables are experienced. Comparing two firms, one with 10 percent of its workers with low tenure and one with 20 percent, the firm with

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<sup>20</sup>One-tailed tests reflect the prior expectation that the variable's effect will be in a given (positive or negative) direction. The null hypothesis for large firms is that they will have more injuries than medium size. The rejection of that hypothesis indicates our conclusion that they have fewer injuries.

more low tenure workers would be expected to have about 2 percent more recordables according to these results. The asterisks that this result is significantly greater than zero at the 99 percent confidence level.

The percent of the workforce on rotating shifts was converted into a dichotomous variable using a threshold of 20 percent, i.e. establishments with more than 20 percent of their employees on rotating shifts recorded the presence of the dichotomous rotating shifts while those with less than 20 percent of the workforce on rotating shifts did not. Table 4.4 indicates that this estimated coefficient is not significantly different from zero. The multiple plant variable is also a dichotomous variable. It attempts to control for the effect of a larger corporate entity on the performance of a given size establishment. The estimated coefficient indicates that multiple plant firms have approximately 25 percent lower recordable rates, and this coefficient is significantly less than zero at the 95 percent confidence level.

The safety standards control variable was an attempt to adjust for those circumstances where customers or other entities imposed safety standards over and above those required by MIOSHA. This is common practice in the auto industry and therefore was developed as a control variable. The estimated coefficient in table 4.1 is not significantly different from zero and there is, therefore, no evidence that the imposition of such safety standards improves MIOSHA recordable performance. However, it should be noted that this variable was reported frequently in SIC 80 by virtue of the accreditation requirements for hospitals. It is possible that the confounding of these two different sources of safety standards prevented the accurate estimation of this variable's impact.

The unionized variable is a dichotomous variable. It represents the presence of an organized union at the establishment. The coefficient indicates that the presence of a union is associated with 17 percent higher MIOSHA recordable rate across the establishments in this sample. Further, the t statistic indicates that this coefficient is significantly greater than zero at the 90 percent confidence level. This coefficient is subject to interpretation, as it raises the question of whether there are too many recordables at unionized firms or too few

at non-unionized firms. It is possible that the effect of the union's presence on the MIOSHA log is to enforce better reporting than in a non-union situation.

The last control variable is loss control consultation. It represents an attempt to control for the contact of the establishment with a consulting entity aimed at controlling accidents, injuries, or workers' compensation losses. These would include the Safety Education and Training Division of the Bureau of Safety and Regulation, as well as loss control services from individual workers' compensation insurance carriers, or other private entities. The estimated coefficient indicates that no significant effect of loss control consultation was demonstrated across the establishments in our sample.

Finally, we come to the independent variables. The prevention model includes three independent variables, SAFETY DILIGENCE, SAFETY TRAINING, and ERGONOMIC SOLUTIONS. All three are included in this estimation of the impact on MIOSHA Recordable Rates. As indicated in the table, no significant connection between MIOSHA Recordable Rates and our three independent variables was demonstrated. The independent variables are measured in standard deviation (or z score) metric so the coefficient for SAFETY DILIGENCE indicates that a one standard deviation improvement in safety diligence would lead to a 6.6 percent reduction in MIOSHA recordables.

It is disappointing that SAFETY DILIGENCE, SAFETY TRAINING, and ERGONOMIC SOLUTIONS, as measured here, did not show strong association with the MIOSHA Recordable Rate reported by the firms in the study. If this result held across all outcome variables we would be very concerned. However, the systematic relationships between independent variables and outcomes in other analyses convinces us that there is a separate MIOSHA recording behavior over and above the injury or disability rate. In particular, figure 3.1 in the previous chapter showed that SIC 80 had significantly lower recordables per 100 employees. This could reflect more adequate disability prevention and management behaviors, but based on other evidence presented later, it more likely represents different MIOSHA reporting standards in the health care industry. That recording behavior

is reflected in the significant negative coefficient for the health services industry reported in table 4.4.

### Lost Work Day Cases

Table 4.5 reports the similar regression estimates for the Lost Work Day Case Rate outcome variable. In this instance the table indicates that the mean log of the Lost Work Day Case Rate for our analytical sample was 4.66 cases per 100 employees per year; again significantly less than the sample as a whole. The summary statistics indicate that the regression estimates are significantly better than chance, but the adjusted  $R^2$  is .14 indicating that 14 percent of the variance in Lost Work Day Case Rate across sample firms is explained by the regression model.

Table 4.5 indicates that large establishments, with over 500 employees, have approximately 50 percent fewer Lost Work Day Cases than medium size establishments. This result is significant at a 99 percent confidence level. Small firms, on the other hand, do not show statistically significant differences in Lost Work Day Case Rate, unlike the MIOSHA Recordable result. Among the industry coefficients only SIC 34, Fabricated Metals, shows a significant difference from the SIC 20 comparison group, with approximately 40 percent higher Lost Work Day Case Rate.

Among the control variables for the Lost Work Day Case Rate regression, only the percent of low tenure workers was statistically significant. The coefficient indicates that for each 1 percent additional low tenure workers, .16 percent (one-sixth of one percent) more Lost Work Day Cases are experienced. The dichotomous union variable just misses statistical significance at the 90 percent confidence interval, but the point estimate of 18.4 percent higher Lost Work Day Cases in unionized firms is consistent with the MIOSHA Recordable Rate results. None of the other control variables are close to statistical significance, and therefore can be regarded as indistinguishable from zero.

The independent variables perform much better in the Lost Work Day Case Rate regression than they did in the MIOSHA Recordable regression. One standard deviation better performance in SAFETY DILIGENCE was associated with 16.6 percent fewer Lost Work Day Cases. A one standard deviation improvement in SAFETY TRAINING was associated with a 13 percent reduction in Lost Work Day Cases in our sample. These results indicate that improving both by one standard deviation could yield a cumulative total of 30 percent reduction. ERGONOMIC SOLUTIONS, as measured here, were not correlated with the Lost Work Day Case Rate reported by sample firms. This does not mean that ergonomic interventions do not pay off, but it does mean that the ergonomic dimension as measured in this study is not adequate to demonstrate a significant relationship to Lost Work Day Case Rate outcomes, given the design elements.

Figure 4.2 shows the independent variable impacts on Lost Work Day Cases in elasticity form.<sup>21</sup> The figure shows the effect of a 10 percent change in each independent variable on the outcome variable as measured across the firms in our sample. Thus, 10 percent better performance in SAFETY DILIGENCE is associated with a 13 percent lower rated Lost Work Day Cases on the average across our sample. Similarly, a 10 percent better performance in SAFETY TRAINING is associated with a 6.5 percent reduction in Lost Work Day Cases across our sample. Both results are significant at a 95 percent confidence level.

The difference between the figure and the raw coefficients reported in table 4.5 lies in the specification of the value of the independent variables. The regression coefficients in table 4.5 report the impact of a one standard deviation change in the independent variable, whereas the graphic shows the impact of a 10 percent improvement in the raw independent variable value. These results are very impressive demonstrations of the impact of SAFETY

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<sup>21</sup>The figure shows the same relationship as the regression equation. To derive the elasticity estimate, the regression equation is evaluated at the means for the relationship between each independent variable and the dependent, outcome, variable. Thus, the figure indicates how responsive the dependent variable is to variation in the independent variables across the sample.



DILIGENCE and SAFETY TRAINING on disability performance for the establishments in our sample.

### Workers' Compensation Claim Rate

Table 4.6 reports the regression estimates of the Prevention Model on the Workers' Compensation Claim Rate. The table shows that the average firm in the survey sample had 3.6 Workers' Compensation Claims Per 100 Employees per year. About 12 percent of the variation in Workers' Compensation Claim Rate is explained by the regression. The impact of employer size is less evident for Workers' Compensation Claims than for either Lost Work Day Cases or MIOSHA Recordables. In table 4.6, neither small nor large firms show significant differences from the medium size firms that are the reference category. As in the case of Lost Work Day Cases, only SIC 34 (Fabricated Metals) differs significantly from the reference category, SIC 20 (Food Production); and while SIC 25 (Furniture) and SIC 35 (Non-Electrical Machinery) show positive coefficients they are not quite significant at the 90 percent level.

Among the control variables in the Workers' Compensation Claim Rate regression the percent of workers with tenure less than one year, the multiple plants variable, and the union variable are significantly different from zero. For each additional percent of workers with less than one year tenure, approximately .12 percent (one-eighth of one percent) additional Workers' Compensation Claims Per 100 Workers are expected. Establishments that are part of multiple plant firms show 18 percent fewer workers' compensation claims than other plants, and firms that are unionized show 22 percent higher Workers' Compensation Claim Rate than those that are not. These results are generally consistent with those shown for MIOSHA Recordables and Lost Work Day Cases.

SAFETY DILIGENCE shows a very substantial impact on Workers' Compensation Claim Rate according to the regression reported in table 4.6. A one standard deviation improvement in SAFETY DILIGENCE is associated with 21 percent fewer workers' compensation claims, controlling for all other variables in the regression model. The

elasticity estimates presented in figure 4.3 indicates that a 10 percent improvement in achieving SAFETY DILIGENCE translates into a 22 percent reduction in Workers' Compensation Claims Per 100 Employees. Neither ERGONOMIC SOLUTIONS nor SAFETY TRAINING showed relationships that were significantly different from zero in the regression model of Workers' Compensation Claim Rate.

In Michigan, the workers' compensation system requires seven lost work days before an injured worker is eligible for workers' compensation income maintenance payments. Thus the threshold of measurement for Workers' Compensation Claim Rate is significantly greater than for Lost Work Day Case Rate which in turn is greater than for MIOSHA Recordable Rate. It is very interesting that the performance of the SAFETY DILIGENCE variable increases as the severity measure rises. In elasticity terms, a 10 percent improvement in SAFETY DILIGENCE is associated with a 5 percent reduction in MIOSHA Recordables, a 13 percent reduction in Lost Work Day Cases, and a 22 percent reduction in Workers' Compensation Claims. This is an empirical expression of the principle that prevention of injuries in the first place is the most effective way to reduce lost work time and workers' compensation claims. It is also a demonstration of the fact that SAFETY DILIGENCE is not only effective in preventing recordable injuries, but that this is even more dramatically manifested in subsequent reductions in Lost Work Day Cases and Workers' Compensation Claims.

### **Disability Management Model**

This section reports the empirical estimation of the disability management models. The outcome variables will be Lost Work Day Case Rate, Lost Work Days Per Lost Work Day Case, and the Workers' Compensation Claim Rate. The control variables are slightly different than in the Prevention Model and, of course, the independent variables are completely different from the previous section. The independent variables in the Disability Management Model consist of PROACTIVE RETURN-TO-WORK PROGRAM, DISABILITY CASE MONITORING, and WELLNESS ORIENTATION.

## Lost Work Day Case Rate

The mean log Lost Work Day Case Rate for the 171 establishments included in this analysis was 4.8 cases per 100 employees per year according to table 4.7. The model explains 16 percent of the variance in Lost Work Day Case Rate. As explained previously, the Lost Work Day Case Rate includes only full lost work days away from work, no restricted or partial lost work days are included. Among the structural variables, the large firms show 45 percent fewer Lost Work Day Cases than the medium firm reference group. Small establishments do not show significant differences from the medium size. Only SIC 80, Health Services, shows significantly lower incidence than the Food Production reference group, although SIC 34, Fabricated Metals, is close to significantly positive at the 90 percent level.

Among the control variables, the union effect, the individual self-insurance effect, and the hourly wage effect each show significant coefficients. The presence of a union is associated with the reporting of 22 percent higher Lost Work Day Case Rates across our sample and the existence of individual self-insurance for workers' compensation is associated with nearly 24 percent greater Lost Work Day Cases, controlling for other factors in the model. The union effect is similar to that shown in the Prevention Model, but the self-insurance variable is new to the Disability Management Model.

It is perhaps surprising that self-insurance status is associated with higher Lost Work Day Case Rates in our sample, because the conventional wisdom is that the potentially significant direct benefits of disability prevention and management activities on costs of disability at the establishment level would lead to a greater incentive effect for self-insured firms. This would lead us to expect a negative coefficient for individual self-insurance. However, table 4.7 reports that a positive coefficient of some magnitude has been demonstrated. This means that self-insured firms are, in fact, experiencing higher disability rates, at least as measured by the Lost Work Day Case Rates reported by our sample.

The hourly wage for production workers is designed to control for the wage loss replacement differences among low and high wage workers.<sup>22</sup> It also serves as a control for the general quality of the working environment, since this has been widely observed to correlate with wage levels. Table 4.7 indicates that a 1 percent increase in the hourly wage is associated with .9 percent (nine-tenths of a percent) lower Lost Work Day Cases Per 100 Employees. This finding is highly significant and indicates a strong negative wage effect on Lost Work Day Cases.

The PROACTIVE RETURN-TO-WORK PROGRAM variable is the star performer in this regression analysis. Table 4.7 indicates that a one standard deviation higher self-rated achievement on PROACTIVE RETURN-TO-WORK PROGRAM in the establishment is associated with nearly a 30 percent reduction in Lost Work Day Cases. Furthermore, this result is highly significant according to the t statistic. DISABILITY CASE MONITORING, on the other hand, is shown to have a perverse effect on the Lost Work Day Case Rate in table 4.7. A one standard deviation higher self-rated achievement on DISABILITY CASE MONITORING is associated with a nearly 15 percent greater Lost Work Day Case Rate across our sample. This result is significant at the 90 percent confidence level using a one-tailed test. This is an unexpected result and the explanation is not a simple matter, especially given the high level of correlation (.74) between these two independent variables. It appears that there are several key behaviors whose omission or commission greatly impacts these results.

We believe that close examination of the content of the DISABILITY CASE MONITORING variable indicates that it consists largely of elements that could potentially be interpreted as punitive or controlling, unless occurring within a supportive, human resource oriented culture. Thus, our interpretation of the positive coefficient on DISABILITY CASE MONITORING is that it reflects the perverse impact of DISABILITY CASE MONITORING

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<sup>22</sup>Michigan statute provides for the replacement of 80 percent of take home pay subject to a maximum at 90 percent of the state average weekly wage. Thus high wage workers receive lower relative benefits than low wage workers.

in those cases where it occurs in the absence of a supportive environment or program, particularly when there is also an emphasis on return-to-work.

Table 4.7 also shows that the WELLNESS ORIENTATION variable was not associated with Lost Work Day Case Rate. We do not believe that this demonstrates that wellness has no impact, but rather indicates the difficulty of establishing its impact with a cross-section study design over a relatively short period of time and/or the inadequacy of our measurement of this dimension. It is also noteworthy that WELLNESS ORIENTATION had the lowest mean of any independent variable and the highest variance, indicating a wide variation in establishment practice.

Figure 4.4 reports the elasticity estimates for Lost Work Day Cases. A 10 percent higher achievement of the PROACTIVE RETURN-TO-WORK dimension is associated with a 13.6 percent reduction in Lost Work Day Cases, while a 10 percent improvement in the DISABILITY CASE MONITORING score is associated with a 10 percent increase in Lost Work Day Cases across our sample. As in the case of the Prevention Model, these elasticity estimates are larger than anticipated and demonstrate the very considerable impact of the policy and practice dimensions measured in this study. The impact of DISABILITY CASE MONITORING needs further consideration before firm conclusions can be rendered, but the contradiction in the performance of these two related variables is clearly food for further thought and study.

#### Lost Work Days Per Case

Table 4.8 reports the regression model estimates for the outcome variable Lost Work Days Per Lost Work Day Case. This variable is a pure measure of duration as it only involves those cases with at least one lost work day. The mean log of the variable for the 179 establishments available for analysis is 21.1 Lost Work Days Per Case over the period of 1987 through 1989. The first thing to notice in table 4.8 is that this regression model does no better than chance in predicting the value of Lost Work Days Per Case. This is indicated by the insignificant F statistic and by the  $R^2$  value which is essentially zero,

meaning that none of the variation in the dependent variable is explained by the model. This is confirmed in the individual coefficients where no structural variables are statistically significant. Weak statistical significance is demonstrated for multiple plants and group self-insurance, but both coefficients are perverse according to other results reported here, so little credence should be placed in these findings.

None of the three independent variables shows significant association with Lost Work Days Per Case although WELLNESS ORIENTATION comes the closest. A one standard deviation improvement in WELLNESS ORIENTATION is associated with a 6 percent reduction in Lost Work Days Per Case, although this result is not quite significant at the 90 percent level of confidence. In general, the poor performance of the Disability Management Model in explaining Lost Work Days Per Case is surprising and disappointing. It is presumed that other factors specific to the individual case, including the nature and severity of the injury and the specific medical and rehabilitation treatment required, are more determining of this dimension of disability performance than the variables gathered in the survey from the employer respondents. At any rate, the failure to explain Lost Work Days Per Case remains one of the unexplained puzzles of the study.

#### Workers' Compensation Claim Rate

Table 4.9 reports the Disability Management Model estimates for the Workers' Compensation Claim Rate variable. The mean log workers' compensation claims per 100 employees in 1989 for the sample was 3.6. The summary statistics indicate that the percent of explained variation is lower than all previous regression results, except for Lost Work Days Per Case, at about 7 percent. However, the F statistic indicates that the equation does do significantly better than chance in predicting the level of Workers' Compensation Claims across the 187 establishments available in the database.

Among the structural variables reported in table 4.9 the small firms show a 20 percent lower rate of Workers' Compensation Claims when compared to the medium sized reference group. Large firms do not show a significant difference in this particular regression model.

Only SIC 34, Fabricated Metals, shows a significant difference from the SIC 20 reference group, with a 35 percent higher incidence of Workers' Compensation Claims. The performance of the structural variables is similar but slightly less impressive than in the earlier results.

For the control variables, the union effect, the self-insurance effect, and the hourly wage effect are again significant. The presence of a union is associated with 22 percent higher self-reported Workers' Compensation Claim Rates, controlling for other factors. The presence of individual self-insurance for workers' compensation is associated with 21 percent greater incidence of Workers' Compensation Claims across our sample. Finally for each 1 percent increase in the hourly wage for production workers, a .6 percent (six-tenths of one percent) lower incidence of Workers' Compensation Claims is demonstrated. All three of these results are statistically significant at the 95 percent confidence level or better.

The PROACTIVE RETURN-TO-WORK PROGRAM dimension is the only independent variable showing significant results in table 4.9. A one standard deviation increase in the PROACTIVE RETURN-TO-WORK PROGRAM dimension is associated with 14.5 percent lower Workers' Compensation Claim Rate Per 100 Employees across our sample. Neither DISABILITY CASE MONITORING nor WELLNESS ORIENTATION coefficients are significantly different from zero, indicating that these independent variables are not closely related to performance on the outcome measures for our sample establishments.

