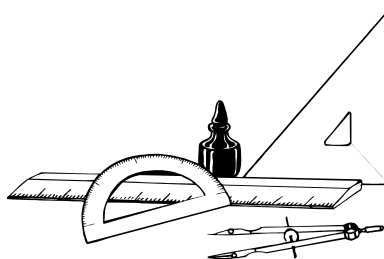


Measuring Return to Work



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Measuring Return to Work

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*Thanks to the LMEA staff at the
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Executive Summary

The return of injured workers to the workforce is an important goal of any workers' compensation system. Increasingly, measurement of return to work has become a component in program evaluation of workers' compensation systems.

Ongoing measures of return to work in Washington State have been nonexistent. A number of detailed studies have examined return to work rates at certain points in time. Often these studies were designed to measure the effectiveness of a new or changed policy or program; when the review period ended, and the questions regarding the project or policy change were answered, the measurement of return to work ceased.

In 1998, an audit of The Department of Labor and Industries was conducted at the request of the Joint Legislative Audit and Review Committee. One recommendation of the JLARC audit was that the Department, in measuring claims management performance, should emphasize successful return to work.

This study of return to work presents measures that can be used on an ongoing basis to report on return to work. What constitutes successful return to work is open to debate and continues to be explored. The measures presented are appropriate for measuring return to work in the aggregate, not the experience of individual claimants. The measure for return to work following injury is a point in time measure of employment status at one and two years. It does not provide a measure of total work disability and it assumes that work disability immediately follows the injury. This type of measure may underestimate the total burden of work disability (Krause et al., 1999).

As with any analysis of administrative data, the data used in this study has limitations. Workers compensation data available for state fund claims is more comprehensive than that for self-insured claims, particularly for non-compensable claims, limiting the types of analysis that can be performed. In addition, wage data used to track employment is limited to Washington State, and thus post injury employment in states other than Washington cannot be identified.

The measures are not intended as a tool for comparing the performance of the state fund system to that of the self-insured. The return to work rates, and the percentage of workers earning 80% or more of pre-injury wages, do differ between those covered by the state fund and those covered by self-insured firms, and the differences are discussed in this analysis. However, these differences likely have a great deal more to do with the characteristics of firms that self-insure (Reville et al.) rather than claims management practices.

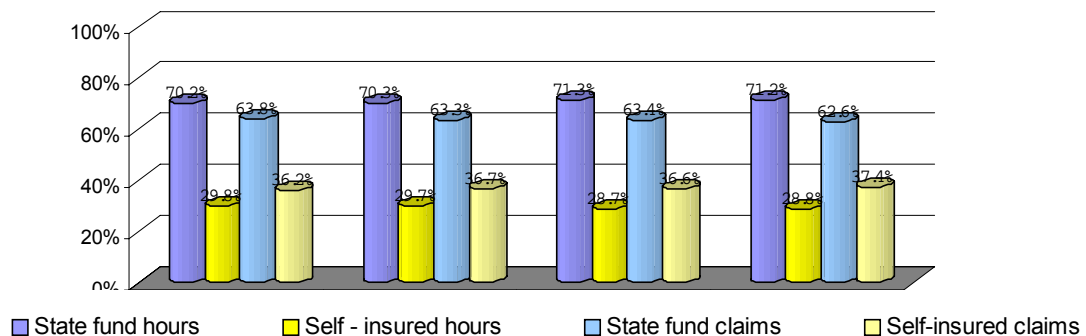
Firms that self-insure have common characteristics that distinguish them from the typical state fund firm:

1. Size
2. Higher Wages
3. Concentration in certain industries.

In Washington, there are approximately 400 self-insured employer accounts, and about 160,000 state fund employer accounts. Self-insured firms cover approximately 30% of employment subject to state workers' compensation law. Self-insured firms account for a disproportionate 37% percent of total compensable claims (Chart 1).

Chart 1

Percent Distribution of Hours and Compensable Claims by Insurance Coverage Type, 1997 - 2000



Current coverage: State fund = 160,000 accounts, 1.5 million employees (full-time equivalents). Self-insurance = 400 accounts, .6 million employees (FTEs) . Note: numbers are approximate and change daily.

In addition to differences in firm characteristics, and perhaps due in part to these differences, the claimant populations differ between the two insurance systems. A higher proportion of state fund claimants are: male, younger, single, employed in agriculture and construction, and living in rural and distressed areas (Appendix A). Given that all of these factors have the potential to influence an injured workers return to work and return to pre-injury earnings levels, it is important to keep them in the mind when viewing the measures.

Many factors other than those related to the injury affect return to work. Any analysis of return to work should consider this. The findings of this study include:

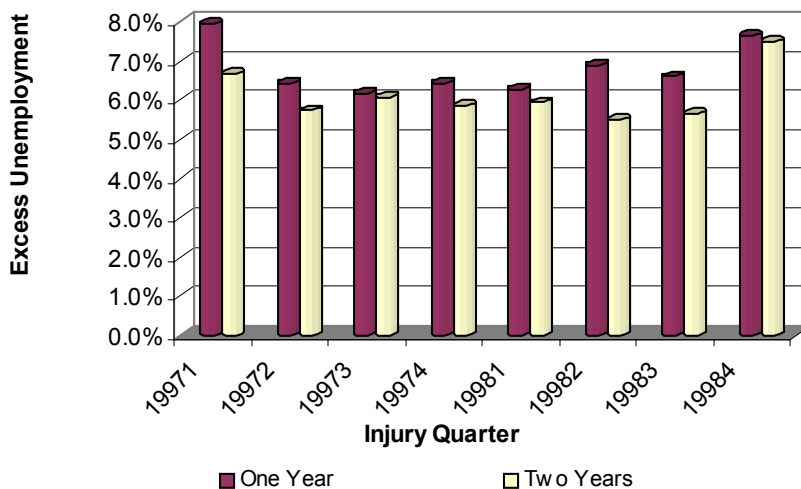
- Excess unemployment, defined as that portion of unemployment among injured workers that would likely not have occurred but for the injury or

disease, is higher among workers with claims covered by the state fund. As previously discussed, this is likely due in part to the very characteristics that allow a firm to self-insure, primarily firm size, and the expanded return to work options that large firms can provide.