Figure 4.5 shows the elasticity estimates for this set of independent variables. The figure shows that a 10 percent higher level of achievement of PROACTIVE RETURN-TO-WORK PROGRAMS is associated with 8.7 percent lower incidence of wage loss claims, as indicated in the regression results in table 4.9. While this coefficient is not as large as some of those seen earlier in the empirical results, it is still an impressive demonstration of the impact of a PROACTIVE RETURN-TO-WORK PROGRAM on Workers' Compensation Claim incidence among our employer sample.

Parallel to our observation of the stepwise effect of SAFETY DILIGENCE as we moved up from MIOSHA Recordables to Lost Work Day Cases to Workers' Compensation Claims, PROACTIVE RETURN-TO-WORK PROGRAM also demonstrates a differential effect. As we move up in severity from Lost Work Day Cases (at least 1 lost work day) to Workers' Compensation Claims (at least 7 lost work days), the effect of a one standard deviation difference in PROACTIVE RETURN-TO-WORK PROGRAMS drops from nearly 30 percent to about 15 percent. Further, moving to Lost Work Days per Case as the outcome variable reduced the effect of PROACTIVE RETURN-TO-WORK PROGRAM to zero (table 4.8).

Thus, the picture that emerges is one of a decreasing impact of PROACTIVE RETURN-TO-WORK PROGRAM as more significant disabilities (at least as measured by lost work time) are encountered. This makes sense, as there may be less discretion involved in returning to work from a very serious injury; the discretionary element is maximized in the less significant injuries. Early in the case is the point where the employer has the best opportunity to intervene to influence the disability outcome. It also might explain why our Disability Management Model was not able to predict the duration of disability.

### **Managerial Model**

Now we turn our attention from the operational elements to focus on the more subtle company environment issues. We will use two overall performance measures as dependent variables to examine the impact of the managerial elements of ACTIVE SAFETY LEADERSHIP and PEOPLE ORIENTED CULTURE as the independent variables in the regression analysis. Because of the tendency for the various policy and practice dimensions to vary together across the establishments in our sample, it is impossible to simultaneously estimate the impact of the operational elements and the managerial elements that underlie them. Thus, we regard these results as indicating the importance of ACTIVE SAFETY LEADERSHIP and PEOPLE ORIENTED CULTURE in setting the proper organizational tone within which specific policies of SAFETY DILIGENCE and PROACTIVE RETURN-TO-WORK PROGRAM are able to flourish.



## Lost Work Day Rate

Table 4.10 reports the regression for the overall Lost Work Day Rate and the two managerial elements as independent variables. The Lost Work Day Rate reflects both incidence and severity of injury, as all work time lost to occupational injuries is included. Results are generally similar to those seen earlier for structural and control variables. As shown in table 4.10 large firms have significantly lower lost work day rates, approximately 45 percent lower when compared to medium size reference firms. SIC 34, Fabricated Metals, shows a significantly elevated level of lost work days compared to the SIC 20 reference group. In addition, SIC 35, Non-Electrical Machinery, and SIC 37, Transportation Equipment, now approach statistical significance with lost work day levels approximately 34 to 35 percent above that of the reference category, Food Production.

The control variables also perform similarly to the earlier regressions, with the exception of multiple plants. The impact of one additional percent of the workforce with tenure less than one year is shown in table 4.10 to be approximately .1 percent (one-tenth percent) increase in Lost Work Day Rate. The effect of a unionized workforce is approximately 21 percent greater reported Lost Work Days, while a 1 percent increase in the hourly wage is associated with a .6 percent (six-tenths percent) reduction in the number of Lost Work Days Per 100 Employees. As in the earlier results individual self-insurance is associated with a substantially (44 percent), higher Lost Work Day Rate among the establishments in our sample.

The managerial element of ACTIVE SAFETY LEADERSHIP is shown in table 4.10 to be associated with a reduction in the Lost Work Day Case Rate at the 90 percent of significance. A one standard deviation increase in ACTIVE SAFETY LEADERSHIP was associated with 11 percent fewer Lost Work Days across our sample. The effect of PEOPLE ORIENTED CULTURE was slightly smaller; an 8 percent reduction in Lost Work Day Rate for a one standard deviation increase in the independent variable. In this case the coefficient was not statistically significant, but is in the expected direction.

Figure 4.6 displays these results in the graphical format used throughout this chapter. It demonstrates the reduction in Lost Work Days associated with 10 percent higher self-reported levels of ACTIVE SAFETY LEADERSHIP and PEOPLE ORIENTED CULTURE respectively. ACTIVE SAFETY LEADERSHIP shows a 5.7 percent impact, while the 10 percent change in PEOPLE ORIENTED CULTURE achievement has a 4 percent impact. While these effects are smaller than those shown earlier for SAFETY DILIGENCE and PROACTIVE RETURN-TO-WORK PROGRAMS, they still are noticeable effects. Furthermore, since these effects are estimated together, they are additive. Thus a 10 percent improvement in both ACTIVE SAFETY LEADERSHIP and PEOPLE ORIENTED CULTURE could be expected to lead to almost a 10 percent reduction in Lost Work Days Per 100 Employees.

#### Workers' Compensation Payments

Table 4.11 reports the regression estimates for Workers' Compensation Payments per 100 employees using the Managerial Model. Reflecting the concerns expressed earlier about the accurate measurement of Workers' Compensation Payments, these estimates do not appear to be very robust. The adjusted  $R^2$  has dropped to .069 indicating that the equation is less successful in predicting the level of the dependent variable. This could reflect measurement error in the dependent variable, of course.

Table 4.11 shows the familiar impact of firm size, and lack of significant findings for the industry controls. Among the covariates, tenure of workers is not significant, multiple plant status is not significant, hourly wage is not significant, and self-insured status is barely not significant. The unionized effect is even larger than earlier, recorded here as 57 percent. This means that across our sample, controlling for all other variables in the regression, unionized firms reported 57 percent higher Workers' Compensation Payments than non-unionized. However, we would not ascribe any particular significance to the increase in the union coefficient with the change from operational variables to managerial variables, especially since there are reasons to be concerned about measurement error with this variable.

PEOPLE ORIENTED CULTURE is shown to be significantly related to Workers' Compensation Payments. An improvement of one standard deviation in PEOPLE ORIENTED CULTURE across our sample was associated with a 21 percent reduction in the Workers' Compensation Payments Per 100 Employees. On the other hand, ACTIVE SAFETY LEADERSHIP does not appear to be particularly powerful in this regression, with a coefficient insignificantly different from zero. Figure 4.7 presents these results in elasticity terms. It shows that a 10 percent change in PEOPLE ORIENTED CULTURE across our sample was associated with an 11 percent reduction in Workers' Compensation Payments.

One could argue that Workers' Compensation Payments is a more distal measure of company disability performance that is influenced by many other factors than the disability prevention and management behaviors studied here and serves as a more general indicator of the company's climate. The significant positive correlation between unionization and Workers' Compensation Payments along with the significant negative correlation between PEOPLE ORIENTED CULTURE and Workers' Compensation Payments provide intriguing support for this notion.

### **Summary Model**

One final Summary Model will be reported to provide an overview of the most significant independent variables from previous analyses. Estimating their influence on the broadest measure of disability performance, Lost Work Days Per 100 Employees, will provide an opportunity to assess the relative efficacy of disability prevention and disability management techniques. The Lost Work Day Rate is the product of the number of lost work day cases and the average duration of those cases. This variable, therefore, gives the greatest scope for the influence of disability prevention and disability management on performance outcomes. Thus, it also should provide an excellent opportunity for demonstrating the impact of policy interventions at the establishment level.

The most significant elements of the Disability Prevention Model and of the Disability Management Model were both incorporated and estimated simultaneously. This enables us to

make judgments about the relative impacts of disability prevention and disability management variables because they are estimated in the same model. In addition, the WELLNESS ORIENTATION variable was added to test whether its influence might emerge in the context of a simultaneous analysis that controlled the primary elements of disability prevention and disability management.

### Lost Work Day Rate

Table 4.12 reports the estimated results for the Summary Model estimated on Lost Work Day Rate for the 166 firms in the sample that had no missing data on the items used in the model. As shown in the table, the establishments available for analysis had an average of about 96 Lost Work Days Per 100 Employees per year over the 3-year period, 1987-1989. This level is substantially lower than for the entire sample at about 137 Lost Days Per 100 Employees. The summary statistics show that the equation does a moderately successful job of explaining the variance in Lost Work Days across sample firms; the adjusted  $R^2$  indicates that 16.5 percent of the variance is explained by the model.

The estimated coefficient for large firms (over 500 employees) indicates that they have 48 percent fewer Lost Work Days Per 100 Employees when compared with the middle size reference group. There is no significant difference between small and medium size firms according to our results. Among the industry variables only SIC 34, Fabricated Metals, shows a coefficient significantly different from zero. The percent of employees with tenure less than one year is significantly associated with the Lost Work Day Rate; the estimated coefficient indicates for each additional 1 percent of workers with tenure less than one year .16 percent (one sixth percent) fewer Loss Work Days are experienced. The multiple plant and union variables are not statistically significant, but have the same direction and only slightly lower orders of magnitude than in earlier regressions. Thus, we probably could conclude that multiple plant structure is associated with lower rates of Lost Work Days and unionized plants are characterized by somewhat higher rates of Lost Work Days.

The coefficient for the production worker hourly wage indicates that for each additional 1 percent in hourly wage, .6 percent (six-tenths percent) fewer Lost Work Days are experienced. This effect is roughly comparable to earlier estimated levels of wage impact. The variable representing individual self-insurance indicates that, in our sample, self-insured firms on the average have 50 percent more Lost Work Days, controlling for the other factors in the regression. This coefficient is nearly twice as large as earlier estimates using other dependent variables and is regarded as possibly resulting from some interaction between the effects on the number of injuries and their duration. Again, this finding contradicts prior assumptions about the incentive effect of self-insurance. It would be conventional to expect that establishments that are self-insured would devote more resources to disability prevention and management because of the greater likelihood of capturing the financial return to such investments.

Last we come to the selected independent variables in table 4.12, SAFETY DILIGENCE, PROACTIVE RETURN-TO-WORK PROGRAM, and WELLNESS ORIENTATION. The estimated coefficients of SAFETY DILIGENCE and PROACTIVE RETURN-TO-WORK PROGRAM indicate, as before, that these policy and practice areas have very significant potential for reducing Lost Work Days. One standard deviation higher self-rating in SAFETY DILIGENCE is associated with 21 percent fewer Lost Work Days on the average across our sample. One standard deviation higher self-rating on PROACTIVE RETURN-TO-WORK PROGRAM is associated with 16 percent fewer Lost Work Days Per 100 Employees across our sample. The WELLNESS ORIENTATION variable again fails to perform at a significant level, presumably reflecting the measurement problems discussed earlier.

Figure 4.8 translates these results into graphical terms. The figure shows that a 10 percent increase in SAFETY DILIGENCE level is associated with a 17 percent reduction in Lost Work Days, controlling for all other variables in the regression model of table 4.12. This is a very large impact and establishes a very high level of statistical significance, at the 99 percent level of confidence. The PROACTIVE RETURN-TO-WORK PROGRAM

variable in figure 4.8 shows that a 10 percent higher rating in this dimension is associated with a reduction of 7.3 percent in Lost Work Days across our sample. This is also an impressive impact and is significantly different from zero at the 95 percent level.

Thus the basic connection has been made. Company disability prevention and management initiatives have been shown to be associated with performance differences. Further, these connections operate in the expected direction, with one notable exception, and are quite large. These results suggest that achieving improvement of 25 percent in performance should not take extraordinary measures at all. Arguing from the cross-section results presented here, substantial improvements in disability prevention and management performance should be within reach of most firms.

Table 4.1 Dependent Variable Means in Log Transform for Regression Analysis, 1987-89

Dependent Variable		
MIOSHA Recordables Per 100 Employees	Mean	2.87
	S.D.	0.77
	N	177
LWD Case Rate Per 100 Employees	Mean	1.56
	S.D.	0.83
	N	176
Wage-Loss Claim Rate	Mean	1.28
	S.D.	0.68
	N	196
Lost Work Days Per Case	Mean	3.05
	S.D.	0.55
	N	187
Lost Work Days Per 100 Employees	Mean	4.55
	S.D.	0.95
	N	175
WC Losses Per Employee	Mean	5.42
	S.D.	1.17
	N	172

Table 4.2 Independent Variable Means for Regression Analysis

Independent Variable		
People Oriented Culture	Mean	3.46
	S.D.	0.71
	N	219
Active Safety Leadership	Mean	3.76
	S.D.	0.75
	N	220
Safety Diligence	Mean	3.98
	S.D.	0.52
	N	220
Disability Case Monitoring	Mean	4.31
	S.D.	0.61
	N	219
Proactive RTW Program	Mean	3.63
	S.D.	0.77
	N	220
Wellness Orientation	Mean	3.10
	S.D.	1.31
	N	219
Ergonomic Solutions	Mean	3.30
	S.D.	0.90
	N	218
Safety Training	Mean	3.85
	S.D.	0.78
	N	220



Table 4.3 Covariate Means for Regression Analysis

Multiple Plants (1=yes)	Mean	0.656
	S.D.	0.476
	N	218
Safety Standards/Accred. (1=yes)	Mean	0.327
	S.D.	0.470
	N	217
Percent on Rotating Shifts (x > 20% = 1)	Mean	0.078
	S.D.	0.269
	N	205
Percent Tenure Less Than 1 Year (Log)	Mean	1.922
	S.D.	1.159
	N	210
Percent Workforce Salaried (Log)	Mean	2.889
	S.D.	0.631
	N	217
Individual Self Insurance (1=yes)	Mean	0.450
	S.D.	0.499
	N	218
Group Self Insurance (1=yes)	Mean	0.128
	S.D.	0.335
	N	218
Commercial Carrier (1=yes)	Mean	0.422
	S.D.	0.495
	N	218
Unionized (1=yes)	Mean	0.615
	S.D.	0.488
	N	218
Loss Control Services (1=yes)	Mean	0.747
	S.D.	0.436
	N	217
Average Hourly Wage (Log)	Mean	2.301
	S.D.	0.264
	N	208

Table 4.4 MIOSHA Recordable Rate  
Prevention Model With Covariates

Dependent Variable:

MIOSHA Recordable Rate  
Per 100 Employees (1987-89)

$$\ln(\bar{X}) = 2.88$$

n = 163

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.198	0.132	-1.499 $\rho$
Large (over 500)	-0.264	0.147	-1.790*
SIC 25 - Furniture	-0.233	0.286	-0.814
SIC 30 - Rubber & Plastics	-0.135	0.210	-0.641
SIC 34 - Fabricated Metals	0.125	0.192	0.650
SIC 35 - Non-Electrical Machinery	-0.249	0.234	-1.065
SIC 37 - Transportation Equipment	-0.053	0.224	-0.238
SIC 80 - Health Services	-1.286	0.259	-4.962**

Control Variables:

Percent Salaried	-0.093	0.097	-0.961
Tenure < 1 Year	0.186	0.055	3.397**
Rotating Shifts	-0.156	0.209	-0.745
Multiple Plants	-0.255	0.121	-2.107*
Safety Standards	-0.086	0.138	-0.625
Unionized	0.171	0.129	1.328 $\rho$
Loss Control Consultation	-0.067	0.136	-0.491

Independent Variables:

SAFETY DILIGENCE	-0.066	0.076	-0.865
ERGONOMIC SOLUTIONS	0.003	0.067	0.049
SAFETY TRAINING	-0.006	0.070	-0.082

Intercept

3.253

0.350

9.291\*\*

Summary Statistics:

$$F = 3.442**$$

$$R^2 = 0.301 \quad \text{Adjusted } R^2 = 0.213$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.5 Lost Work Day Case Rate  
Prevention Model With Covariates

Dependent Variable:

LWD Case Rate  
Per 100 Employees (1987-89)       $\ln(\bar{X}) = 1.54$        $n = 162$

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	0.101	0.150	0.674
Large (over 500)	-0.508	0.166	-3.058**
SIC 25 - Furniture	0.179	0.323	0.556
SIC 30 - Rubber & Plastics	0.084	0.238	0.352
SIC 34 - Fabricated Metals	0.403	0.217	1.857*
SIC 35 - Non-Electrical Machinery	0.183	0.265	0.689
SIC 37 - Transportation Equipment	0.148	0.253	0.584
SIC 80 - Health Services	-0.205	0.292	-0.702

Control Variables:

Percent Salaried	0.011	0.111	0.100
Tenure < 1 Year	0.162	0.062	2.607**
Rotating Shifts	0.192	0.236	0.815
Multiple Plants	-0.096	0.138	-0.696
Safety Standards	-0.109	0.156	-0.695
Unionized	0.184	0.146	1.264
Loss Control Consultation	-0.073	0.152	-0.478

Independent Variables:

SAFETY DILIGENCE	-0.166	0.086	-1.941*
ERGONOMIC SOLUTIONS	0.031	0.076	0.413
SAFETY TRAINING	-0.130	0.079	-1.652*

Intercept      1.172      0.396      2.958\*\*

Summary Statistics:

$F = 2.449^{**}$

$R^2 = 0.236$       Adjusted  $R^2 = 0.139$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.6 Workers' Compensation Claim Rate  
Prevention Model With Covariates

Dependent Variable:

WC Claim Rate

Per 100 Employees (1987-89)

$$\ln(\bar{X}) = 1.29$$

n = 178

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.077	0.119	-0.644
Large (over 500)	-0.047	0.129	-0.362
SIC 25 - Furniture	0.300	0.257	1.166
SIC 30 - Rubber & Plastics	0.102	0.206	0.498
SIC 34 - Fabricated Metals	0.462	0.187	2.474**
SIC 35 - Non-Electrical Machinery	0.241	0.218	1.104
SIC 37 - Transportation Equipment	0.124	0.207	0.597
SIC 80 - Health Services	-0.159	0.236	-0.675

Control Variables:

Percent Salaried	-0.099	0.085	-1.156
Tenure < 1 Year	0.123	0.049	2.522**
Rotating Shifts	0.154	0.183	0.839
Multiple Plants	-0.180	0.108	-1.671*
Safety Standards	0.021	0.126	0.163
Unionized	0.220	0.114	1.926*
Loss Control Consultation	0.133	0.120	1.106

Independent Variables:

SAFETY DILIGENCE	-0.213	0.069	-3.103**
ERGONOMIC SOLUTIONS	0.044	0.059	0.741
SAFETY TRAINING	-0.032	0.061	-0.522

Intercept	1.067	0.315	3.381
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Summary Statistics:

$$F = 2.365**$$

$$R^2 = 0.211 \quad \text{Adjusted } R^2 = 0.122$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.7 Lost Work Day Case Rate  
Disability Management Model With Covariates

Dependent Variable:

LWD Case Rate

Per 100 Employees (1987-89)

$$\ln(\bar{X}) = 1.57$$

n = 171

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.032	0.144	-0.222
Large (over 500)	-0.452	0.163	-2.769**
SIC 25 - Furniture	-0.150	0.316	-0.475
SIC 30 - Rubber & Plastics	-0.157	0.226	-0.695
SIC 34 - Fabricated Metals	0.248	0.204	1.216
SIC 35 - Non-Electrical Machinery	0.139	0.252	0.551
SIC 37 - Transportation Equipment	0.114	0.230	0.496
SIC 80 - Health Services	-0.393	0.255	-1.542 $\rho$

Control Variables:

Multiple Plants	0.033	0.135	0.245
Unionized	0.223	0.133	1.675*
Group Self-Insurance	0.221	0.192	1.150
Individual Self-Insurance	0.238	0.149	1.597 $\rho$
Hourly Wage	-0.916	0.283	-3.236**

Independent Variables:

DISABILITY CASE MONITORING	0.147	0.093	1.581 $\rho$
PROACTIVE RTW PROGRAM	-0.295	0.091	-3.235**
WELLNESS ORIENTATION	0.071	0.067	1.056

Intercept

3.484

0.675

5.162\*\*

Summary Statistics:

$$F = 3.038$$

$$R^2 = 0.240 \quad \text{Adjusted } R^2 = 0.161$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.8 Lost Work Days Per Case  
Disability Management Model With Covariates

Dependent Variable:

Lost Work Days Per Case  
(1987-89)

$$\bar{\ln(X)} = 3.05$$

n = 179

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	0.002	0.104	0.021
Large (over 500)	-0.040	0.117	-0.342
SIC 25 - Furniture	0.077	0.225	0.344
SIC 30 - Rubber & Plastics	0.073	0.168	0.437
SIC 34 - Fabricated Metals	0.066	0.152	0.434
SIC 35 - Non-Electrical Machinery	-0.031	0.181	-0.169
SIC 37 - Transportation Equipment	0.053	0.167	0.315
SIC 80 - Health Services	0.004	0.179	0.020

Control Variables:

Multiple Plants	0.154	0.096	1.606 $\rho$
Unionized	-0.064	0.095	-0.680
Group Self-Insurance	-0.191	0.139	-1.375 $\rho$
Individual Self-Insurance	0.048	0.107	0.445
Hourly Wage	0.249	0.207	1.204

Independent Variables:

DISABILITY CASE MONITORING	0.057	0.067	0.856
PROACTIVE RTW PROGRAM	-0.019	0.065	-0.290
WELLNESS ORIENTATION	-0.060	0.049	-1.240

Intercept 2.387 0.491 4.865\*\*

Summary Statistics:

$$F = 0.743$$

$$R^2 = 0.068 \quad \text{Adjusted } R^2 = -0.024$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.9 Workers' Compensation Claim Rate  
Disability Management Model With Covariates

Dependent Variable:

WC Claim Rate  
Per 100 Employees, 1989       $\ln(\bar{X}) = 1.28$        $n = 187$

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.198	0.117	-1.694*
Large (over 500)	-0.063	0.134	-0.472
SIC 25 - Furniture	0.114	0.250	0.456
SIC 30 - Rubber & Plastics	-0.034	0.199	-0.172
SIC 34 - Fabricated Metals	0.355	0.181	1.964*
SIC 35 - Non-Electrical Machinery	0.199	0.209	0.953
SIC 37 - Transportation Equipment	0.137	0.193	0.711
SIC 80 - Health Services	-0.181	0.212	-0.853

Control Variables:

Multiple Plants	-0.058	0.108	-0.532
Unionized	0.219	0.109	2.006*
Group Self-Insurance	0.113	0.159	0.710
Individual Self-Insurance	0.210	0.122	1.724*
Hourly Wage	-0.616	0.229	-2.695**

Independent Variables:

DISABILITY CASE MONITORING	0.034	0.073	0.469
PROACTIVE RTW PROGRAM	-0.145	0.073	-1.978*
WELLNESS ORIENTATION	0.038	0.054	0.703

Intercept      2.463      0.550      4.476\*\*

Summary Statistics:

$F = 1.893^*$

$R^2 = 0.151$       Adjusted  $R^2 = 0.071$

$\rho =$  significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.10 Lost Work Day Rate  
Managerial Model With Covariates

Dependent Variable:

Lost Work Days

Per 100 Employees (1987-89)

$$\ln(\bar{X}) = 4.56$$

n = 166

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.056	0.176	-0.319
Large (over 500)	-0.448	0.197	-2.276*
SIC 25 - Furniture	0.372	0.378	0.984
SIC 30 - Rubber & Plastics	0.167	0.272	0.612
SIC 34 - Fabricated Metals	0.523	0.248	2.110*
SIC 35 - Non-Electrical Machinery	0.354	0.300	1.182
SIC 37 - Transportation Equipment	0.338	0.275	1.229
SIC 80 - Health Services	-0.219	0.304	-0.720

Control Variables:

Tenure < 1 Year	0.129	0.076	1.710*
Multiple Plants	0.007	0.158	0.042
Unionized	0.217	0.167	1.302 $\rho$
Hourly Wage	-0.595	0.357	-1.668*
Individual Self-Insurance	0.443	0.163	2.711**

Independent Variables:

ACTIVE SAFETY LEADERSHIP	-0.113	0.085	-1.338 $\rho$
PEOPLE ORIENTED CULTURE	-0.081	0.091	-0.893

Intercept

5.227

0.910

5.744\*\*

Summary Statistics:

$$F = 2.227 **$$

$$R^2 = 0.182 \quad \text{Adjusted } R^2 = 0.100$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%



Table 4.11 Workers' Compensation Payment Rate  
Managerial Model With Covariates

<u>Dependent Variable:</u>			
WC Payment Rate, 1989	$\bar{\ln(X)} = 5.43$		n = 161
<u>Structural Variables:</u>	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.441	0.224	-1.964*
Large (over 500)	-0.345	0.247	-1.393 $\rho$
SIC 25 - Furniture	0.152	0.491	0.310
SIC 30 - Rubber & Plastics	-0.279	0.370	-0.752
SIC 34 - Fabricated Metals	0.221	0.332	0.666
SIC 35 - Non-Electrical Machinery	-0.139	0.376	-0.371
SIC 37 - Transportation Equipment	0.220	0.354	0.622
SIC 80 - Health Services	-0.428	0.393	-1.089
<u>Control Variables:</u>			
Tenure < 1 Year	0.103	0.096	1.066
Multiple Plants	-0.142	0.199	-0.713
Unionized	0.574	0.212	2.714**
Hourly Wage	0.078	0.438	0.178
Self-Insured	0.244	0.207	1.176
<u>Independent Variables:</u>			
PEOPLE ORIENTED CULTURE	-0.212	0.115	-1.852*
ACTIVE SAFETY LEADERSHIP	0.040	0.106	0.380
Intercept	4.935	1.126	4.382**

Summary Statistics:

$$F = 1.793^*$$

$$R^2 = 0.157 \quad \text{Adjusted } R^2 = 0.069$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

\*\* = significantly less than (more than) zero at 1%

Table 4.12 Lost Work Day Rate  
Summary Model With Covariates

Dependent Variable:

Lost Work Days

Per 100 Employees (1987-89)

$$\ln(\bar{X}) = 4.56$$

n = 166

Structural Variables:

	$\hat{\beta}$	s.e.	t
Small (100-249)	-0.033	0.171	-0.192
Large (over 500)	-0.482	0.190	-2.534**
SIC 25 - Furniture	0.409	0.368	1.114
SIC 30 - Rubber & Plastics	0.044	0.259	0.171
SIC 34 - Fabricated Metals	0.425	0.238	1.784*
SIC 35 - Non-Electrical Machinery	0.259	0.290	0.892
SIC 37 - Transportation Equipment	0.164	0.267	0.613
SIC 80 - Health Services	-0.334	0.294	-1.134

Control Variables:

Tenure < 1 Year	0.161	0.074	2.175*
Multiple Plants	-0.091	0.156	-0.583
Unionized	0.157	0.160	0.983
Hourly Wage	-0.613	0.354	-1.733*
Individual Self-Insurance	0.502	0.159	3.151**

Independent Variables:

SAFETY DILIGENCE	-0.211	0.082	-2.575**
PROACTIVE RTW PROGRAM	-0.160	0.075	-2.134*
WELLNESS ORIENTATION	-0.039	0.078	-0.501

Intercept	5.373	0.908	5.917**
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Summary Statistics:

$$F = 3.043**$$

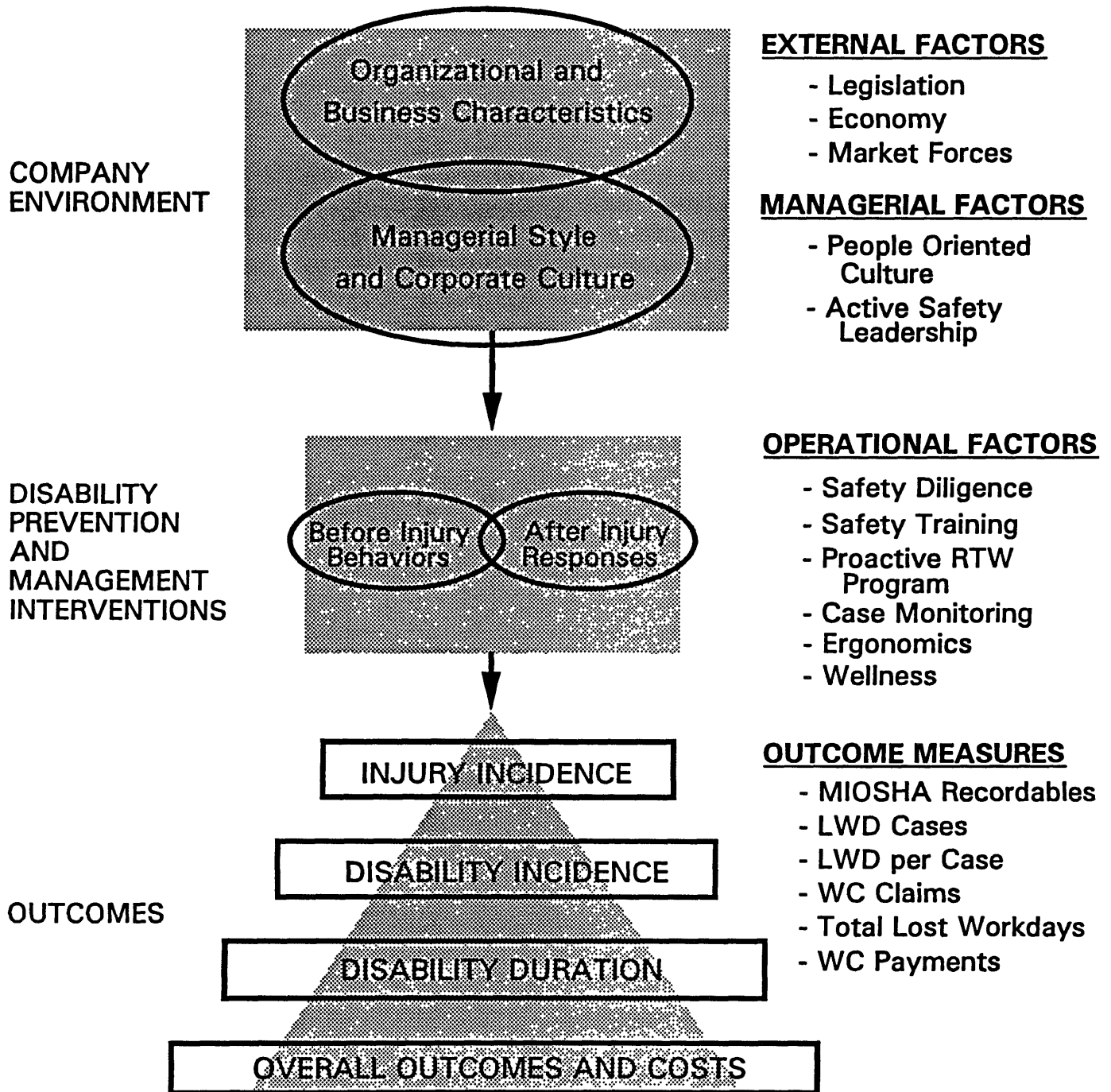
$$R^2 = 0.246 \quad \text{Adjusted } R^2 = 0.165$$

$\rho$  = significantly less than (more than) zero at 10%

\* = significantly less than (more than) zero at 5%

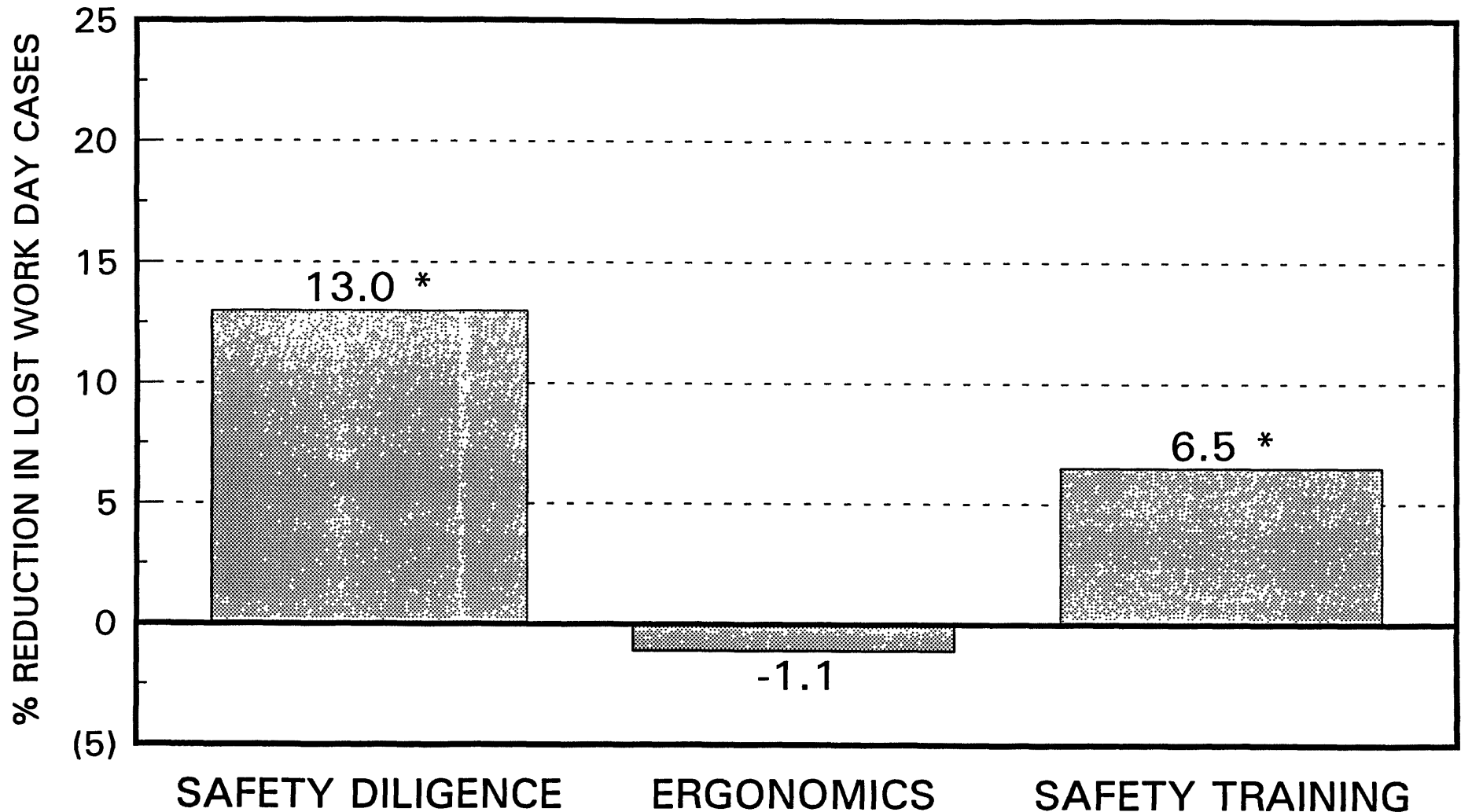
\*\* = significantly less than (more than) zero at 1%