- The employment status and earnings of workers covered by self-insured firms stabilize more quickly following an injury. Differences in excess employment levels between self-insured and state fund claimants are larger at one year following injury than at two. Self-insured workers in general show more volatility in earnings and employment between the first and second year following an injury than that of their state fund covered counterparts. This appears to be due to factors other than the injury, but indicates that initial outcomes may not be sustainable. Future research is needed to confirm this. A similar finding of diminished differences over time in employment status between insured and self-insured claimants was reported in a RAND study of permanent disability claims in California (Reville et al., 2000).
- As the age of workers with state fund time loss claims increases, so does the likelihood that they will not return to work at all in the two-years following injury. This is true of each successive age group beginning with the youngest group, 16-19 year olds. This pattern is not seen in the self-insured data where workers in their middle years are more likely to return to work.
- Workers in agriculture, forestry and fishing, and construction tend to have longer delays in returning to work.
- Excess unemployment at one and two years following injury varied by less than 2 percentage points over eight injury quarters analyzed (Chart 2).

Chart 2

Excess Unemployment at One and Two Years Following Injury - All



Many other factors influence whether a worker will return to work, whether the return will be successful and how long that success will be sustained. It is known that incurring a workplace injury and illness can affect a worker's life and earnings potential far beyond the immediate years following injury (Fulton-Kehoe et al., 2000). The data system established for this analysis will allow for the ongoing measurement of return to work that was recommended in the JLARC audit. It will also allow additional research to be conducted on the many possible variables that influence return to work.

Background

This study stems from a recommendation made in the 1998 Workers' Compensation System Performance Audit. The audit was conducted at the request of the Joint Legislative Audit and Review Committee. One of the audit recommendations dealt with measuring claims management performance. The specific recommendation was, "The measurement of claims management performance should be changed to emphasize prompt payment, three-party contact, and successful return to work." This study deals with the third component of this recommendation: developing a return to work measure.

The Department of Labor and Industries' Planning and Research Services Program staff has researched the various factors involved in developing a return to work measure and established the data system necessary to provide an ongoing measure of return to work. The development of this measure and the initial findings are reported here.

The return to work measure will allow for ongoing reporting of the return to work outcomes of the claimant population and may shed light on agency performance with regard to this aspect of the workers' compensation system. There is, however, a vast amount of knowledge yet to be learned regarding the factors that affect return to work and the role of the Department in influencing these factors.

Certain demographic characteristics correlate either positively or negatively with return to work. These include items such as age, sex, marital status, educational attainment, pre-injury industry etc. Knowledge of the effects of these factors could help with targeting return to work interventions and other proactive efforts aimed at returning injured workers to employment.

Less well understood, and much more difficult to measure and respond to are the effects of claimant characteristics that are suspected to impact return to work, but for which no solid evidence confirming this argument exists. The impacts of

personal motivation, cultural expectation, work ethic, and other psychological factors, on return to work are very difficult to measure and not well understood. Clearly some factors that influence whether an injured worker returns to work are outside the control of the Department.

Research Design

In order to evaluate the work patterns of injured workers, wage data was obtained via a research data-sharing contract with the Department of Employment Security. This data is confidential; findings stemming from this research will be published only in the aggregate.

Data

Claims included in the study were selected based on claim status code. Medical only, time loss, and loss of earning power (LEP) claims were included. Medical only claims involve the payment of medical expenses only. Time loss claims, also called temporary total disability claims (TTD), involve workers who were unable to return to the job after a work related injury, payments are intended to partially replace wages. LEP claims, a subset of time loss claims, involve cases where the worker is not fixed and stable but is able to return to some form of work, payments are intended to supplement reduced income. If a claimant had multiple claims in the study quarter, the claim with the earliest date of injury was selected, with time loss claims taking precedence over medical only claims. The social security numbers of injured workers were matched to the Employment Security wage files to obtain wage records. Records for the injured workers were then separated into two groups, the study group and the comparison group.

The study group represents workers who were unable to work for some period after a workplace injury. Workers in this group received either a time loss or loss of earning power (LEP) payment, or both following the injury. To help isolate changes in employment status due to factors other than the injury, this analysis required the use of a comparison group.

The Comparison Group

Ideally, the comparison group would be comprised of a group of workers who had never suffered a workplace injury. Unfortunately many of the data elements needed for a thorough analysis of return to work patterns of injured workers such as information on occupation, age, gender etc., are not available in external databases. Data limitations made constructing such a group impractical. Instead, individuals with medical only claims were used to construct a

comparison group. These claims are generally for minor injuries that do not cause much interruption in the claimant's work.

In order to rule out other factors affecting return to work, it is important that members of the comparison group be similar in demographic, industrial, occupational, and wage earning capacity to the study group. Distributions by age, gender, risk class, and industry were compared. Descriptive statistics on the composition of the study group and comparison group are provided in Appendix A.

While overall differences in composition between the study group and the comparison group for each insurance type are small, inter-group differences between the self-insured and state fund groups are apparent and reflect differences discussed earlier: claimants injured while working at self-insured firms tended to earn higher wages and be concentrated in certain industries.

Measurement Issues

Unemployment

Many factors lead to unemployment. Economic cycles, retirements, deaths, marriage rates etc., can all affect employment rates among various populations over time, and any group observed over time will likely show a decline in the percentage employed. Unemployment rates during the study periods (including pre and post-injury periods) are shown below.

Quarterly Unemployment Rates, not seasonally adjusted, 1996 - 2000				
	Q1	Q2	Q3	Q4
1996	5.6	4.9	4.9	5.3
1997	5.3	4.6	4.4	4.6
1998	5.3	4.6	4.5	4.7
1999	5.8	4.7	4.2	4.4
2000	7.6	6.7	5.9	5.8

Washington State Employment Security Department, Labor Market and Economic Analysis Section LMEA , prepared in cooperation with the Bureau of Labor Statistics.

In order to evaluate the impacts of occupational injury or illness on return to work patterns, it is necessary to isolate the portion of unemployment among a group of workers that is presumably due to the injury as opposed to other extraneous factors. This study addresses this requirement through analysis of the comparison group, contrasting the employment patterns of the workers in that group with the more severely injured claimants in the study group.

For purposes of this analysis, the amount by which employment in the comparison group exceeds that of the study group is the measure of unemployment presumably due to occupational injury or illness. The following table and charts help to illustrate this point.

EXAMPLE DATA: Return to work at one year			
Percent employed at one year following injury			
Quarter	Study (Timeloss/LEP)	Comparison (medical only)	Excess unemployment (attributable to the injury)
97-1	84.1%	89.1%	5.0
97-2	85.9%	91.2%	5.3
97-3	85.6%	90.6%	5.0
97-4	86.2%	92.5%	6.3

Chart 3

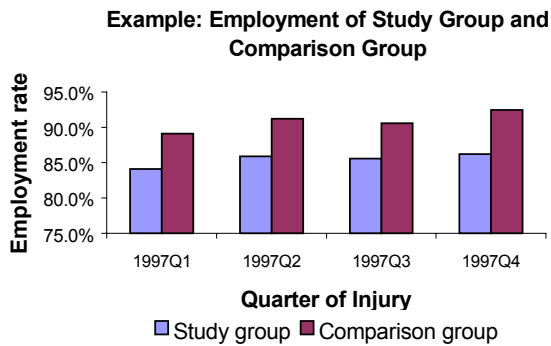


Chart 4



In the example above, an examination of the employment rates for the study groups in isolation would provide the impression that return to work rates improved in the second and fourth quarter. Taking the results from the comparison groups into consideration depicts a different picture: the difference in employment rates among the two shows an increasing level of excess unemployment among the second and fourth quarter study groups (Chart 4).

Methodology

Data Extraction

Claim records were identified by querying the Department of Labor and Industries data warehouse. Records were extracted for claimants with valid social security numbers. Records for any workers younger than 16 or older than 70 years of age were excluded.

Claims data were grouped based on the quarter of injury, as the data for return to work rates is presented by injury quarter. For example, the post injury return to work (RTW) rate for claimants injured in the first quarter of 1997 will be represented in the RTW rate for 1997 – Q1, the rate presented for 1997 – Q2 represents the return to work rate for workers injured in the second quarter of 1997.

An alternate approach to using the date of injury for analysis would be to utilize the claim received date. This proposition could mitigate some issues affiliated with using the date of incident, primarily claims with changing injury dates and occupational disease claims, a small portion of total claims. Another concern is that the injury date is not an indicator of Departmental knowledge of the claim; therefore using injury date as the start of a return to work measure puts the measure out of the time period for which the Department exercises control over the claim. Despite arguments in favor of using the claim receive date for grouping and analysis, it was rejected for the following reasons: this analysis utilizes a point in time extract, consequently changing injury dates are not an issue; reporting lags are an issue in a very small percentage of cases; and, concerning latent illnesses, if the date of injury falls during a period of retirement or unemployment due to some other purpose, the claimant would be excluded from the analysis by the study design, which requires that wages be earned during the quarter of injury or in any one of the 4 preceding quarters. The benefits of tracking return to work from the date of injury outweigh the potential complications.

Matching Records

The next step in the analysis involved matching the claimant records to the employment security wage files. The matching was done via a multi-step process using social security numbers (SSN) and name. The process was complicated by the existence in both databases of multiple individuals (based on name) having identical social security numbers and by the same SSN being used for seemingly different individuals in the two databases. (See Appendix A)

Once the Labor and Industries record was matched to a wage record, wage data was extracted for the claimant for the 4 quarters prior to the injury (Q -4 – Q -1), the quarter of injury (Q0), and the eight quarters following injury (Q 1 – Q 8). Wage records were analyzed and additional records were excluded if the following criteria was not met: In

order for a claimant to remain in the RTW study, wage records must have been found in at least one of the 4 quarters before the injury or in the injury quarter. This mechanism was put into place to exclude claimants who may be outside of the coverage of the unemployment insurance system and for whom it would be unlikely to find post injury wage records.

Wage Adjustments

The wage data was adjusted for inflation using the non-seasonally adjusted Consumer Price Index for All Urban Consumers (CPI-U) U.S. City Average (Bureau of Labor Statistics). Occasionally wage outliers are found on the wage file. This occurs due to a number of reasons, stock options for example. These outliers affect any analysis that involves looking at average wages, or post injury wages as a percentage of pre-injury wages. For this reason, wage data used in this analysis was capped at the 99th percentile wage. The cutoff value for each quarter was based on all wages reported in the quarter.

Findings

For this initial examination, return to work findings are presented for any return to work and return to work at a minimum of 80% of pre-injury wages. Return to work rates by industry division and age are also presented. Rates of return to work are presented for both one and two years following the date of injury.

A simple return to work measure can be calculated without considering the wages a worker receives following injury. However, such a measure does not address whether the return to work is “successful.” Earnings upon returning to work following an injury that are at least 80% of pre-injury wages are often used as a measure of success. Florida’s Division of Workers’ Compensation routinely reports on this rate and has termed it the “preferred rate” as a means of emphasizing that simply returning to work does not insure adequate compensation and incentives for continued employment. In the state of Oregon, placement into a job with adequate wages, defined as employment at 80% of pre-injury wages, is a statutory goal of vocational assistance.

Another argument for considering wage levels is that they are often deemed influential as an incentive in returning to work. A study of factors affecting return to work in Wisconsin found that workers returning to jobs at pre-injury wages go back to work an average of 2.6 days sooner (Galizzi, Boden). Studies have also shown that the probability of return to work decreases as the gap between wages and workers’ compensation benefits narrows (Butler et al. 1995). A Workers’ Compensation Research Institute report, summarizing a number of studies on the topic, states that “Studies of workers’ compensation find that a 10 percent increase in benefits raises the duration of temporary total disability by 2 percent and the number of claims by 3

percent.” The author (Gardner) goes on to state that, “This rule of thumb is a necessary simplification.” However, several recent studies looking at disability following low back injuries indicate that the positive affect of disability benefits on work absences may be overstated (Butler et. al. 2001, Dasinger Lisa K. et al.).

Attempts to quantify the complex interplay between the level of benefit and the impact on return to work prove difficult. However, the majority of literature points to the existence of such a relationship and based on these studies it seems likely that the higher one’s earned wages, the less attractive the replacement wages offered by the maximum allowable benefit.