Figure 4.1



# LOST WORK DAY CASES PER 100 EMPLOYEES

## EFFECT OF 10% CHANGE IN BEHAVIOR

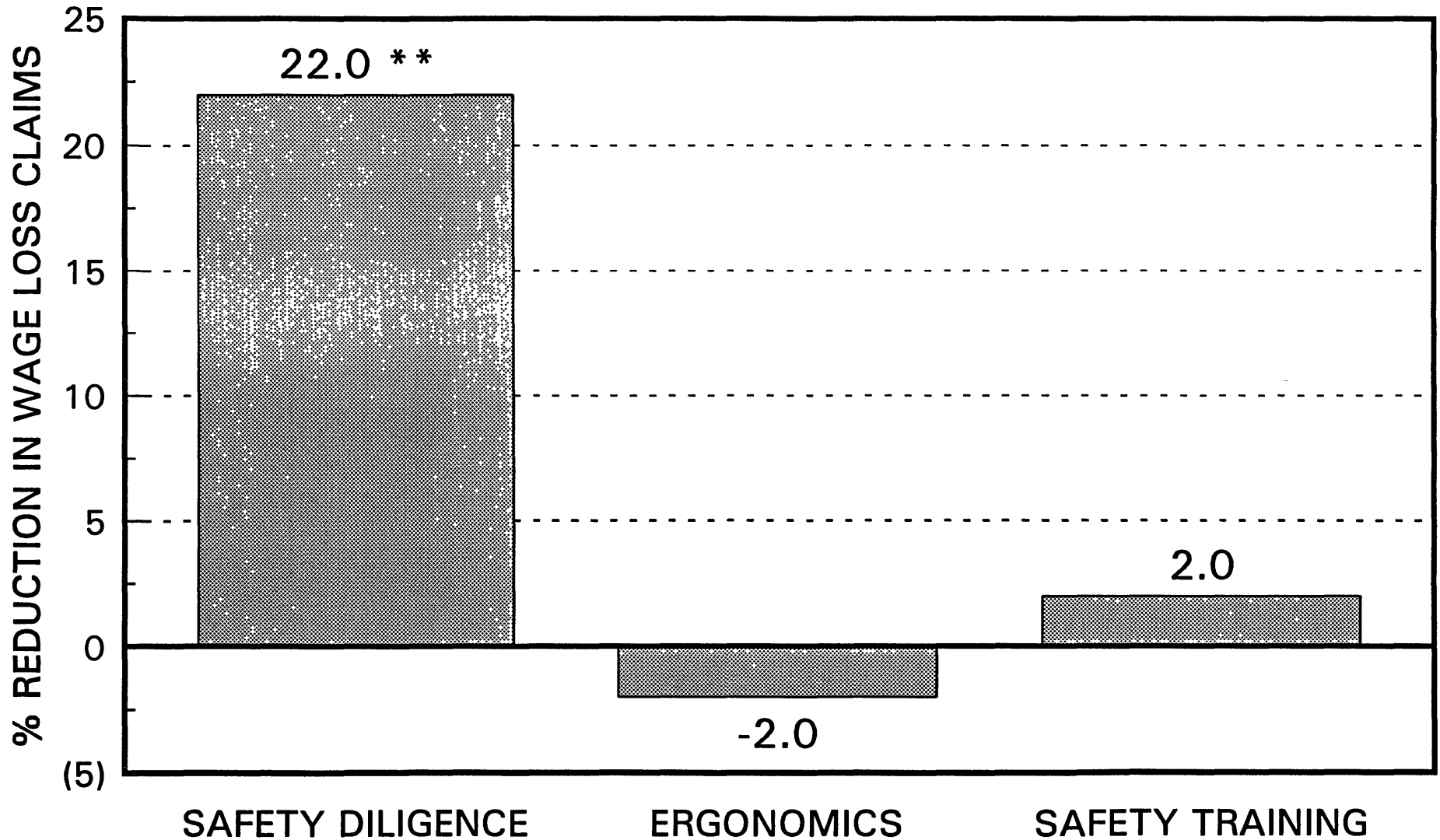


4-41

Figure 4.2

# WAGE LOSS CLAIMS PER 100 EMPLOYEES

## EFFECT OF 10% CHANGE IN BEHAVIOR

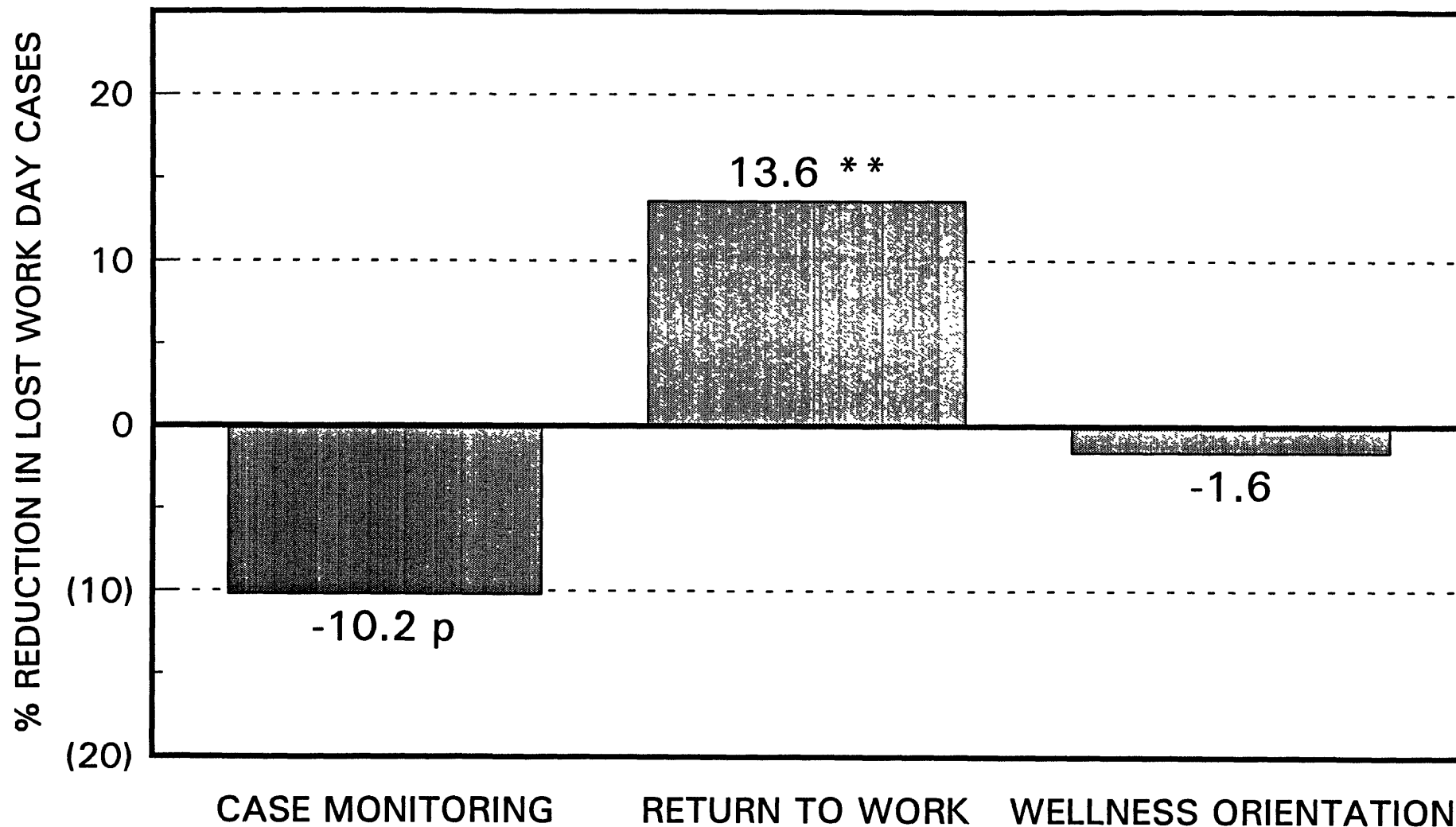


4-42

Figure 4.3

# LOST WORK DAY CASES PER 100 EMPLOYEES

## EFFECT OF 10% CHANGE IN BEHAVIOR



4-43

Figure 4.4

# WAGE LOSS CLAIMS PER 100 EMPLOYEES

## EFFECT OF 10% CHANGE IN BEHAVIOR



4-44

Figure 4.5

# LOST WORK DAYS PER 100 EMPLOYEES

## EFFECT OF 10% CHANGE IN BEHAVIOR

4-45

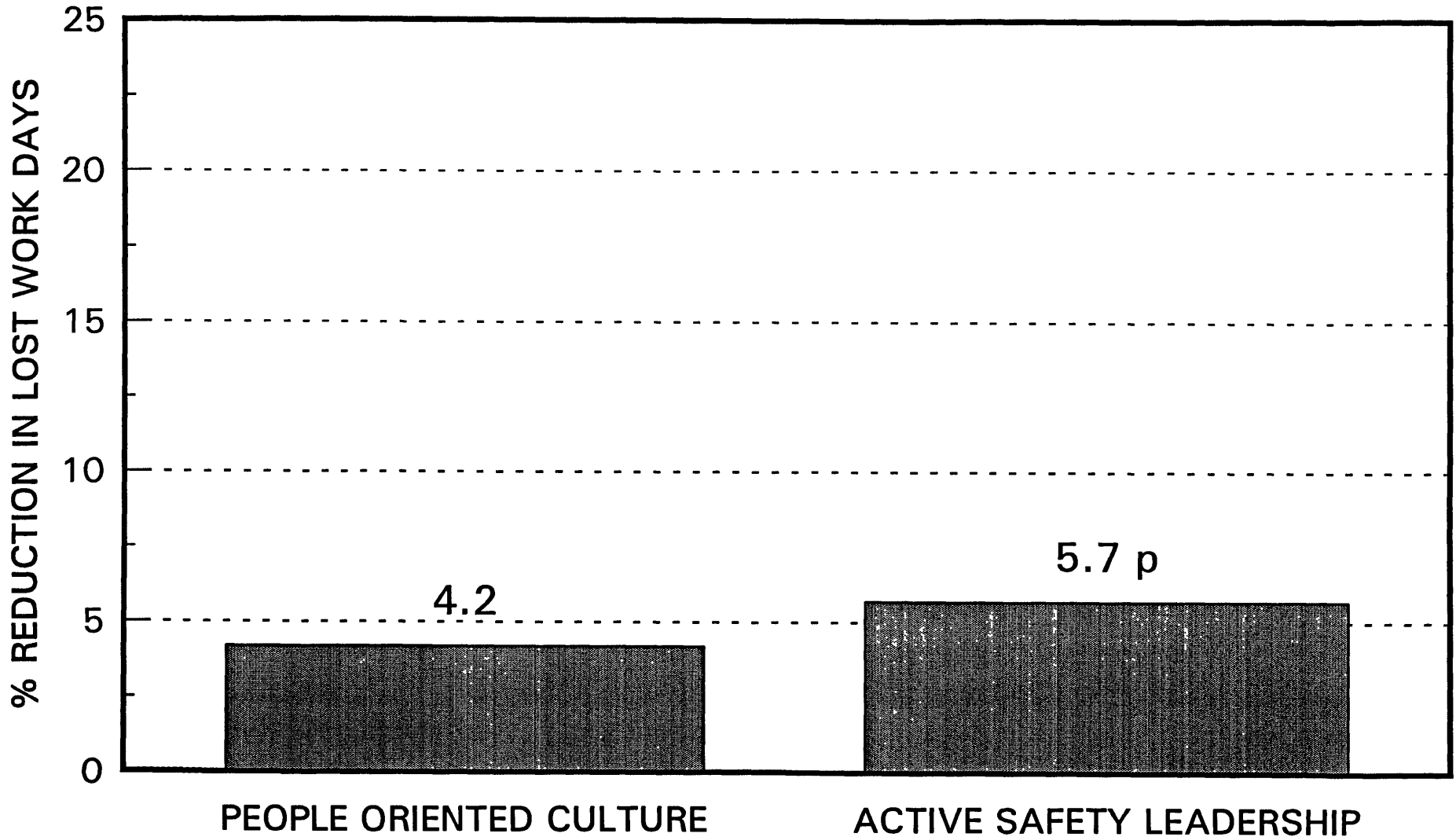
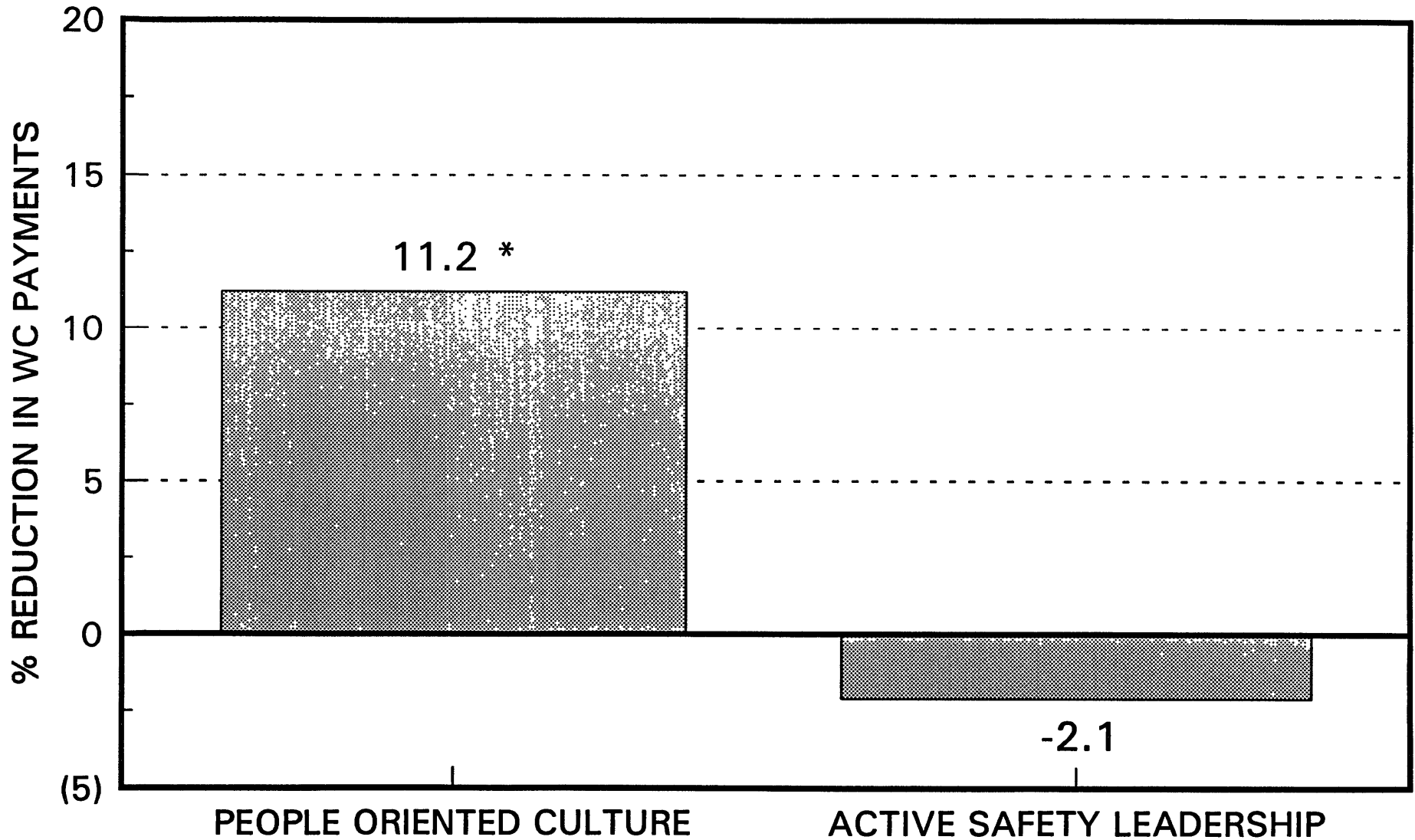


Figure 4.6

DISABILITY PREVENTION AMONG MICHIGAN EMPLOYERS  
W.E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH



# WORKERS' COMPENSATION PAYMENTS PER WORKER EFFECT OF 10% CHANGE IN BEHAVIOR



4-46  
97-7

Figure 4.7

# LOST WORK DAYS PER 100 EMPLOYEES

## EFFECT OF 10% CHANGE IN BEHAVIOR

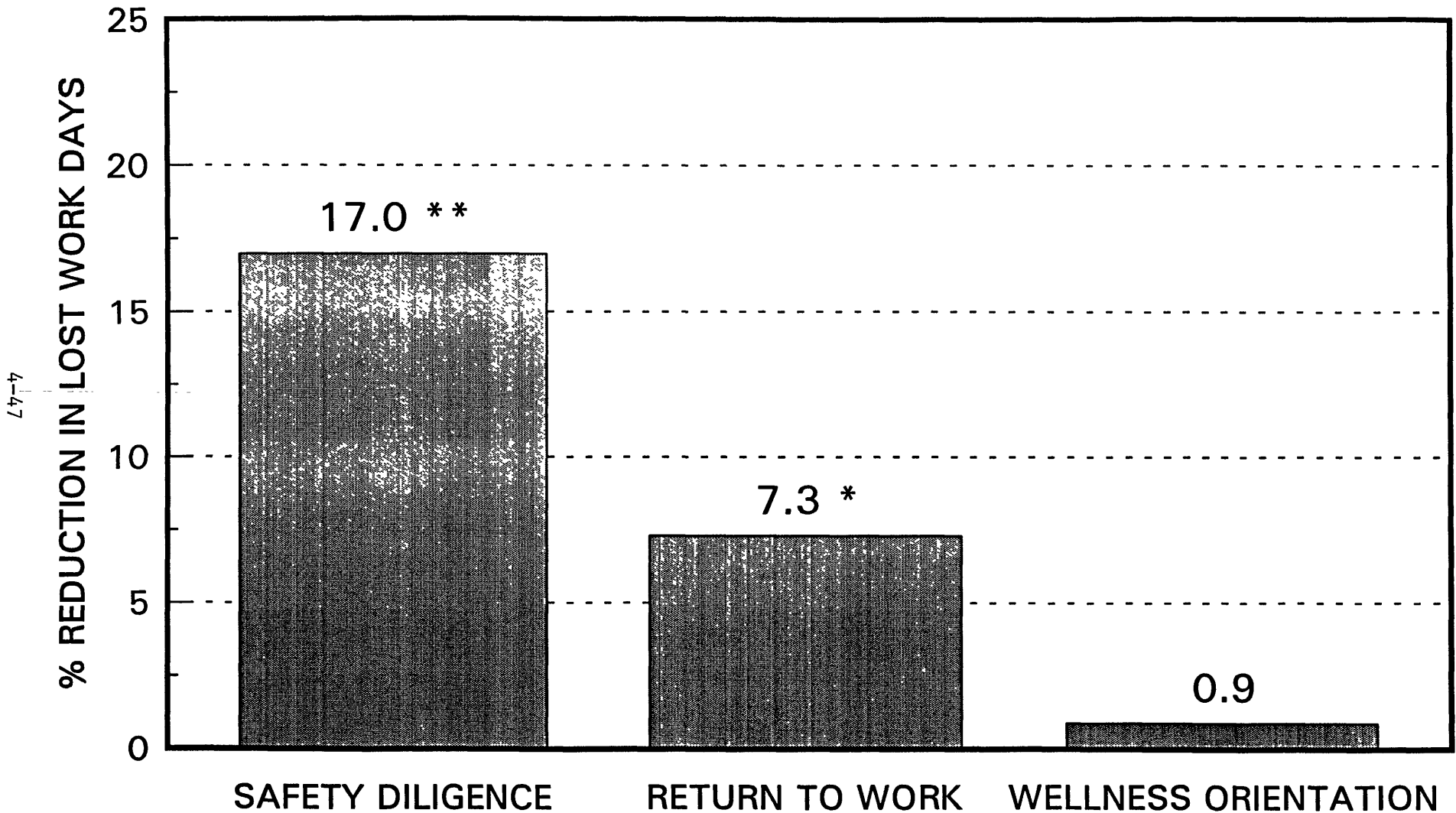


Figure 4.8

DISABILITY PREVENTION AMONG MICHIGAN EMPLOYERS  
W.E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH



## CHAPTER 5 QUALITATIVE ANALYSIS

### Introduction

The goals of the company site visits were to substantiate the quantitative findings of the study and to obtain an improved understanding of how those firm-based behaviors that contribute to the effective prevention and control of work-related disability actually operate in the workplace. An understanding of the operational details of these injury prevention and disability management factors can assist other firms in making improvements in disability prevention and management performance.

Site visit selection paralleled the mail survey sample in that companies were chosen from each of the three size classifications within six industries (SIC 20 was eliminated due to resource constraints) resulting in 18 sampling cells. Next, one high- and one low-performance company were chosen to represent the extremes of performance in each cell of the sampling framework (random selection was not used), in order to investigate behaviors that differentiated employers with very different outcome experiences. The rate of lost workdays per 100 employees was used as the primary indicator for selecting high- and low-performance companies. A total of 36 firms were selected, and 32 firms were successfully visited in the spring and summer of 1992.