Return to Work at One and Two Years

Return to work rates showed little change across the eight injury quarters included in this analysis. The percent of injured workers in the study group found employed at one year following injury ranged from 76% to 78%. Variation was slight with a low of 76.4% of workers injured in the first quarter of 1997 having employment at one year following injury versus a high of 78.5% of workers injured in the third quarter of 1997. Eighty-four to 85.1% of workers in the comparison group had employment in the fourth quarter following injury (Chart 5).

Chart 5

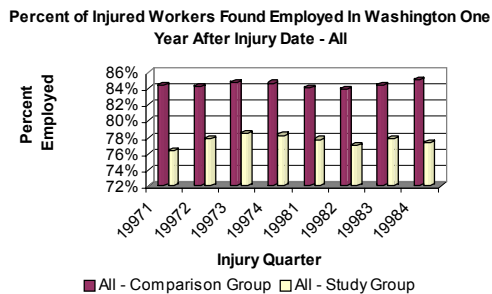
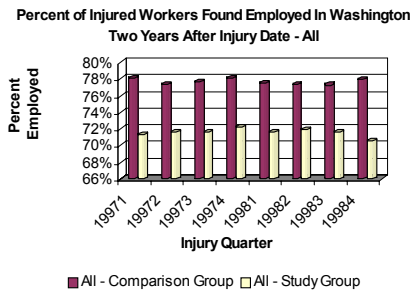


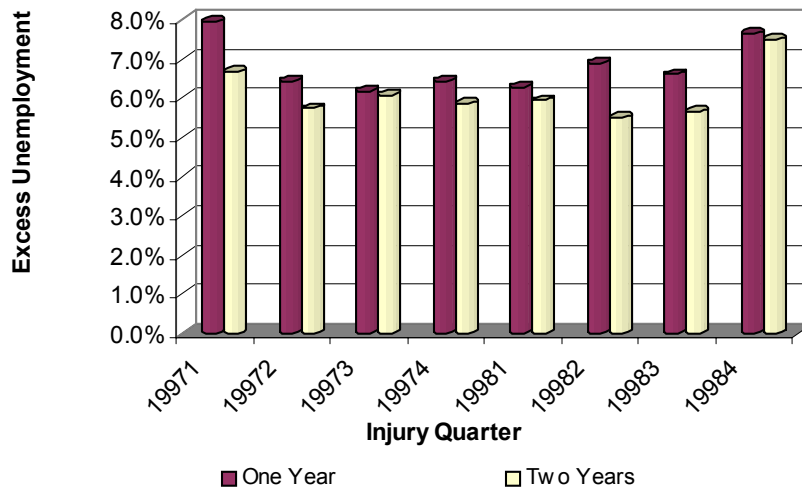
Chart 6



At the two year mark (eight quarters following injury), 71% –72% of injured workers in the study group were employed, approximately 6 percentage points less than at the one year mark. Seventy-seven to 78% of the comparison group were employed in the eighth quarter following injury, approximately 7 percentage points less than at the one year mark (Chart 6). This drop in employment levels between the fourth and eighth quarter following injury serves to illustrate an important point: even though employment levels in the study group dropped 6 percentage points, those of the comparison group dropped more, thus excess unemployment, that portion of unemployment presumably attributable to the injury, was slightly less at the two-year mark (Chart 7).

Chart 7

Excess Unemployment at One and Two Years Following Injury - All



As charts 8 & 9 indicate, workers employed by self-insured firms at the time of injury were more likely to be found employed at four quarters following injury than workers covered by the state fund. This was true for the study group, 86-88% versus 70-73% as well as the comparison group 87-91% versus 82-84%. This indicates average excess unemployment at one-year following the injury of 1.9% for workers injured while working for self-insured firms versus 10.5% for workers injured while employed by state fund firms. These are averages over the eight study quarters; actual excess unemployment levels are presented in charts 12 and 13. These differences in return to work rates between workers covered by the state fund versus self-insurance are likely due to the factors discussed earlier such as firm size, higher wages and concentration in certain industries.

Chart 8

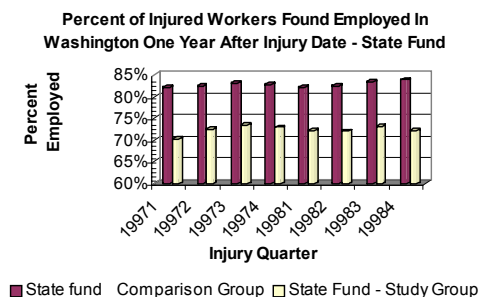
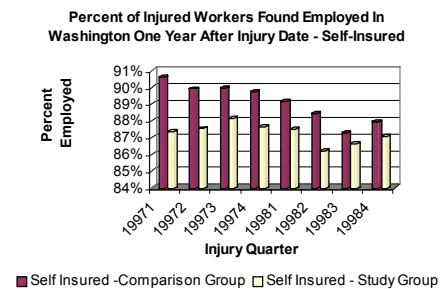


Chart 9



At the two-year mark, the percentage employed among the self-insured study group drops to 79-81% over the eight quarters versus 65-68% for the state fund group (Charts 10 & 11). The comparison groups show a similar trend at the two-year mark, with 81-

83% employed (self-insured) versus 76-77% employed (state fund). Average excess unemployment at the two-year mark over the eight study quarters remains nearly unchanged at 1.8% for injured workers employed by self-insured firms, but drops slightly to 9.4% for workers covered by the state fund.

For workers covered by self-insured firms and injured in the latter half of 1997 and first quarter of 1998, excess unemployment was slightly higher at the two-year mark than at one-year. Excess unemployment for workers covered by the state fund was consistently higher at one-year following injury than at two (Chart 12 & 13).

Percentage-point drops in employment between the one and two-year mark tended to be slightly larger for both the self-insured study group and control group than the respective state fund study and control group. This implies that while excess unemployment attributable to workplace injury does not change much from the one-year to the two-year mark for self-insured claimants, unemployment due to other circumstances does affect this group.

Chart 10

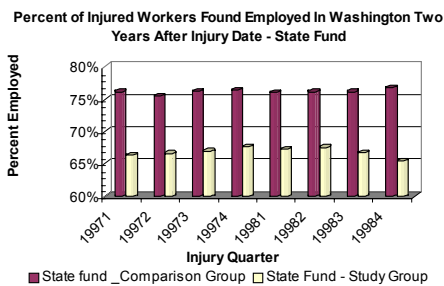
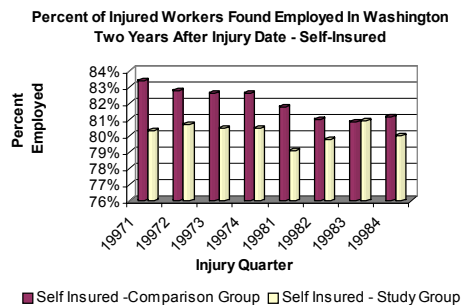


Chart 11



Changes across injury quarters (1997 Q1-1998 Q4) in the percentage of injured workers employed following injury were slight. Variability was higher for the self-insured comparison group than the state fund comparison group; the converse was true for the study groups where more variability in the percent of workers employed following injury was seen in the state fund. This was true of employment at both 4 and 8 quarters following injury.

At the one-year mark, state fund excess unemployment figures showed slightly more variability than self-insured rates (Chart 12). At the two-year mark, the reverse is true with the self-insured excess unemployment figures showing slightly more variability over the eight quarters (Chart 13).

Chart 12

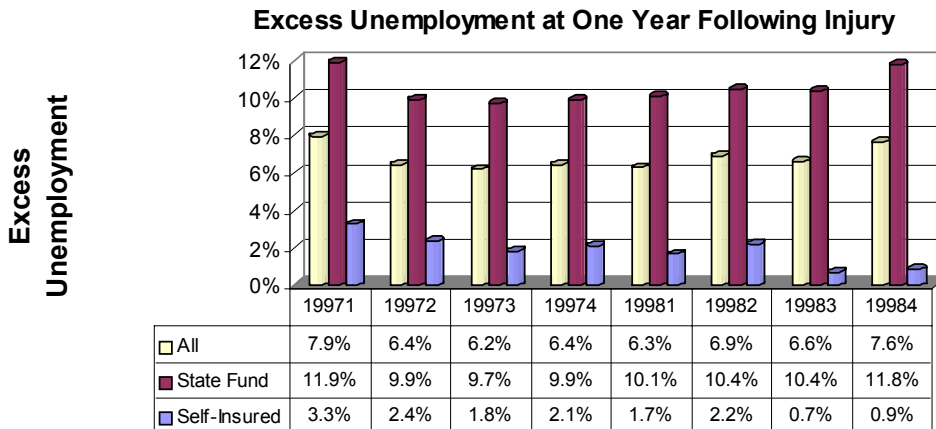
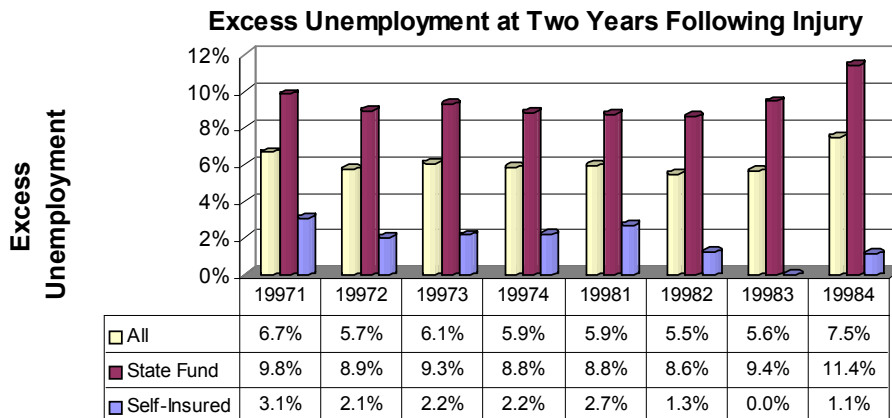


Chart 13



Return to Work Wages - Percent of Pre-injury Wages

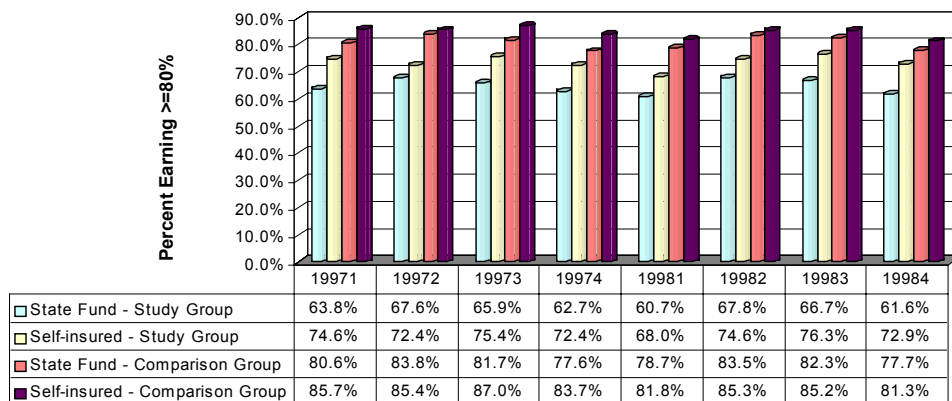
In addition to identifying how quickly injured workers return to the workforce, it is important to look at whether that return is at a level of participation in the workforce comparable with the worker's participation before the injury. For this analysis, pre and post injury wages were used to evaluate participation levels. The number of hours worked, the economy and job changes are representative of the many factors that affect wages. In an attempt to identify the portion of wage loss incurred by injured workers that is attributable to the occupational injury or disease, an analysis of post injury wages as a percent of pre-injury wages was completed for both the study and comparison group. The wage data was adjusted for inflation using the non-seasonally adjusted Consumer Price Index for All Urban Consumers (CPI-U) U.S. City Average.

The pre-injury wage was defined as the average wage for all four quarters prior to the injury quarter in which wages were greater than zero. Post injury wages during the first and second year following injury were calculated as the average of wages greater than zero and reported in quarters 1-4 (5-8) following the injury, or the fourth (eighth) quarter wage, whichever was greater.