In larger companies the length of the visit ranged from four to eight hours, with three to four individuals involved due to specialization of function. In smaller companies, typically only one or two individuals were involved, and visits ranged from two to four hours. The interview protocol included the updating of establishment data through 1991 from MIOSHA log summaries, workers' compensation figures, and current employment data. The visit included: (1) a management overview about the business and its current economic climate, (2) an interview regarding initiatives for safety and injury prevention, (3) an interview concerning procedures for injury management and return-to-work, and (4) an interview regarding human resource management, wellness initiatives, labor management climate, and company culture. When permitted, a tour of the physical work environment also occurred.

Information and data gathered during the on-site visits were then dictated, transcribed, summarized, and analyzed. Major observations and findings from the high-performance and low-performance firms were compiled for comparison. Exemplary models, unique ideas, and helpful resources were also documented.

## **Confirmation of Quantitative Findings**

### **Validating the Stability of Performance**

The site visit findings generally confirmed the self-reported data collected in the mail survey. First, MIOSHA log data, workers' compensation data and workforce data were added for 1990 and 1991. This allowed us to observe the company records from which these data were originally drawn and confirm the basis of the data provided for 1986-1989 in the survey, as well as to view the trends in company performance across a 6-year period. MIOSHA log data were generally found to be complete and accessible. Workers' compensation data, more frequently missing in the survey responses, were more difficult to obtain on site as well.

Most companies presented performance data that were generally similar to, or part of an observable trend with, their earlier performance. In some cases, dramatic changes from earlier performance were noted. These apparent inconsistencies were discussed and plausible factors were identified to explain these fluctuations. For the most part, observable trends were attributed to actual changes in the company's behavior in regard to disability prevention and management. In other cases, changes in recording practices (in regard to recordables only), insurance carriers, or rapid business expansion or contraction were cited.

As discussed earlier, each company's disability performance data for 1989, as reported in the mail survey, were used to select the high- and low-disability firms within each industry and size group to visit. The performance data collected on site for subsequent years (1990-1991) were examined not only to assess the accuracy of data reported, but to determine whether firms selected because of their high-or low-disability status in 1989 could

still be correctly classified as such. This was important to determine before drawing conclusions about the relationship between these firms' behaviors and their outcomes.

The majority of the firms visited continued to perform in the same high- or low-disability status relative to their industry, thus validating their selection as high- or low-disability claim firms. Although the relative classifications of these firms remained the same, nearly half of the high disability firms had realized some improvement in their disability performance.

About 20 percent of the firms had experienced such significant changes in performance that they no longer represented the extremes for their industries. In most cases, these firms were now closer to average in their performance. This included four previously low-disability firms whose performance had declined and two previously high-disability firms who had successfully engineered dramatic turnarounds in their performance. The current performance and classification of approximately 10 percent of the firms could not be determined because of missing data.

#### Validating the Self-Assessment of Firm Behavior

The mail survey asked respondents to rate the extent to which their firm achieved specific behaviors related to the policies and practices under study. This was the company self-assessment. During the site visits, interviewers observed and collected information in an attempt to validate or confirm companies' self-ratings. The self-ratings of both the high and low disability firms were generally similar to the on-site interviewer ratings. Approximately 40 percent of both high- and low-disability firms had rated their achievement of behaviors similarly to our rating. About half of the firms (both high and low performers) had rated themselves as having achieved the specific behaviors to a slightly greater extent as compared to the ratings of our interviewers. The remaining 10 percent of the high- and low-disability firms had rated themselves more critically with lower ratings than those assigned by the interviewers. It is worthy of note that there was no discernible difference in accuracy of reporting between high and low performance establishments.

Some possible explanations for differences in the self-reported ratings and those of the interviewers should be considered. First, approximately one year had elapsed between the time of the company self-ratings and the interviewer visits. Thus, real changes in company practices are likely to have occurred, especially considering the feedback we had provided them about their performance relative to their industry cohort. Second, the 5-point rating scales used for these assessments lack sufficient precision and definition to enable different respondents to assign the same numerical rating to global behaviors in a completely reliable way. Further, where differences in ratings occurred, the lower ratings were assigned by the interviewers. These interviewers are experts in the content area and constructed their ratings with greater awareness of the range of employer behaviors, thus leading to a more rigorous standard in assigning their ratings.

However, these differences do not invalidate the survey self-rating results. The magnitude of the differences in ratings between self-rater and interviewer, where they occurred, were small (generally 1 point differences on the 5-point scale); the self-ratings were not highly inflated. Further, these higher ratings occurred in both the high- and low-disability groups and thus had no discernable impact on the differences between the mean scores of the two groups. Thus, it is likely that the mean factor scores from the self-report data may give a slightly more positive picture of the achievement of disability prevention and management policies and practices as compared to an assessment by a highly trained expert. However, the self-reported ratings did vary consistently between the high- and low-disability firms, and the general validity of these ratings was confirmed by our site visits. Thus, the quantitative findings for the independent variables (which are based on the self-ratings) are believed to comprise valid differentiations of employer behavior on policies and practices related to disability prevention and management.

#### Validating the Linkage Between Behaviors and Outcomes

For illustrative purposes, the two groups of site visit firms were compared on the basis of their 1989 reported information with respect to their disability performance (dependent variables), organizational characteristics (covariates), and achievement of the

policies and practices of interest (independent variables). These data are presented in table 5.1.<sup>23</sup> The comparison of means between the high- and low-disability groups verifies the substantial difference in their experience of injuries, disabilities, duration and costs. As expected, the high-disability firms have substantially more injuries (higher MIOSHA Recordable Rates). More notably however, they have five times more Lost Work Day Cases Per 100 Workers and roughly 2.5 times greater Lost Days Per Lost Work Day Case. As a result they have 3.5 times more Wage-Loss Claims Per 100 Workers, and nearly 12 times more Lost Work Days Per 100 Workers. These differences create very considerable cost and productivity advantages for the low-disability firms. The table shows that the high-disability firms incurred \$600 more in Workers' Compensation Losses Per Employee.

Differences in the organizational characteristics of these two groups parallel the quantitative findings. The low-disability firms are larger, are less frequently self-insured, have a slightly higher hourly wage, have a significantly lower turnover rate, and have a lower but still substantial level of union representation. Most important, the low-disability group reports substantially more frequent achievement of the policies and practices of interest. In particular, they report much more frequently achieving PROACTIVE RETURN-TO-WORK, WELLNESS ORIENTATION (although neither group engages in this area with high frequency), and PEOPLE ORIENTED CULTURE. This cluster emphasizes the human resource orientation present in these low-disability firms. They also achieve higher scores in SAFETY DILIGENCE and ERGONOMIC SOLUTIONS as compared to the high-disability firms. The groups report more similar behavior in other areas, particularly DISABILITY CASE MONITORING. Taken as a whole, this comparison highlights the tremendous differences across companies in their disability performance and confirms the relationship between positive policies and practices and better performance in the prevention and management of disability.

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<sup>23</sup>Since these establishments were not randomly selected, statistical hypothesis testing is not appropriate. In particular, it is not possible to generalize from these samples to the broader population.



## **SET Program Utilization and Evaluation**

Each of the firms visited was asked whether they had used the services of the Safety Education and Training Division (SET) of the Bureau of Safety and Regulation, and if so, what particular services they had received and to comment on the effectiveness of these services. Of the 32 firms, 20 (62 percent) had used SET services; 12 (67 percent) of the high-disability firms, and 8 (57 percent) of the low-disability firms.

These employers reported receiving the following services from their SET consultants:

- training targeted to company's specific needs (for example, providing a safe lifting seminar for a company with frequent back strains)
- training for safety committees and supervisors
- training employees in safe work behaviors (for example, explaining the purpose of personal protective equipment to counter employee resistance)
- training materials
- attending SET seminars offered in geographic area
- training from SET grantee for back injury prevention
- guidance in MIOSHA recordkeeping
- analyzing company MIOSHA data to estimate disability costs and potential savings
- analyzing MIOSHA data to identify major risks and offering recommendations to reduce or eliminate them (for example, one company installed lifting cranes in the plant based on the SET consultant's analysis of their MIOSHA recordables which identified a high incidence of back strains)
- conducting informal walk-through inspections to identify risks
- evaluation of specific hazards (for example, noise levels)
- consultation in solving ergonomic problems
- guidance and checklists for conducting self-audits
- current information on changes in OSHA standards
- assistance in preparing for MIOSHA inspections
- voluntary inspection program

A few firms reported concerns with SET services. Most often these involved long delays in obtaining particular training materials or in receiving scheduled services. Some firms were unwilling to use SET services because of their (mistaken) belief that such involvement would lead to MIOSHA inspection. A few firms preferred to use corporate resources because of their perceived superiority in technical knowledge and professionalism. However, the vast majority of firms who had used SET services commented very favorably on the effectiveness of the services they received. These firms felt that SET intervention had generally increased the level of safety awareness within their firms and had significantly impacted their injury rate and disability experience.

For example, one company we visited had reported a Lost Work Day Rate nearly double the industry average at the time of survey. Subsequently, the firm received considerable consultation from the SET Division. Middle management staff and the SET consultant conducted a formal evaluation of the company's safety program, analyzed their injury experience, and estimated the costs of disability to motivate top management's involvement. Together, they identified key problems and risks and developed a plan for change. At the time of our site visit, they had reduced recordables by 34 percent, the severity of incidents by 42 percent, and the lost work day rate by nearly 50 percent. The SET consultant was perceived to have been instrumental in developing a strategy to gain top management's support and implement new initiatives with supervisors. In this case, SET services were reported as having a very significant impact on reducing the frequency and severity of recordable incidents and work disability.

### **Examples of Successful Initiatives**

With respect to the qualitative findings from these visits, several observations can be made with regard to all of the companies visited. The competitive business conditions of the last few years have created an economic climate that poses challenges in virtually all of the organizations visited. Companies with increasing market share and favorable profitability, as well as companies facing declining demand, are working hard to be responsive to customers, improve product quality, and achieve efficient utilization of resources.

Across all groups, we observed a general shift toward the principles of total quality management, which has led to changes in traditional work cultures and roles. For many firms this has meant extensive change in their management philosophy and organizational structure, with greater involvement of employees in all aspects of operation. As part of the quality movement many firms have shifted toward the use of work cells and/or work teams. This change in work flow has facilitated the use of job rotation, which in turn has helped some companies to address training and promotion opportunities, and to prevent risks of repetitive strain and cumulative trauma by altering work functions. Some companies have found that placement of workers with restrictions has been easier to accommodate in a work-team concept.

Throughout our visits we observed many innovative measures undertaken by firms to improve their safety and disability performance. We noted the high-disability firms that participated in the site visits were often very aware of their problems and were motivated to change, or were actively involved in changing, their performance. Available data support the effectiveness of their initiatives to date. As compared to their performance in 1989, the high-disability companies by 1991 reported substantial reductions in their recordable rates, lost workday case rates, and total workers' compensation costs. The low-disability firms by comparison, held relatively steady in their performance measures through 1991. This is, of course, still an achievement, since industry statistics in these areas were generally rising during this time period. Thus, successful strategies were identified from both high- and low-disability firms that offer helpful suggestions for companies looking to improve their situation.

The site visits provided a wealth of company experiences. More detailed comments and selected examples that illustrate the use of these strategies are offered below. We have attempted to loosely organize these examples by the major type of initiative they represent; however, these company behaviors are multifaceted and generally occur as an overlapping constellation of initiatives that have been developed to address a problem or achieve a goal.

- Use of Data

Analysis of site visit data revealed that low-disability firms have developed rather sophisticated data analysis methods. These firms use data effectively to measure their performance, to determine trends and identify important problems, to isolate causal factors and to target solutions to improve their experience. These data also provide information for communicating performance to all levels within the company, including management and production workers and serve as the basis for achieving accountability in reaching new goals. However, many firms still do not have access to useful workers' compensation data on a timely basis, thus hindering the full potential of these data systems. This problem is discussed more fully later in the report.

One company provided a good example of an extensive data analysis process which has been successful at bringing safety awareness to the employee level. This company utilizes a computerized process to record key information about each injury and its investigation report which enables risk information to be analyzed and disseminated efficiently. This system also compiles information from the medical department, the workers' compensation department, and each business unit into one comprehensive format that assists the corporation and its individual business units in making decisions that lead to the reduction of risks within individual areas of responsibility. Reports are also generated which provide detailed information regarding each injury, the resulting restricted and lost workdays, and accumulated costs. Each department and business unit within the company receives this report. The reports are felt to be very helpful by the individual business units because they reveal quickly and clearly where improvements need to be made in their own areas. This is a key tool in enabling the business units to achieve a very challenging safety goal issued by the CEO; one of the five major goals set for the corporation.

Another company with very comprehensive safety efforts has developed a computer program that mirrors the OSHA 200 log in order to efficiently meet its recording requirements, while also using and analyzing this information for internal needs. This information is communicated to individual business teams and a meeting is held to discuss

findings. Each supervisor is called upon to discuss the trends in the performance of their business team, to implement strategies aimed at improving their team's performance and to report their results at subsequent meetings. Company management encourages team supervisors to consider their teams as individually owned businesses with reduction of operating costs as a goal which can in part be achieved by reducing injuries and disability.

- **Active Involvement of Top Management**

One company with high-disability rates at the time of our mail survey had greatly improved its injury prevention performance by the time of our visit. This occurred as the result of a dramatic change in the behavior of the upper management team who, after receiving an unexpected and substantial workers' compensation premium adjustment, realized that they must address safety as a high priority. Now, a management meeting is held each month in which plant and division managers report to the executive team. Top management has altered the agenda of the meeting so that safety reports come first, followed by quality reports, and then by productivity reports. This change in emphasis by upper management has resulted in improvements in safety and quality for the company. Considerable peer pressure is generated in these meetings for plant managers and division managers to demonstrate continuous improvement in all areas of their responsibilities. The safety director generates reports for each of these managers regarding their safety performance, which must be reported and defended at the monthly management meeting. The reports include computer generated graphs that show incidence rates and severity rates across time, thus analyzing performance on both injury prevention and reduction of lost work time. More specific reports are generated as needed to identify trends and key problem areas. As a result of this change in the attention of top management and the use of data to track performance at the plant level, accountability for safety has increased within the company as a whole.

- **Management System Achieves Accountability**

One highly successful company cited its most important strategy for preventing and reducing injuries was its effort to make supervisors responsible and accountable for their safety performance. These efforts date back nearly a decade in response to new assignments

of responsibility and reporting within the firm. At that time the new vice president of manufacturing directed that one-third of supervisors' merit increase would be based on their safety performance. A safety report card for each supervisor was constructed for monthly review by the safety steering committee which included the vice president of manufacturing. These report cards documented monthly safety talks, involvement in monthly formal inspection of the department, participation of a line employee in the inspection, etc. During these monthly meetings supervisors were called upon to present their investigations of any injuries that had taken place in their department. This required supervisors to be accountable to their peers and to their vice president regarding the type of incident that had occurred and the recommendations and actions they were taking to keep the incident from recurring. This particular procedure was believed to have had a major impact on the quality of injury investigations, the quality of recommendations made, and corrective actions geared to the causal factors that led to the injuries. As a result, supervisors became more responsible and accountable for safety and performance improved.

Further, audits are conducted on a regular basis by the safety manager, the vice president of manufacturing, and the parent corporation. The results of these audits are factored into the supervisors' safety performance scores, as well. The audits encompass MIOSHA violation criteria as well as the company's own standards for housekeeping and safety. Results of the audits are centrally compiled into a loss control project log. This allows oversight by the safety manager to document and track all recommendations identified as well as the length of time to implement recommendations. The log is forwarded to the vice president of manufacturing for further oversight and accountability.

- **Immediate Response to Identified Risks**

Successful firms were highly rigorous in their investigation of accidents. Their efforts are characterized by immediate response to incidents and timely determination of the root causes of accidents and injuries. These firms also employ formal investigation procedures for near misses. The firms not only have regular accident investigation procedures, that are documented policy with operational procedures spelled out, but their management is

responsive to the findings of these investigations and timely in implementing corrective solutions.

One firm has implemented a "safety gram" as part of its safety initiative. The forms are available throughout the company in triplicate. The purpose of the form is to allow any employee to easily report risks and unsafe conditions. The form may be signed by the employee or may be turned in anonymously. The form must be responded to within 72 hours by a designated management representative. If the employee signs his/her name, a copy is returned to the employee. If the form is turned in anonymously the response to the form is posted on the bulletin board. The response from management must indicate the corrective action that will be taken and the deadline by which that action must be completed.

- **Labor Understands and Is Involved with Company Disability Prevention Goals**

While virtually all firms with respectable disability performance reported devoting time and resources to safety training, truly innovative companies had invested more deeply in their training efforts. They regularly devote time and resources to conduct mandatory MIOSHA training, to provide training to new or newly assigned employees, to conduct training for applicable employees when new equipment is installed, and to update training when necessary. But, further, these companies develop and implement training in response to problems and needs that are identified through their data system. These educational efforts are one element in their prevention approach, using training to heighten employee awareness about potential hazards and risks and how to avoid them.

Another major means of facilitating employee involvement in safety initiatives is the active involvement of line employees as equal partners to supervisory and management representatives in key safety activities including investigations, inspections, audits, and regular committee operations. As part of its move to the standards of world class performance, one firm had implemented volunteer work teams. The purpose of these teams is to identify a specific issue in their work process that they want to analyze, study, and resolve. Seventy-five percent of the volunteer work teams that have been initiated have

worked on projects that have a safety component, often ergonomic in nature. This evolution to employee involvement and ownership of work process with company support has led to the direct participation of employees in problemsolving that has improved safety for the firm and its workers.

Another firm cited the use of safety tags or stop tickets as motivating safe behavior. These highly visible tags are available for all employees to use, and an employee can place the tag on any machine that is believed to be unsafe or an area where a hazard is perceived. There is designated responsibility for addressing the hazard as soon as possible in order to remove the safety tag. Sometimes tags have been placed on fellow employees to communicate in a joking manner that an employee is behaving in an unsafe manner and that this has been noticed by peers. Safety tags are automatically placed on any new machinery or equipment that the company builds for itself and requires the sign off of key designated individuals in response to various safety inspections of the machine before it can be removed.

The use of safety incentives did not appear to be a major strategy for employee involvement among the most successful firms. When used, incentives are fairly small in monetary value but meaningful in terms of recognition of the individual employee. When significant incentives are used in these firms, they typically are awarded to business units as a whole, encouraging group attention to safety and lost work time performance. For example, one successful firm recognizes employees who have worked safely by publishing the names of those individuals who have worked for the year without a recordable incident and providing a certificate. Continuing that performance for subsequent years results in some small gift but also continued recognition of the employee. This recognition brings positive reminders to all employees that workplace behavior is monitored and that safe performance is appreciated.