Over the eight quarters, an average of 64.6% of workers in the state fund study group who returned to work earned 80% or greater of pre-injury wages during the first year following injury, while 80.7% of the comparison group did. Not surprisingly, a higher percentage of workers in both the self-insured study group and comparison group earned 80% or more of pre-injury wages during the first year following the injury at an average of 73.3% and 84.4% respectively (Chart 14).

Chart 14

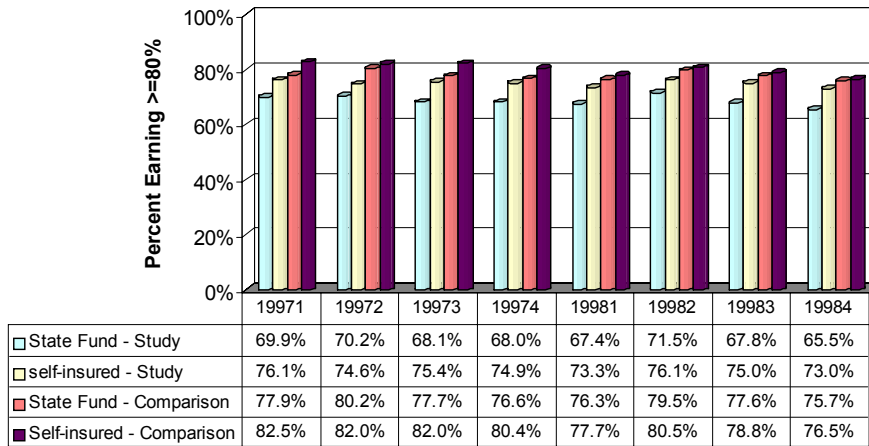
Earning \geq 80% of Pre-injury Wages During First Year Following Injury (Among Employed)



Earnings for those in the study group generally improve during the second year following injury. Over the eight study quarters, an average of 68.6% of employed workers in the state fund study group earned 80% or more of pre-injury wages during the second year following injury compared with an average 74.8% of the self-insured study group. Percentage employment at the 80% or greater level for the state fund comparison group averaged 77.7% compared to 80.1% for the self-insured comparison group (Chart 15).

Chart 15

Earning > = 80% of Pre-injury Wages During Second Year Following Injury (Among Employed)



As previously mentioned, among the employed, a higher percentage of workers in the study groups typically earn at least 80% of pre-injury wages during the second year following injury than during the first. An exception is observed among self-insured claimants injured in the third quarter of 1998. The percentage of these workers earning at least 80 percent of pre-injury wages actually dropped between years one and two. This appears to be due to a higher than average percentage of workers earning greater than 80% of pre-injury wages during the first year following injury, rather than a lower percentage earning that level of wages in the second year following injury. The self-insured comparison group for this same period showed the largest drop (first year to second year) in the percentage of workers employed earning at least 80% of pre-injury wages among the eight study quarters (Charts 16 & 17).

One hypothesis is that these anomalies are related to layoff events at the Boeing Company, which, according to published reports, caused the loss of approximately 10,000 jobs from mid-1998 to March 1999, and continued throughout the remainder of the quarters included in this analysis. Severance packages or other benefits associated with the termination of employment may have temporarily inflated reported wages causing a higher percentage of the self-insured study group to earn at least 80% of pre-injury wages at one year than at two years following injury. This could also help to explain the large first to second year percentage-point drop in workers in the self-insured comparison group earning at least 80% of pre-injury wages, as well as other observations regarding self-insured workers injured in the third quarter of 1998 including: relatively low employment observed at the one year mark in both the study and comparison group; a comparison group with low employment at the two-year mark; and, the lowest excess unemployment figures at one and two years of any quarters analyzed (Charts 11-13). To the extent that the study and comparison group are similarly affected, the influence of these events is minimal on the measure of wage loss presumably due to injury (Chart 18).

Chart 16

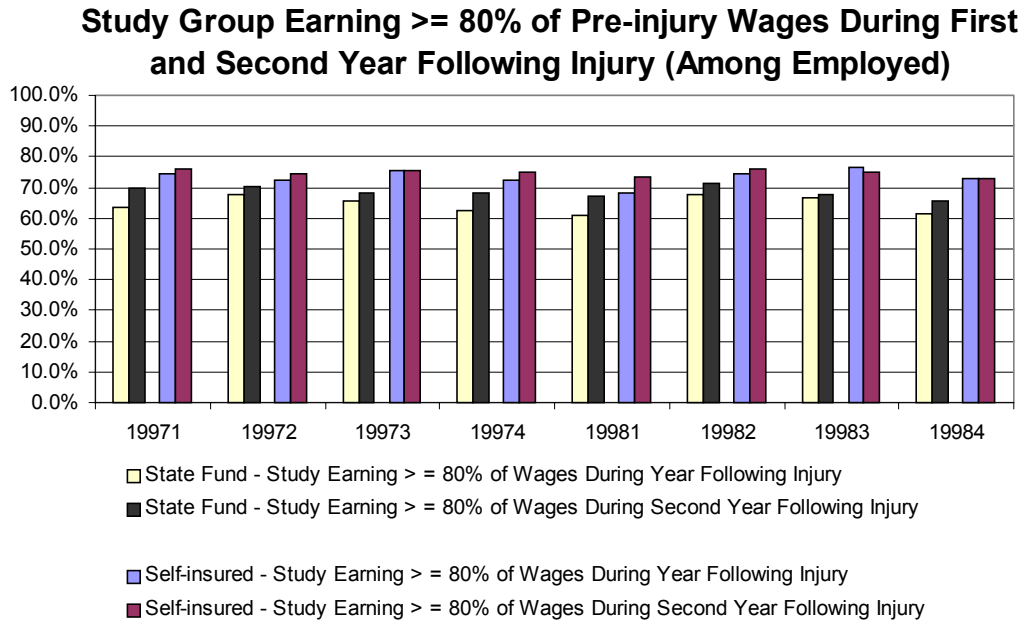
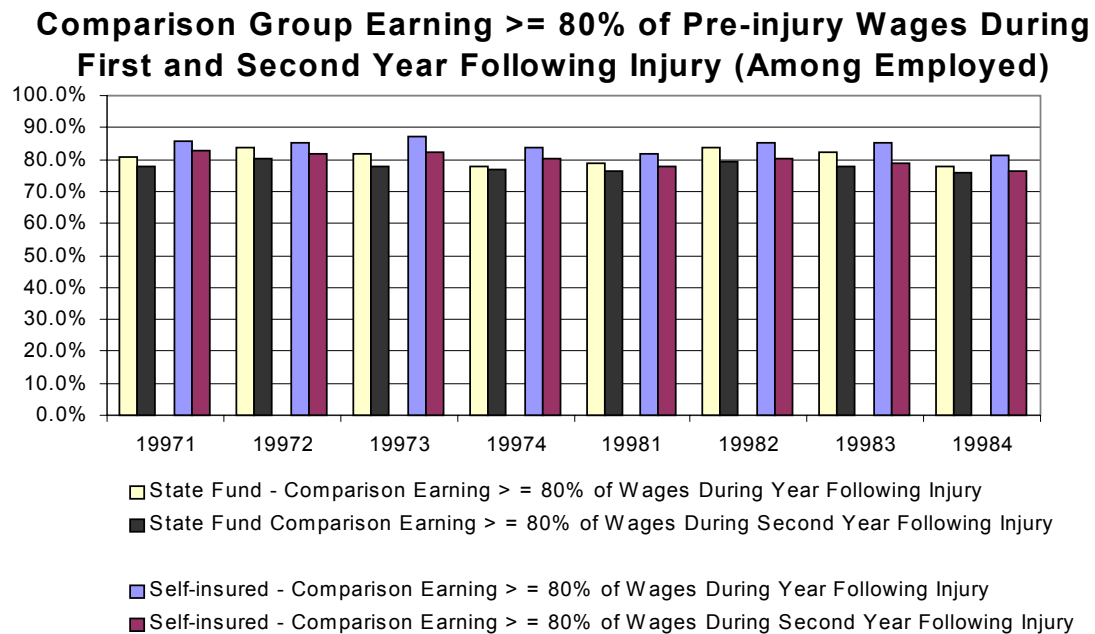


Chart 17



Comparing the percent of workers in the study and comparison groups earning less than 80% of pre-injury wages following injury helps to isolate that portion of the

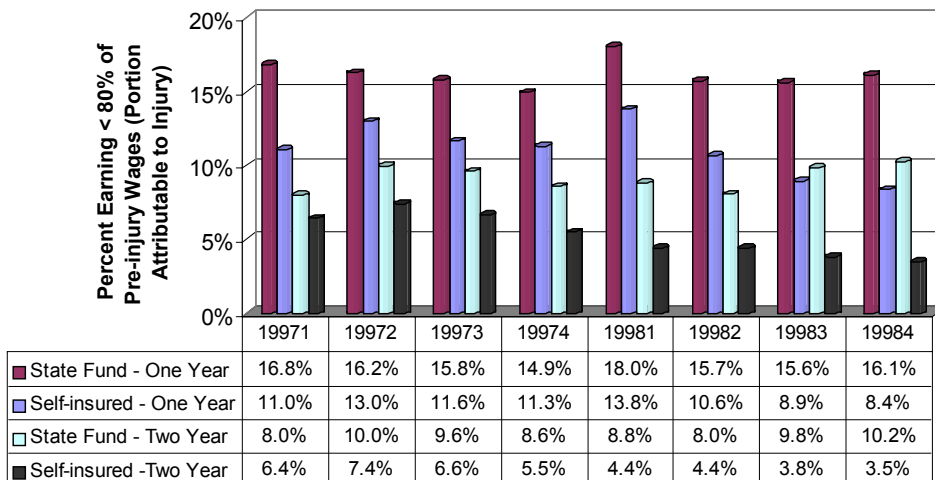
earnings loss attributable to the injury itself. Over the eight study quarters, the percentage of workers earning less than 80% of pre-injury wages presumed attributable to the injury averaged 11.1% for the self-insured group, and 16.1% for the state fund group during the year following injury (Chart 18).

During the second year following injury, the percentage of workers earning less than 80% of pre-injury wages, where the wage loss is presumed to be attributable to the injury, drops to an average of 5.3% for the self-insured group and 9.1% for the state fund group.

A higher percentage of workers injured in the first quarter of 1998 were earning less than 80% of pre-injury wages during the year following injury than those injured in any other quarter; this was true for both the state fund and self-insured study groups. Higher than average employment at less than 80% of pre-injury wages was also seen in the comparison groups for this quarter. However, the self-insured and state fund study groups for this quarter showed the biggest percentage-point increase between the first and second year following injury in terms of workers earning greater than 80% of pre-injury wages, while the comparison group showed a more typical drop in the percent of workers earning greater than 80% of wages. These factors combined resulted in employment rates at less than 80% of pre-injury earnings during the second year that were more typical (Chart 18).

Chart 18

Excess Employment at < 80% of Pre-Injury Wages During First and Second Years Following Injury (Among Employed)