One firm cited its negative experience with emphasis on incentives to motivate behavior. When upper management wanted to increase its emphasis on accountability for safety, they put in place a significant monetary incentive for all employees when the plant



was successful in having one year without a lost work day incident. Employee peer pressure to achieve these goals was quite high. When a lost work time injury was finally reported there would typically be several other incidents reported shortly after. Thus, the pattern of these reportings led the safety manager to believe that the incentive program was leading to false impressions from their data and delayed medical treatment for repetitive trauma injuries. They felt it suppressed data that could lead to the early identification of symptoms, and the sources of risks for these chronic injuries, and possibly to the delay of preventive interventions. Thus, the incentive program was restructured so that plants would be awarded recognition on the basis of their audit scores for preventive actions taken to address identified risks, a process focus rather than a results focus.

- Ergonomic Initiatives to "Design-In" Prevention

Many innovative firms have pursued ergonomic strategies as a major component of their disability prevention program. To do so, these firms first must have in place data systems that allow them to analyze injuries by type and location in order to identify ergonomic factors that may be contributing to their high incidence, high cost, and long duration disability cases. Ergonomic solutions have been implemented where appropriate to remove risk factors from work process or equipment design. Many of these companies report that the success of their ergonomic initiatives is bolstered by the education of their employees about ergonomics. In fact, many ergonomic initiatives also involve education programs to improve human mechanics as well as machine design.

In one company, workstations in three of its facilities have gone through ergonomic redesign. This has included making equipment adjustments such as platforms that are height adjustable and the addition of stools for employees to have the option of sit/stand. A second initiative is the implementation of job rotation; in some cases every two hours, and in other cases on a daily basis. Another initiative has included requiring a supplier to alter the material from which a part is made in order to reduce the amount of heavy lifting on their jobs. They are also contemplating the design of roller guides to be used in trim operations, thus eliminating wrist pressure in this high injury incidence work process.

Another company used ergonomic initiatives to address the increased number of back strains and sprains. This included the installation of palm buttons on its presses to reduce the number of bending and twisting motions needed to operate the machines and the installation of conveyor belts and hydraulic baskets to reduce bending to pick up parts produced by the machine. These initiatives have greatly reduced the amount of employee bending and the subsequent injury rate.

- Other Prevention Initiatives

Few companies reported extensive involvement in wellness or other human factor prevention activities. Nevertheless, some interesting initiatives were reported. In one firm the risk manager had developed a wellness committee which operates similarly to a safety committee. The wellness committee is composed of management and hourly employees and has used the company's health insurance claim data to analyze causes and trends in utilization, to develop wellness initiatives targeted to major health risks, and ultimately to reduce the risks and subsequent health care costs. For example, their highest health insurance costs are related to cardiovascular treatment, thus they began doing cholesterol screening as well as nutrition and dietary information programs for individuals at risk. The firm has conducted many innovative programs including a mini-health fair, "healthy refunds" or reimbursement for wellness activities of employees at community facilities, company campaigns for smoking cessation, educational programs targeted for family members' health behaviors and utilization of medical care, and special wellness lunches for employees and management. The wellness committee has also undertaken a special initiative to improve utilization of the company's Employee Assistance Program (EAP). The committee has worked with the EAP provider to improve the ease of referrals to the EAP and the information that employees have about using the EAP. As a result utilization of the EAP has increased.

One firm made use of a back school training program provided by a SET grantee. This training was offered to employees because the company had identified an increasing trend in back strains and potential risks for cumulative trauma back injuries. Another

innovative company implemented a program in which they use physical therapy consultants on site for prevention purposes. This program was initiated when analysis of the company's data showed that the number of recordable incidents due to cumulative trauma symptoms had doubled during the last year. The company solicited proposals from external providers to address their needs. The company selected a program provided by physical therapy consultants which emphasized specific physical conditioning and biomechanical training for each individual employee to help alleviate physical and mental stress factors that could lead to cumulative trauma.

The consultants required that management teams also learned the interventions so that the importance of these behaviors would be reinforced in management behavior. This was very consistent with the culture of the company in emphasizing the equality among employee groups and the importance of all employees. Once implemented, the program involved a 10 minute period at the beginning of each shift where stretching exercises are completed while the current day's business is discussed. This example illustrates the important linkage between analyzing company incidence and performance data and the implementation of prevention initiatives for targeted risks. The example also demonstrates that successful implementation of new initiatives is enhanced by developing an approach that is consistent with the culture prevalent in the company.

- **Coordinated Injury Management with Responsive Providers**

It was clear from the experience of companies that have been successful in reducing the incidence and duration of disability that timely and effective coordination of medical care from designated and qualified providers has been a critical, and perhaps the most important, component in their success. These high performance companies have devoted time and effort to developing effective working relationships with knowledgeable and responsive health care providers. The best of these relationships include the following components essential for effective injury management:

1. procedures to facilitate immediate and ongoing communication regarding the outcomes of evaluation and treatment;
2. supplying information to providers regarding the company's philosophy, policies, and capability of accommodating restrictions for safe and early return to work;
3. establishing clear expectations and timeframes of treatment for each case;
4. providing a mechanism (typically a standard form) to receive a functional assessment of the workers' residual capacities as they relate to available job duties; and
5. requiring recommendations and timeframes for return to work, including any accommodation that may be necessary.

In order to ensure effective injury management, some companies have acquired "in-house" medical providers. These companies have either employed the necessary medical staff themselves to treat many of the injuries which occur, or in some cases have invited a provider to establish an in-house medical center. Companies have reported many benefits of the in-house medical provider approach, including timely medical treatment, immediate and continual communication with involved parties within the firm, on-site consultation for direct assignment to positions compatible with restrictions, and hence quicker return to work.

One large firm was able to provide an in-house medical center staffed by nurses, physical therapists, and physicians. This facility provides a comprehensive array of services including: treatment for work-related injuries, education of employees on effective communication with the outside medical community, education for the external medical community regarding the company's objectives for the early return to work following injury, and facilitation of cases using outside health care providers. This firm's medical center staff also works with manufacturing personnel in order to answer questions and help supervisors develop return-to-work placements that appropriately and safely accommodate employee restrictions.

In other cases the medical center staff communicates directly when outside physicians or specialists are required. They obtain information from supervisors regarding the employee's job functions and physical demands to share with these specialists in order to facilitate return to work in a more timely manner. The firm believes that these medical coordination efforts have significantly reduced their lost work time and disability duration. They have developed an effective working relationship with community medical providers, thereby maintaining control over the return-to-work process while ensuring quality medical care to employees, even in cases where more extensive medical care and utilization of specialists are required. In general, firms with in-house medical services seem to be able to more quickly accomplish referrals to specialists when they are needed and to maintain more effective control and communication. This has been particularly helpful with cumulative trauma and other complex disability situations.

A more typical situation is for a company to have an occupational health nurse who coordinates medical care on and off site. For example, one company requires that employees who are hurt report the incident to their supervisor and then be sent to the company nurse who provides immediate first aid as appropriate and referral as needed to the previously designated community emergency room, company doctor, or specialist. The company has selected its doctor on the basis of the individual's ability to sustain communication with the company and to facilitate return to work. The designated physician comes to the plant on a periodic basis to foster communication, provide some follow-up visits, and to treat certain strains and sprains on site.

For second and third shift employees, the company has developed an alternative system by training and certifying an individual to provide first aid, and by arranging with the designated emergency room for immediate treatment with follow-up communication for further treatment the next day. Therefore, all health care is coordinated and designated by the company. Forms have been developed that travel with employees to their health care provider, and which require the physician to complete information about restrictions and a

projected return-to-work date. The employee is responsible for returning the form, which is then used with the supervisor to facilitate the return-to-work plan.

In another mid-sized firm an occupational health nurse is the risk manager. In addition to her other duties, she has responsibility for medical management as well as claims management. Once she determines whether or not an individual needs more than on-site attention, she determines which clinic to utilize for the employee. She has utilized an area employer network for information about provider effectiveness in determining her designated providers. Based on her knowledge of area providers she determines which clinics to use according to the needs of individual employees. For example, she has designated one clinic as being more effective in dealing with complaints involving cumulative trauma and a different lower cost provider for more straight forward laceration injuries. In this firm, the nurse also handles follow-up communication with providers and is the liaison with supervisors in regard to determining return-to-work options based on restriction information from the physician.

For many firms, an in-house medical center or medical staff is not feasible. Therefore, careful recruitment and selection of a community provider is a critical component in developing their injury management efforts. Procedures to facilitate immediate and ongoing communication on the outcomes of evaluations and expectations of treatment are the goals. For example, one firm originally identified in our survey as a high-disability company had analyzed their disability experience prior to our site visit and noted a major problem in the number of lost work days associated with their workers' compensation cases. After careful analysis they determined that their long-duration cases were resulting from inefficient injury management.

The firm attempted to address this problem with their local medical providers but found that they were not receptive toward the company's desired emphasis on conservative management of chronic disabilities (e.g. cumulative trauma) or on an early return-to-work approach even when assurance of safe accommodation of restrictions was stipulated. Thus,

the firm began looking elsewhere and, with the help of their insurance carrier, located a medical provider 40 miles from the company who would provide high quality treatment and communicate the results of evaluation and treatment to the firm on a timely basis. This medical provider works in tandem with the company to provide conservative treatment and earlier releases for modified work duty. These efforts have helped the firm to significantly reduce the number and duration of long-term cases and their workers' compensation costs, even with the additional cost of employee mileage to and from this provider.

In the case of one small firm we visited, the company has established a relationship with a local occupational health clinic to handle their simple cuts and lacerations. When more complex injuries such as carpal tunnel are identified, the firm utilizes services from their carrier to handle medical coordination, in particular, referrals to designated specialists. The firm has substantiated the quality of care with the local medical center by using this source for personal care of the managers who were involved in selection of the provider.

In another larger firm, their injury management program with a designated provider was developed about 10 years ago in response to a marketing assessment by a new provider in the area. In this case the plant was located in an industrial park and had no medical services nearby. The prospective clinic met with companies in the area of the industrial park to determine the types of services that would meet their particular needs. Therefore, the clinic was designed in part by the employers to be served. Many of these companies initiated their restricted return-to-work programs with the assistance of this designated clinic.

Regardless of the source of health care provider resource--whether that be internal providers or community providers--companies with successful injury management programs have made use of the Michigan law allowing employers choice of provider during the first 10 days of disability. Those who have been successful in their efforts have attempted to assure both quality and responsiveness of the providers chosen. Regardless of the specific model used, one key characteristic of effective injury management that we found among successful

firms was management's emphasis on immediate reporting and response to injuries or perceived injuries.

Rather than supervisors or employees being deterred from reporting incidents due to fear of reprisal, the emphasis in these firms is the opposite. That is, employees are aware that management absolutely expects that injuries will be reported and responded to immediately. Although this may lead to an inflated estimation of recordables, management has informed safety managers and supervisors that this error is preferable to the alternative and that the goal is to allow the company to control these incidents by being knowledgeable of them as soon as they occur. Finally, it is evident in the successful firms and to their employees that the injury management process is intimately related to the company's policies and practices to accommodate restrictions for early and safe return to work. Thus, the components of injury management and return to work function as a coordinated two-part process; which our research identifies as a proactive return-to-work program.

- **Systematic Approach to Accommodation for Return to Work**

Nearly all of the companies visited reported at least some efforts underway to return workers to work with restrictions, suggesting that most employers now recognize the benefits of early return to work through accommodation. Companies who have been successful in limiting their disability incidence and duration identified their return-to-work process as a critical component in effective injury and disability management. The particular return-to-work programs reported by these companies varied according to company size and the type of disability problems encountered. It appeared that those with successful strategies have moved beyond simply designating light duty jobs for restricted placements and have developed their capabilities for making more flexible, individualized responses to return-to-work accommodation needs which are transitional in nature. Further, return-to-work efforts in successful companies appear to be more fully developed in terms of supporting policy and operational guidelines in place. In several notable cases these highly successful programs seem to be firmly tied to the company's culture as a formal expression of their concern for human resources. That is, the return-to-work program is communicated as a benefit to



employees and part of the human resource program rather than simply a managerial strategy to control employee behavior. Regardless of the philosophical underpinnings of successful programs, it is clear that in these effective companies employees who experience injuries know that they will be expected to return to work and will be accommodated if required.

One large manufacturing firm provides an example of the comprehensive process that has been established in an effective company program for return to work. Although this program is not written down in a manual, through our interviews and observations we were able to identify a sequence of steps that are followed to ensure appropriate return-to-work placements. The company perceives that their comprehensive return-to-work program has been the most significant element in impacting their positive disability performance. The components of their program are as follows:

1. At the time of injury the supervisor assesses the situation and determines the need for first aid or provides authorization to the medical clinic.
2. The company enforces its prerogative to use a designated provider during the first 10 days after injury, and all employees who require medical attention are sent to the identified industrial clinic.
3. Determination of whether the employee would drive him or herself or should be assisted to medical care is made and arranged by the supervisor.
4. The supervisor contacts human resources department when an employee is sent to the medical clinic.
5. Following treatment, the employee is instructed to return to work with documentation from the physician. The supervisor reviews the documentation for prognosis and restrictions assigned and to evaluate the availability of work in the area to accommodate the employee.
6. If restrictions are for a week or less supervisors are encouraged to accommodate the employee and keep them in the home department. If they are unable to accommodate the employee the supervisor contacts human resources who assists in return-to-work placement.

7. In cases of significant expected time off work, the employee relations manager assumes responsibility for "case management." This happens rarely.
8. The employee relations manager maintains regular contacts with the staff at the industrial clinic and communicates regularly regarding any individuals off work or on restricted work.
9. This individual also maintains contact with employees who are off work emphasizing her role in assuring that the employee receives the best medical care, consulting with the employee regarding decisions that have to be made, and facilitating return to work.
10. In returning employees back to work she attempts to accommodate the individual first in their home department, including rotation within their own jobs when possible. When this cannot be accomplished the home supervisor attempts to identify jobs the employee can do, accommodating work restrictions such as reduced work hours.

Many smaller firms who have been successful in controlling the duration of disability in their lost time cases have a return-to-work philosophy, but were not able to delineate a formal set of policies and procedures for their approach. Despite their comparative informality, these small, low-disability firms have achieved impressive results with their return-to-work efforts. In general, these smaller companies actively involve supervisors and injured workers in the return-to-work placement process. Even though they have fewer professional staff available to assist them, they are able to directly use the knowledge that employees and supervisors have about their jobs and other available job duties within the plant to accommodate restricted workers.

In one medium-sized, unionized firm that we visited management has strongly endorsed a return-to-work philosophy but also has communicated a desire to avoid adversarial reactions from the union. Thus in this location, management's expectations are that individuals will be placed back within their own job and within their own department.

With this top management philosophy and support the loss control manager is able to obtain supervisor support in modifying employee jobs to accommodate restrictions. This is accomplished by involving the engineering department in order to redesign equipment or job process as needed, and also by modifying job duties through enlisting support from co-workers to swap and share duties that involve restricted activity.

Because of management's philosophy, co-workers and supervisors are supportive in utilizing job enlargement and job modification to accommodate employees back in their original jobs. Thus far, they have had no formal complaints from their union or resistance from co-workers. Supervisors have also been cooperative, except in cases where employees have been poor performers prior to the injury. In these cases the influence of the senior manager is used to secure placement in a different department or to persuade the supervisor to accommodate the individual. This employer, as did most others, reported its greatest frustration in dealing with employees who are resistive to returning to work. They feel that existing policies and procedures are often insufficient to resolve these problems and that further intervention and assistance from the carrier or vocational rehabilitation specialist is often needed in such cases.

In general, successful companies have worked to develop the effectiveness of their return-to-work process and have focused on modified assignments which are productive, meaningful employment situations. In those companies that are organized, the union's role was often discussed as a factor influencing the return-to-work process and success of the program. Unionized companies who are successful in their placement efforts of restricted workers tended to have positive, cooperative relationships with their bargaining units. In many cases these unions are well aware of the financial importance of the company's health care and workers' compensation costs, and are working cooperatively with the company to control costs in order to protect employment of all workers. Thus, these labor groups see disability management efforts as part of the solution to employee job security concerns. Sometimes modified duty placements or procedures regarding accommodations have been written into the contract and a union representative is involved in placement planning.

Successful unionized companies have made significant efforts to ensure the placements were satisfactory to all parties involved.

One company initiated a program with their union where employees who have restrictions can gain "handicap" status. This designation allows them to bump into jobs within their seniority level and compatible with their work restrictions. This formal mechanism has allowed the union and company to foster the use of modified placements while protecting the seniority concept. The handicap status is typically designated for a specific time period in order to keep restricted work as a transitional measure; but handicap status can be designated as permanent when the disability is expected to be permanent.

Although many companies have had good results with their restricted return-to-work efforts, there are clearly several types of situations that are quite challenging. As mentioned earlier, employees who are perceived to be resistant to return-to-work efforts and employees who are perceived as poor prior performers are clearly more difficult to accommodate. In firms where local labor leadership return-to-work efforts as challenging union authority and goals, limited flexibility in return-to-work options can result. Many companies, regardless of their labor relations, have difficulty in finding a sufficient number of modified situations to accommodate the number of workers with restrictions that they have. Thus, in order to achieve their restricted return-to-work policy, many firms reported that they do in fact make use of less than productive or meaningful work assignments.

In some cases these are used purposefully as a motivator for employees to return to their former duty. In other cases firms have too many lost work day cases requiring modified situations to integrate effectively in their job structure. In still other situations the severity of restrictions or the duration of the restrictions exceed the work accommodations that are feasible. For example, firms that have high incidence of cumulative trauma or repetitive strain to wrists or backs may have a high proportion of their work in this area and thus have few jobs that do not require these repeated movements. Since these conditions may persist for a long period of time, finding meaningful and productive work that does not

require use of the wrist or back for many people is simply not feasible. Until these firms can develop strategies to reduce the lost work day cases due to these chronic conditions, effective accommodation will remain a difficult challenge.

Few firms reported regular utilization of vocational rehabilitation providers to assist the return-to-work process. Typically, external providers are used only in those cases where disability is expected to extend for long periods of time or where the company is unable or not interested in bringing the individual back to work. Often initiation of services to a vocational rehabilitation provider is made by the firm's insurance carrier when a long-term or complex case is unlikely to be resolved through less intensive, company-based return-to-work measures.

- **Maintain Active Role in Case Management**

The firms that we visited which have been successful in reducing costs demonstrated an active role in the management of their work injury cases. This case management function, whether it be informal or formal in nature, occurred in companies regardless of size and despite the fact that the company might be commercially insured and receive claim management assistance from their carrier or administrator, or might use a medical management group to provide assistance with long-term cases. Successful firms reported that they do not lose contact with injured workers and that the status of claims is always monitored by an individual within the company. This "keeping in touch" function by the company seems essential to an effective program. This aspect also seems important to effective monitoring of the quality, volume, and cost of health care and rehabilitation services used in a given case. Thus, the firm's direct role in case management seems to impact both the attitude of the injured employee toward the firm and return to work, and to impact the effectiveness and efficiency of services used.

Active case management typically means that someone from the company calls the employee on a regular basis to determine the employee's status and to communicate concern on behalf of the company. They also make telephone calls to monitor health care and

rehabilitation services received by providing follow-up as to the outcomes of evaluation and treatment, and the implications of these services for return-to-work goals and timing. These calls also help to evaluate the care received from the perspective of the employee to determine the adequacy of services and their impact on the employee's progress.

In one small firm the president of the company requests and receives a monthly list of all employees who are off work due to an accident or injury. The president then monitors these situations and contacts employees as he sees appropriate and time permits. In another firm when an employee has been on a medical leave of absence more than 30 days, policy requires that this individual be interviewed by a senior executive upon their return to work. The purpose is for management to let the employee know that they were missed, that the company is glad to have them back, to solicit their feedback about what occurred during their absence, the treatment that they received, and to make the point that the company needs and depends on them. This is also done to convey to employees that the company views lost work day cases as a serious matter and monitors them closely, thus discouraging fraudulent use of lost work time.

In another firm the risk manager implemented a formal pre-surgery conference where this manager determines the expected outcomes from the surgery including return-to-work timeframes, restrictions, and accommodations needed in order to bring the employee back to work early in their recovery process. A formal pre-surgery conference is set involving the risk manager, the employee, and the surgeon, where they review their expectations concerning responsibilities for communication following the surgery in regard to the return-to-work plan. Phone numbers are obtained so that communication during the recuperation process can occur. Employees receive explanations of the benefits they can expect during this period including mileage reimbursement and are assisted with forms that need to be completed. This case management function has significantly reduced the amount of time previously spent attempting to maintain contact with employees following surgery and the adversarial perception of communications regarding restricted assignment for early return to work.

One larger firm has a very well developed and systematic process for internal claim management despite the fact they are commercially insured. All staff are trained in regard to the company's philosophy toward its workers and its consideration of workers' compensation as a benefit to employees. They instruct these internal claim managers as to how contacts with employees and providers will be made, and how to communicate information about the rights and responsibilities of workers to their fellow employees. They have a chronological tickler system that prompts follow-up calls to employees and providers at designated times in order to determine the outcomes of treatment, the quality of care received, and the progress of the case in order to assist in return-to-work planning.

Despite this firm's considerable efforts to develop and coordinate its injury management and return-to-work process through this internal case management system, they have nevertheless experienced significant gaps and overlaps in the disability management process across the various departments in this large corporation. Therefore, in order to address the larger systems perspective of the case management process the corporation has developed a disability management board to achieve a team approach at the middle management and interdepartmental levels to prevent unnecessary long-duration disability cases in the future.

- **Developing a Participative Culture**

There was a wide variety of managerial styles and company cultures observed across the firms visited. Nevertheless, there was a noticeable movement toward total quality management principles in regard to the work process and the relationship between management and employees in many of these firms. The most remarkable work cultures observed were the few firms who have embraced and implemented a "family" environment in their workplace, with employees being treated and feeling valued as members of the organization. These firms seem to more easily integrate the concepts of total quality management in their existing structure and philosophy.

In other cases, there are more conscious efforts underway to revise their managerial structure, work process, and human resource policies in their shift toward a total quality environment. These firms were also typically those noted to be working to improve their disability performance. As part of this change, firms are analyzing their work process and implementing participatory management strategies to enable employees to take more responsibility and to be more accountable in their work. By emphasizing total quality principles, these companies are working with their employees more actively to achieve the interrelated goals of quality, safety, and productivity. Just as production supervisors are developing new strategies for enabling employees to monitor operations and productivity, safety managers in these companies are searching for ways to move the achievement of safety goals from previously hierarchical, supervisor-driven processes to an "employee-owned" process that is more consistent with the new work culture.

A small number of firms, notably those with poor or declining disability status, express significant frustration in the adversarial climate that exists in their work organizations. Some of these firms have sought consultation to advise management on ways to achieve a more participative and cooperative work culture. These firms recognize the critical financial implications of their negative work culture, which is often exemplified in their elevated workers' compensation costs, and are searching for ways to redefine work relationships and expectations in their firms. In a few cases, particularly those with very serious financial problems, the adversarial relationships and mistrust that have resulted from continued layoffs seems impossible to mitigate. In these companies the high disability incidence and costs are symptomatic of the overall negative financial and labor relations climate, and further compound the company's financial difficulties.

By contrast, companies that have consciously moved toward a less hierarchical managerial structure and more empowerment of employees have been able to demonstrate to employees how these increased responsibilities will assist the company in assuring their financial well-being. Several companies noted that younger employees were often very supportive and enthusiastic about these expanded roles and responsibilities and the



implications for their personal career development. Some also experienced resistance from older employees who can be threatened by these expanded responsibilities and demands for new skills.

Many firms that were successful in their disability efforts had a human resource philosophy that recognized their employees as valuable resources; they invested in their workers and involved employees in decisions which affected their jobs. These firms typically had several means by which they share information regarding all aspects of the business operation with their employees and communicate in an open manner and on a regular basis. When they share information about safety and disability performance they expect to motivate employees to work with the company to improve performance.

An excellent example of the relationship between company culture and safety performance is a small company we visited that had a very low incidence of disability. This company described its approach to safety as an attitude rather than a formalized program, and believed that managing safety successfully depends upon involvement from their employees. This company does not use a hierarchical management structure and is used to working directly with employees as colleagues to achieve company goals. Therefore, employees are accustomed to working with management to improve performance and this carries over to safety as well. Managers feel that employees know that safety is their responsibility and that they are personally accountable for a safe performance. This company has had no indemnity claims during the past three years. In this small firm, one might argue that the managerial philosophy and company culture have been sufficient to achieve disability prevention goals on their own.

In another firm with very successful disability prevention, the plant manager and safety director downplayed the prominence of their safety program. While they feel they have an effective program, they believe that their success in preventing injuries and disability is not due so much to their safety program but is a result of their caring attitude and concern for employees. The company likes to be flexible and respond to individual circumstances,

rather than using "canned" programs. They use data to determine their significant injury and disability risks and then analyze these situations individually. The firm has clearly expressed quality as its top priority and implied that safety will not be sacrificed for production. Thus, costs are not an issue when dealing with safety improvements. Hazards are taken very seriously and immediate action is taken to address potential hazards and risks.

Management does not view injuries as "part of doing business" and they are committed to safe work behavior as well as a safe work environment. They are businesslike and serious in their intent. Supervisors and managers are expected to act as role models and to display safe work behavior. Safety violations are handled via individual counseling rather than a disciplinary procedure to determine what issues are involved. When individuals have repeated violations, other issues which may be influencing the employee's behavior are explored. The family atmosphere at this firm was quite observable and for the most part employees express pride in their work and the company. They are positive and cooperative in their interactions with each other and management and are open with outside visitors. Many employees displayed awards which had been given for motivational purposes (e.g. sense of humor, good team player) at their workstations. Like many of the firms with notable cultures, the turnover rate at this firm is negligible.

In another small company where positive culture was a major feature we interviewed the vice president of operations regarding the components of their successful safety program. One of his first responses was that at this firm safety is an attitude more than a program. This is in contrast to previous firms in which he has worked. He attributes the success of the safety program, in part, to the company's human resource practices. The company hires competent employees who have a good work ethic to begin with and that ethic is nurtured by the company with its people oriented style of management. He realized that the causes to which he attributes their success are somewhat abstract, but in the same way the safety program at the company is less concrete. Because the company's approach has been so successful, there has been little need to define strategies in more specific terms. In fact, in this firm there is no one with the word safety in their job title.

He points out that this does not mean the firm does not have a safety program but that safety is a pervasive aspect and attitude within the company. In this firm, in contrast to his prior employment situations, he finds that employees themselves are much more in charge of safety than is top management. It is an unwritten policy that at least one vice president and one director attend every safety committee meeting. The safety committee is chaired by an employee, and the committee has at its disposal the resources of the engineering and maintenance departments as well as support from upper management. This company has multiple means of communicating with its employees including daily memos, letters posted throughout the plant and its offices, a monthly newsletter from marketing, and a weekly newsletter from human resources.

In addition to various special types of employee meetings there are all-employee meetings held on a quarterly basis when profit sharing checks are distributed. At the meeting prior to our visit nearly \$500,000 was distributed in profit sharing at an average of roughly \$1,500 per employee. In an interesting sidelight, at this meeting the usual coffee and cookies were not provided. Several employees came up to the human resources manager after the meeting to ask about this. As she pointed out, it is the details that oftentimes make the big difference in how employees feel. The firm attempts to do its best to pay attention to the details.

- **Engineering a Company Turnaround in Disability Performance**

As mentioned earlier, a number of firms had achieved significant performance improvement in their disability incidence between the time of the mail survey and the time of our site visit (approximately one year). A number of events were cited by these firms which led to their implementation of strategies aimed at a turnaround. The most frequently identified motivator for changing or implementing strategies was the cost associated with high injury and disability incidence. The cost of workers' compensation insurance was so high for some companies that a major change was needed if they were to stay in business. When these costs were made visible they caught the attention of top management, who then became receptive to looking at the company's injury experience and the reasons behind these

costs. It was noted by interviewees that until injury and disability data were clearly expressed in financial terms, gaining top management motivation to take action was difficult. Once this linkage was demonstrated, program advocates were able to use the injury and disability data to develop and implement strategies targeted to their specific problems. In many cases the results achieved from these targeted efforts, once undertaken with top management support, have been remarkable.

For example, one firm had an extremely high incidence of recordables, lost work day cases, lost work days, and workers' compensation claims and costs. By the time of our visit this company had achieved significant decreases in every one of these areas. They explained that the precipitating event was the receipt of an unexpected and extraordinarily high workers' compensation year end adjustment bill for the policy year 1988-89. Previously, top management had been unaware of the cost of their disability experience. This bill constituted a major financial threat to the company. In the previous five years the safety manager had been providing top management with regular information about its safety risks and analyzing the factors contributing to these problems. However, he had been unsuccessful in gaining top management's support to address these issues. After realizing the consequences of their inaction through this workers' compensation bill, top management began to devote attention to this area and provided resources and authority to the safety manager to implement the exact recommendations that had been made in the past.

In another case a firm's poor disability performance record caused their current carrier to turn down the renewal of their policy, and they found it difficult to obtain other workers' compensation insurance due to their past record. This caused the company to take a critical look at their injury and disability problems in order to improve their performance.

In a company discussed earlier the motivating event was an article in a major newspaper which focused on the increasing problems of safety in the automotive industry due to outsourcing jobs from the Big 3 to smaller firms with less safe environments. This company was cited in the article as one of ten firms providing a major portion of the

outsourcing for the automotive industry and noting its poor safety record. At this point top management realized the seriousness of their problem and decided to take action. A new human resource manager was hired to address the company's safety performance and high workers' compensation costs. This individual, utilizing consultation from the SET program, developed a comprehensive system for analyzing the company's safety and disability experience and for estimating the costs of problems and savings from recommended changes. With data to support the initiatives, top management endorsed these efforts. By the time of our visit the company had reduced its workers' compensation costs from 4 percent to less than .5 percent of payroll and won public recognition for its improved safety performance among Michigan employers.

### **Remaining Challenges**

Despite the many successful strategies observed and the significant performance results that these companies have obtained, several remaining challenges were identified. To begin with, it is difficult for all companies to achieve consistency, quality, and coordination in their case management efforts, whether within the company itself or with external parties. Some companies have attempted to carefully analyze the internal process that occurs in response to an incident and its management. Through this process they are able to identify the gaps, overlaps, and discontinuities in their internal efforts and achieve more coordination throughout the organization. In large organizations, lack of coordination is a significant barrier to achieving an effective, integrated system for disability prevention and management.

The vast majority of companies express frustration with the absence of useful workers' compensation data available to support their efforts. Most companies have computerized their MIOSHA log data and use it successfully to track and analyze their performance over time. However, timely and useful data about the incidence of workers' compensation cases, their medical and wage-loss costs, and their duration, are rarely available to individuals in the company who need these performance data to analyze their disability prevention and management efforts. Companies are eager for more responsive service from their insurance carriers or third-party administrators. Informed employers are

becoming more assertive in their requests for responsive communication, technical consultation on loss prevention, and the case management services they receive. At the same time, successful companies know they must maintain adequate internal control over these processes. In fact, some have achieved significant reductions in their claim reserves by demonstrating their capability for internal case management and their return-to-work performance. Clearly, new roles and partnerships are being forged in the traditional relationships between insurance carriers and their employer clients.

Regardless of performance level, companies reported an increasing incidence of cumulative trauma and repetitive motion injuries. To some extent, successful companies have stemmed this tide by focusing on ergonomic and health promotion strategies to prevent their occurrence. However, every company has experienced some long duration cases of this nature that appear to be unresponsive to conventional interventions. Few successful strategies or innovative initiatives seem to have been developed for these intractable cases. It is interesting that little use of conflict resolution procedures, EAP resources, or other interventions that may relate to the underlying causes of some of these adversarial cases have been attempted, despite the fact that companies typically report that these cases usually involve individuals with poor prior work performance and attendance.

Because of concerns about the increasing incidence of disability resulting from cumulative trauma and repetitive strain, companies are often fearful of informing employees about signs and symptoms of their potential impending disability. However, early identification and intervention for these disability conditions has been identified as a far more effective strategy for their resolution than surgery and other treatments after onset of disability. Thus, opportunities for education and early identification of signs and symptoms is another component of prevention that merits further exploration. The development of preventive measures for the individual risks of disability has not yet become an active part of employer strategies. However, advanced employers indicate it may be possible to analyze disability risks, not only from the perspective of identifying ergonomic needs in workplace design and equipment, but also in identifying interventions for at-risk employees targeted to

their conditioning and health enhancement. While a few efforts along these lines have been introduced and found to be successful, they have not been widely implemented to date.

The disability prevention process requires a continuum of intervention that moves from health promotion to safety to injury management to return-to-work. Generally, companies are most advanced in their safety initiatives, are devoting significant attention to their injury management efforts, and have implemented at least some form of a return-to-work program. Few have ventured into systematic health promotion efforts that are targeted to the particular injury and disability risks they confront. So it is likely that, as companies refine and develop their interventions across all phases of this continuum, and build a corporate culture and management support system for these efforts, further reductions may be obtained beyond those measured to date.

### **Summary of Successful Initiatives**

Successful firms effectively use internal data to measure their performance, to identify their specific problems, to inform management, supervisors, and employees of results on a regular basis, and to strategically guide the actions they take to improve their situations. Typically, top management has been motivated to address safety and disability performance because they are aware of the costs they encounter in these areas. Very importantly, they are also aware that these costs can be reduced. Active involvement of top management in the policy and practice initiatives to be undertaken is identified as critical to successful change; thus, providing data on incidence and costs is one way to secure their involvement. Successful organizations have also developed management systems that communicate and achieve supervisory accountability and involvement in their safety and return-to-work efforts.

Successful firms are highly rigorous in their investigation of injuries; more important, they emphasize an immediate response once problems or risks are identified. While policy statements have value in motivating employee attention to safety, management behavior that is responsive and timely was noted to be more convincing. In these firms, injury incidence

and lost workday performance are viewed as part of both the company's and the individual's or workteam's overall quality and production goals.

A supportive culture was often evident in companies that had been successful in their efforts. In these cases employees are considered as respected and valuable members of the organization, and thus are provided information to help them understand the relationship between the company's safety and disability performance and the financial well-being of the company and its employees. The employees in these cultures typically identify with the goals of the organization, and they are treated as active participants in achieving these goals.

Innovative companies have moved upstream in their safety efforts to "design in" prevention through ergonomic initiatives. They have analyzed their data to identify root causes of their high-cost and long-duration disability cases and have used ergonomic solutions to remove these risk factors from their work process and equipment design.

Successful companies have also devoted extensive effort to developing effective working relationships with a designated, knowledgeable, and responsive health care provider. For some companies, this has meant the acquisition of an in-house provider, and for others the careful recruitment and selection of a community provider. Procedures to facilitate immediate and ongoing communication on the outcomes of evaluations and treatments, and recommendations and time frames for accommodation of return-to-work, are an essential aspect of these relationships for effective injury management. Similarly, these companies maintain an active role in case management, staying in regular contact with the employee and involved parties, despite their use of case management assistance from their carrier and/or specialized case management service provider for complex or long-term cases. This "keeping in touch" by the company with its employees seems essential to effective performance.

Finally, successful strategies for return-to-work have moved beyond designated light-duty jobs to more flexible and individualized responses to return-to-work needs.



Successful companies have made their return-to-work process tailored to the needs of the case, transitional in nature with a focus on return to productive employment, and systematic to insure that these efforts occur in all cases.

Table 5.1

**Site Visit Firms (n = 32)**  
**High and Low Disability Group Comparisons**

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	High Disability Firms	Low Disability Firms
<b><u>1989 Performance</u></b>		
Recordables/100 ee	27	17
LWD Cases/100 ee	10	2
LWD/Case	29	12
Wage Loss Claims/100 ee	7	2
LWD/100 ee	307	24
WC Losses/Employee	\$839	\$233
<b><u>1989 Characteristics</u></b>		
Size (Employment)	510	1531
Multiple Plants	78%	50%
Self-Insurance	56%	29%
Average Hourly Wage	\$10.37	\$11.12
Tenure < 1 year	7%	14%
Tenure > 10 years	42%	48%
Turnover rate	22%	12%
Union Representation	72%	57%
<b><u>Policies and Practices</u></b>		
People Oriented Culture	3.25	3.80
Active Safety Leadership	3.93	4.15
Safety Diligence	3.80	4.18
Disability Case Monitoring	4.31	4.47
Proactive RTW Program	3.41	4.07
Wellness Orientation	2.76	3.48
Ergonomic Solutions	2.97	3.43
Safety Training	3.99	4.20



## CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

### **Introduction**

This three and one-half year research project has probed the ways in which individual employers can use disability prevention and management policies to reduce the incidence of work-related disabilities among their workers. Its design was greatly aided by the findings of our pilot study completed in 1988. In fact, many of the innovations of the project came out of the unexpected insights and methodological limitations of that pilot study, and the criticisms that were leveled against it.

Conscious decisions were made about the inclusion of industries in the study to provide for maximum face validity and generalizability. The study was also built on a random sample design that insured the maximum statistical confidence could be placed in the findings. Considerable effort was put into follow-up contacts with employer-respondents to insure the highest possible survey response rate. In the end, a very satisfactory response rate of 46 percent was achieved. The response bias analysis in chapter 2 showed that larger establishments and those with better disability performance were more likely to respond to the survey. However, these biases do not threaten the analytical potential of the survey, especially since size and industry were retained as primary control variables throughout the analysis. The opportunity to extensively analyze administrative data, which is only mentioned briefly in chapter 2, also contributed to the project. While very few of those results have found their way into this Final Report, the data analysis that was done on administrative data both sharpened the focus of the study and improved the confidence in our methods.

A very extensive effort was made to be as comprehensive as possible when selecting disability prevention and management behaviors to be included in the study. Chapter 2 recounts that effort, which involved a literature review, expert input, and an intensive process of development and refinement. This process extended even after the data had been collected, as the mapping of the instrument items into independent variables for analysis was

revised based on the actual patterns of response. Every effort was made to maximize the specific behavioral content of the independent variables, and to make them as interpretable as possible. This reflected the dedication of the project team to making the results useful to individual employers as they attempt to reduce the incidence and/or duration of disability in their establishments.

There were, of course, some disappointments during the project. The necessity to omit all employers with less than 100 employees from the sampling frame was very unfortunate. We believe that our findings have relevance for smaller employers, but we have not had the benefit of studying them directly, to understand the different context within which their disability prevention and management policies must operate. It is critically important for someone to extend these findings to smaller establishments.

We were also very disappointed in the lack of performance of the **ERGONOMIC SOLUTIONS** and **WELLNESS ORIENTATION** variables in the multivariate analysis presented in chapter 4. We believe very strongly from our literature review and site visits that ergonomics and wellness are important contributors to a truly effective disability prevention and management program. However, we are not able to verify this from the quantitative evidence developed in the study. As explained in the text, we believe that the failure to establish the statistical significance of these two variables reflects a combination of inadequate measurement and low frequency of occurrence. Further research is needed to probe the contributions of ergonomics and wellness to reducing work-related disability, perhaps a longitudinal panel study will be required.

Despite the disappointments, the basic goals of this research project were accomplished. The methodological challenges to the pilot study have been answered. Quantitative estimates of the contribution of disability prevention and management policies and practices have been developed. In addition, a rich set of qualitative findings were derived from the site visits. These went far beyond verifying the survey responses; they provided an operational understanding of how these policies and practices work in reality and

identified strategies for their successful implementation. Many examples of the insights developed were presented in chapter 5, but there is no adequate way to fully share the lessons learned by these employers as they have faced the challenges of preventing and managing their disability problems more effectively.

## **Findings**

The study clearly demonstrated that *safety pays*. The constellation of behaviors that we labelled SAFETY DILIGENCE proved to be the most powerful variable in the study. Using our Disability Prevention Model, 10 percent better achievement of SAFETY DILIGENCE was associated with the reduction of MIOSHA Recordables by 5 percent, Lost Workday Cases by 13 percent, and Workers' Compensation Wage-Loss Claims by 22 percent. This is an amazing performance, and it is even more amazing considering it was demonstrated in the context of a multivariate analysis where many other important variables were competing for attention.

When SAFETY DILIGENCE was included in our Summary Model, 10 percent better achievement of SAFETY DILIGENCE was associated with a 17 percent reduction in total Lost Work Days. These results demonstrate conclusively that a solid injury prevention effort is still the first line of defense against disability. SAFETY TRAINING also demonstrated its contribution in reducing disability in the workplace. Our Disability Prevention Model estimates showed that 10 percent better achievement of SAFETY TRAINING was associated with 6.5 percent fewer Lost Work Day Cases across the 220 establishments in our sample.

ERGONOMIC SOLUTIONS did not establish a statistically significant connection with any of the outcome variables in the study. But that does not mean that we proved that ergonomics does not matter. In particular, the most advanced thinking about disability prevention today is in "designing out" the injuries from the jobs, particularly in the case of repetitive strain injuries. This is the current frontier of disability prevention efforts, and perhaps it is too early to establish its impact with a cross-sectional research design.

The study also clearly demonstrated that *disability can be managed*. On the disability management side, our PROACTIVE RETURN-TO-WORK PROGRAM variable was the star performer. In the empirical estimates of chapter 4 using the Disability Management Model, PROACTIVE RTW PROGRAMS showed substantial impacts. Ten percent better achievement of PROACTIVE RTW PROGRAMS was associated with 13.6 percent fewer Lost Work Day Cases and 8.7 percent fewer Workers' Compensation Wage-Loss Claims, other things equal. This, too, is a very impressive performance. When PROACTIVE RETURN-TO-WORK PROGRAMS were included in the Summary Model of chapter 4, it was seen that a 10 percent better achievement of PROACTIVE RTW PROGRAMS was associated with 7.3 percent reduction in Lost Work Days. These results demonstrate conclusively that PROACTIVE RETURN-TO-WORK PROGRAMS significantly reduce the impact of disability when injuries do occur.

DISABILITY CASE MONITORING was the most surprising variable in the study. It showed a perverse impact in our estimates of the Disability Management Model in chapter 4. A 10 percent greater achievement of DISABILITY CASE MONITORING was associated with 10 percent more lost work day cases and 3 percent more workers' compensation wage-loss claims! Our interpretation of this finding is that it probably reflects some interaction between DISABILITY CASE MONITORING and the corporate culture of the establishment. Because the nature of many of the behavioral items included in DISABILITY CASE MONITORING can have a regulatory or policing quality, we hypothesize that DISABILITY CASE MONITORING only has the intended effect when it is practiced in a people oriented company environment along with assistive interventions to reduce disability impacts, such as those in PROACTIVE RETURN-TO-WORK PROGRAMS.

WELLNESS ORIENTATION did not establish statistical significance in the Disability Management Model or the Summary Model of chapter 4. As discussed earlier, we believe that this is due to the measurement shortcomings of the factor and some collinearity with other variables. As in the case of ERGONOMIC SOLUTIONS, we simply were unable to prove its effectiveness with the methodology employed in this study.

The final independent variables to be discussed are those included in the Management Model of chapter 4. PEOPLE ORIENTED CULTURE and ACTIVE SAFETY LEADERSHIP were treated separately because they were highly coincident with the operational variables. Thus it was not empirically feasible to estimate the effect of both sets of variables simultaneously. Nevertheless, when they were isolated in the Managerial Model, they also showed an impact on disability prevention and management performance. A 10 percent greater achievement of PEOPLE ORIENTED CULTURE was associated with 5.7 percent fewer Lost Work Days and 11.1 percent lower Workers' Compensation Payments. The comparable 10 percent greater achievement of ACTIVE SAFETY LEADERSHIP was associated with 4.2 percent fewer Lost Work Days, although this result was not statistically significant.

The managerial variables show the way in which the company environment shapes disability prevention and management performance. While our sample is not large enough to support analysis of conditional probabilities, it seems clear that the existence of a supportive company environment, as measured by PEOPLE ORIENTED CULTURE and ACTIVE SAFETY LEADERSHIP, helps to determine how particular disability prevention and management policies will be received by injured workers. In the first place, company cultures that emphasize the importance and value of people and their safety seem to create certain reciprocal values among employees toward their work, the way they regard their jobs and toward the company. Presumably, demonstrating these values generates employee trust toward company policies. Presence of these managerial variables is thought to work to enable the operational disability prevention and management policies and practices. Thus they set the context in which the other variables perform positively.

Some other variables also were shown to be important in determining establishment performance on disability outcome measures. The percentage of workers with less than one year of tenure was an example. Across a wide variety of outcome measures, a 10 percent increase in the number of low-tenure workers was associated with 1 to 2 percent greater disability incidence.



Establishments that were part of multiple plant firms were shown to have 25 percent fewer MIOSHA Recordables and 18 percent fewer Workers' Compensation Wage-Loss Claims than stand alone establishments, controlling for other performance influences. In addition, larger establishments (over 500 employees) were consistently shown to have lower rates of disability than medium sized establishments (250 to 499 employees), ranging from 20 percent to 51 percent depending on the specific outcome measure. Small establishments (100 to 249 employees) had 20 percent fewer MIOSHA Recordables and 20 percent fewer Workers' Compensation Wage-Loss Claims than mid sized establishments.

Unionized establishments demonstrated consistently higher incidence of disability, from 17 percent higher MIOSHA Recordables to 22 percent higher Workers' Compensation Wage-Loss Claims. This result begs the question of whether the security produced by the presence of the union allows more open reporting of injuries, disabilities, and wage-loss claims, as discussed earlier. In contrast, it may be that the formalized roles and process of labor and management in organized workplaces inhibit the type of teamwork and flexibility that characterize successful programs. Experts have long held that workers' compensation claims and costs are often key indicators of the quality of the climate within an organization. Given the consistent linkage between unionization and company performance in this study, it clearly provides an important diagnostic variable. In any case, further research is warranted to explore this relationship more fully.

Higher wages are associated with fewer Lost Work Day Cases, fewer total Lost Work Days, and fewer Workers' Compensation Wage-Loss Claims in our results. On the average, an employer that pays 10 percent higher wages to production workers, reported from 6 to 9 percent lower disability incidence or cost, other things equal. Presumably this reflects the occupational mix of the workers, the less adequate income replacement from workers' compensation for high wage workers, and other influences.

In addition, our results demonstrated that companies that are self-insured have 20 to 50 percent more disability, again depending on the specific measure. This is not the

expected result, but probably reflects the fact that the decision to become self-insured is primarily a financial decision and does not indicate anything about the dedication of the firm to disability prevention and management. If so, losing the loss control and case management services of a professional workers' compensation carrier without developing comparable internal systems and expertise would be expected to eventuate in poor disability prevention and management performance.

### **Implications for Employers**

There are many valuable messages that this research has collected from innovative employers that can be useful to other firms. Looking at the findings from the perspective of the employer, one can identify several themes to guide the actions of employers in furthering the development and refinement of their own efforts to prevent and manage disability, such as the following:

**Inform** - Employers, their managers, and their employees must be informed about the company's performance regarding injuries and disabilities and the goals that are to be obtained. This requires a comprehensive data system to integrate information across functional areas, including safety, human resources, and workers' compensation, as well as a flexible dissemination process that makes these data available on a timely basis to a variety of users to accomplish a multitude of objectives. Further, all participants must be informed as to the expectations for their performance, and the company must have a system in place to evaluate the effectiveness of performance at individual, group, department, and company levels over time. All employees must be informed about the importance of disability prevention and management for their personal well-being and the company's success.

**Involve** - Achieving the behaviors necessary for a successful safety and disability prevention program requires the active involvement of employees at all levels. Thus, firms must develop a cooperative process that involves employees to control risks and address disability problems. This process must empower participants in order to

motivate and reinforce the importance of their participation, and to genuinely address needs. Safety performance cannot be achieved by management directive alone.

**Prevent** - This project has clearly demonstrated the primary importance of prevention. Preventing the injury from happening in the first place was repeatedly shown to be critical to excellent firm performance. Thus, the study provides collaboration for the old slogan, *safety pays*. Employers who have not yet learned this lesson, who regard disability costs as just another cost of doing business will have higher costs and lower profits.

**Accommodate** - When injuries occur and impairments do result, in addition to the provision of quality medical care, accommodation is the employer's best solution for preventing adverse disability outcomes. Those firms that adopt accommodation as a human resource policy and implement it with adequate technical support and effective procedures save substantially on their incidence of lost work time, disability, and costs. Further, this policy assists the company in demonstrating compliance with the Americans with Disabilities Act and prepares the firm to retain the productivity of other workers who will develop performance limitations through the course of their employment.

**Coordinate** - Disability prevention and management requires a total organizational effort that must involve internal coordination across the various staff levels, departments, and functions of the organization. Further, a successful program requires coordination with any external providers that it uses, including its workers' compensation insurance carrier or administrator. The superior results of successful firms are not achieved by single departments; rather, they are achieved by companies that have sufficient leadership and determination to implement and maintain a coordinated approach to their disability prevention and management efforts.

**Manage** - Successful firms, regardless of their size, have a proactive, managed process within the firm that uses data to monitor, track, evaluate, and assign responsibility for the injury management, return-to-work, and case management process. This management function may reside in various departments or with different types of personnel. The critical feature is that there is designated managerial responsibility and a process to exercise company control at critical points in the injury and disability continuum. Although external resources may be used, successful firms retain final responsibility for the process and its outcome. They delegate, but do not abdicate, their responsibility.

**Partnership** - Given the complex and comprehensive nature of successful disability prevention and management, it is easy to understand why those employers who have been successful in their efforts have established positive partnerships with the parties involved. Firms must achieve a level of cooperation and partnership with their employees, with their insurance carrier or administrator, with the health and rehabilitation providers that they use, and with supportive public resources that can facilitate their efforts. A team approach within the company and as a strategy by the firm with its providers will facilitate the continued success of an effective program.

### **Implications for Employee Groups**

The message of the research is very positive for individual employees, persons with disabilities, and groups who represent their interests. To date, the emphasis of disability prevention and management has laid the burden at the employer's door to implement these programs. It is clear from the findings of this research that supportive employee groups can have a major impact on the quality of the policies and practices adopted by the firm, and in the results that are achieved for individual employees. It would seem advisable that employee groups should get involved in this mission and demand a seat at the table, both within the firm and in larger policy debates, to advance these concepts. These groups can have an invaluable role in educating employees, in assuring that the program is responsive to the needs of workers, and in insisting on quality in all aspects of the program's development

and its operation. Given the magnitude of cost differences, labor organizations should see this as an opportunity to generate a competitive advantage that protects employment. Clearly, the unnecessary costs of prolonged disability by firms which are failing to prevent injuries or to accommodate resulting disabilities have direct implication for reduced competitiveness and eventual reductions in employment. This research offers an agenda for labor that can contribute to its members physical well-being while also working to protect their jobs.

### **Implications for Workers' Compensation Carriers/ Administrators**

From the positive and negative experiences of our study employers, we believe that those insurance carriers/administrators are more effective who: (1) work in active partnership with their employer customers, (2) provide loss control consultation that addresses specific risks encountered, (3) provide timely and useful workers' compensation data to the firm for the firm's own internal tracking and problem analysis, (4) help employers develop their internal capacity to take an active role in disability prevention and management activities (e.g., loss control, case management, return-to-work), (5) assist firms in locating and coordinating care from qualified and responsive health care providers, and (6) provide economic incentives to employers who demonstrate their capacity to prevent and manage disability.

In a competitive market, as employers realize they have the potential to improve their disability experience, those carriers that provide more responsive services to employers in helping them analyze, prevent, and effectively manage their disability experience will be more appealing and likely to achieve greater market share and profitability. At this point several workers' compensation carriers and administrators have developed innovative services to address these employer needs. The market will reward such efforts.

### **Implications for Health Care and Rehabilitation Providers**

It has become clear that work disability is not simply a medical phenomenon. Therefore, providers who seek to be an active and valuable part of the disability prevention

and management initiative must see themselves and their services as part of a larger, coordinated process and system. They must learn to work in partnership with employers, injured workers, and other involved parties as one of the sources in the decisionmaking process. Innovative providers are moving toward a new model of health care and rehabilitation that is centered or coordinated at the workplace, in partnership with the employer and its employees.

Care can no longer be structured as a sequential, linear process that focuses on medical outcomes alone. Rather, to be effective in managing disability, health care must be integrated with the return-to-work process. In the past, most employers have waited passively until the provision of health care services is over and recovery is completed before pursuing plans for workplace accommodation. This research provides additional evidence that a proactive process of injury management and return-to-work that is carefully orchestrated with the health care and recovery process can achieve superior outcomes for all parties.

Given the demonstrated value of early intervention, health care and rehabilitation, providers need to modify their services to adapt them for early intervention that helps prevent unnecessary work disability. Those employers who had developed relationships with providers that were capable of providing a timely, responsive, and coordinated system of service and communication to the workplace were much more effective in controlling their disability experience. Truly informed employers are seeking the complementary criteria of quality and efficiency in the provider resources that they use.

Providers must develop models of care delivery that involve both the employer and employees as joint customers of their service. Those providers who are able to keep the workplace and the employment situation as the focus of activity are more facilitative of the disability management process. This "de-medicalizing" of disability management presents new challenges for delivering care that achieves high quality and meets professional standards, along with efficiency and relevance to the work environment of the injured

person. With increased employer diligence in seeking responsive providers, it will be necessary for health care and rehabilitation professionals to find ways to assure that their services add value to the disability management process and not simply added costs.

### **Implications for Government Officials and Policymakers**

Because the policies and practices supported in the study findings offer cost control measures that are supportive of the interests of both employers and employees, the study provides encouragement for the possibility of achieving the true intent of workers' compensation and occupational safety and health legislation. Assuring a safe workplace and providing prompt medical care and rehabilitation to enable return-to-work clearly are compatible with protecting the liability of employers and limiting the private and public costs of disability.

The research indicates that there is an opportunity to structure policy supports that would provide incentives in order to motivate employer adoption of these behaviors. Given the inherent self-interest of the employer in reducing costs and lost productivity, educational efforts to assist employers in adopting these strategies, and financial incentives to motivate the adoption of these strategies by employers who have not recognized the inherent benefits, would be valuable roles for public sector advocates to consider. At this point, several states are creating financial incentives, typically through the use of scheduled workers' compensation insurance credits, to reward employers for adopting these behaviors. Michigan has implemented a "good faith" credit against MIOSHA fines for firms who can demonstrate their efforts to prevent and manage disability. Others are developing requirements and monitoring procedures for the loss control services of carriers licensed to offer workers' compensation in order to promote behavior at this level. At a minimum, public policymakers and officials should actively cultivate the provision of education and the availability of supportive services to assist employers in adopting effective strategies. In most states, public agencies have some components of safety, public health, and vocational rehabilitation efforts that could be brought together and targeted to deliver consultation that would assist employers in adopting these policies and practices.

Policy officials must recognize, as many of their private employer colleagues have, that the prevention of disability is a comprehensive process involving at least two main parts. What occurs pre-injury to prevent occurrence and that which occurs in the post-injury process to effectively manage and curtail disability outcomes are both important. They must understand that both aspects of this process are necessary to achieve superior results and that the integration between these components is critical in determining the effects of interventions undertaken. As pointed out, the benefits of injury prevention through SAFETY DILIGENCE and SAFETY TRAINING are well recognized. In this research, the further benefits of reasonable accommodation in those firms that have developed a systematic and effective approach to the return-to-work process are also identified. Further, employer success in retaining employees who become disabled in employment represents a significant part of the solution to the public sector costs and negative employment status of persons with disabilities. Public policy should recognize and support these retention efforts, along with safety initiatives, and consider this as a significant private sector contribution to the problems of disability and employment in our society.

In conclusion, we have shown in this project that disability can be prevented and successfully managed to the benefit of the company and its employees when it is a conscious and coordinated part of the company's overall goals. The twin strategies of trying to prevent injuries in the first place, and working to minimize their disabling effects through disability management techniques in the second place, are both shown to be productive in reducing workplace disability. Employers who work in partnership with their employees, their insurance administrator, and their health care providers can substantially control disability costs and achieve more productive and cost-effective outcomes through a proactive process of injury prevention, injury management and return to work.

It is now time to put these lessons to work for all of us.





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