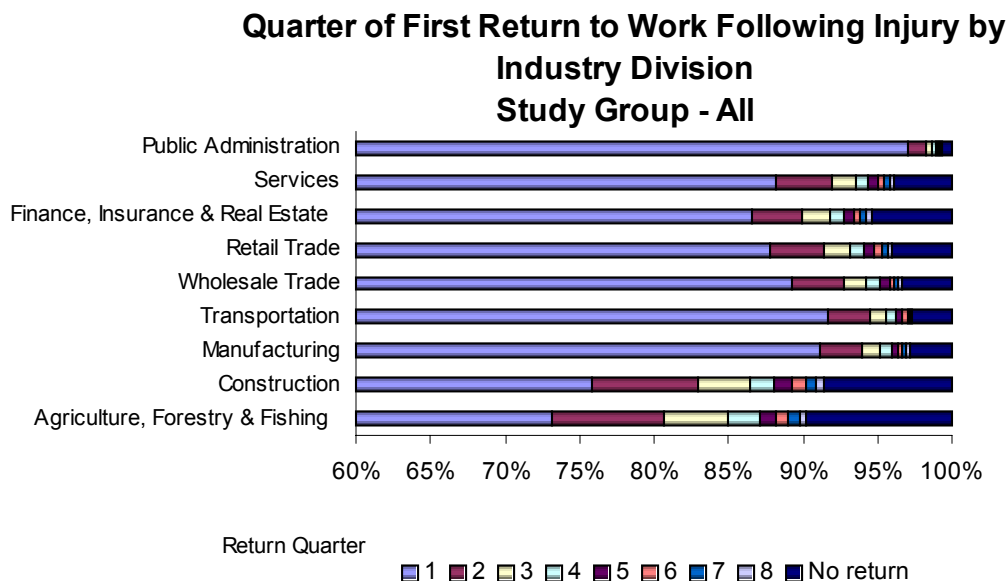
This report on pre and post injury wage earnings between those employed by state fund firms and those employed by self-insured firms illustrates that self-insured firms, as typically large organizations with varied operations, have more opportunities, options and incentives for returning injured workers to work. Light duty opportunities are often available as are opportunities for working in occupations other than the occupation at the time of injury. This is in comparison to the typical state fund firm, which tends to be smaller and less likely to be able to offer the same range of return to work options to the injured worker. A recent Rand study of permanent disability claims in California also found that workers injured at self-insured firms, who return to work, were more likely to return to the employer at the time of injury and were thus able to recoup wages faster (Reville et al., 2000).

Return to Work – by Industry Division

In this initial analysis of return to work measures, return to work patterns by Industry are examined in the aggregate rather than across study quarters. Industry assignments were based on the industry of employment at the time of injury.

Workers in agriculture and construction were less likely to return in the first few quarters following injury – or at all - than workers in other industries. This may be due to the severity of the injury or to the return to work opportunities available in those industries.

Chart 19



The state fund and self-insured study groups both displayed similar return to work patterns by industry. Workers injured while employed in public administration returned at the highest percentage in the first quarter following injury with 95.3% of the state fund group and 98% of the self-insured group earning wages in the quarter following

injury. Those employed in transportation and public utilities were the next most likely to return to work in the quarter following injury with 86.2% of the state fund study group and 96.6% of the self-insured study group returning in the quarter following injury. This compares to workers employed and injured in agriculture, forestry and fishing among which only 72.2% returned in the quarter following injury in the state fund study group and 85.6% in the self-insured study group and construction with 75.3% of the state fund study group and 88.6% of the self-insured study group returning in the quarter following injury (Charts 20 & 21).

Chart 20

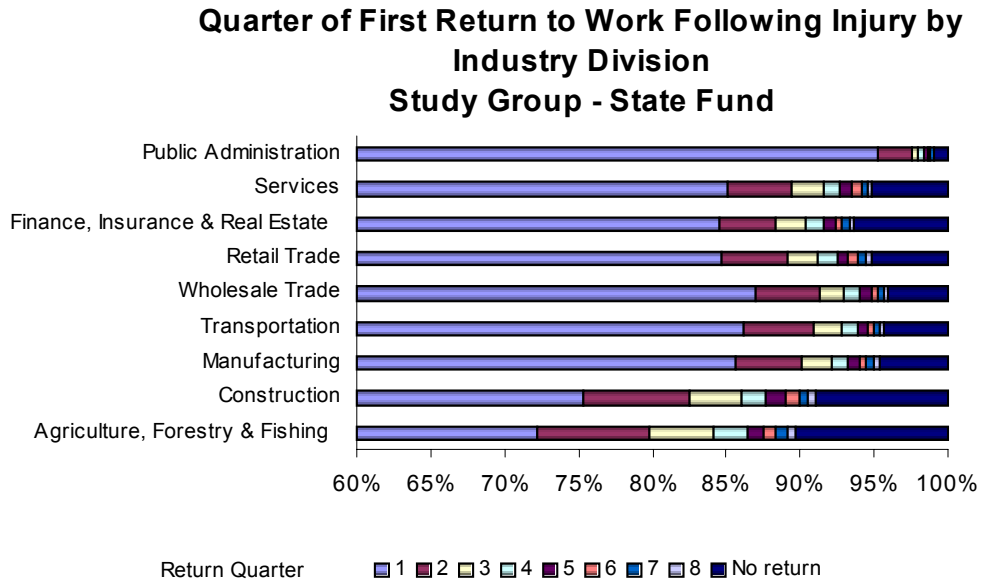
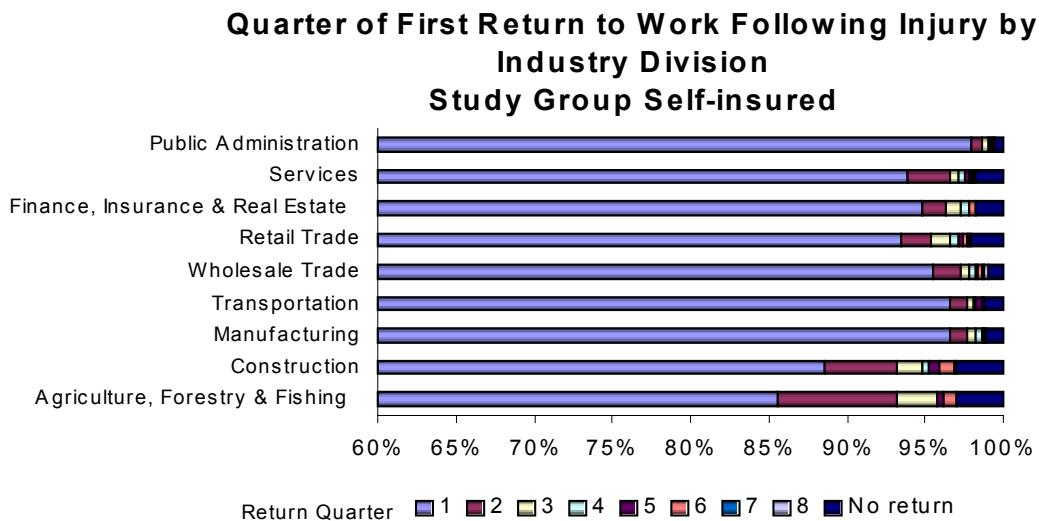


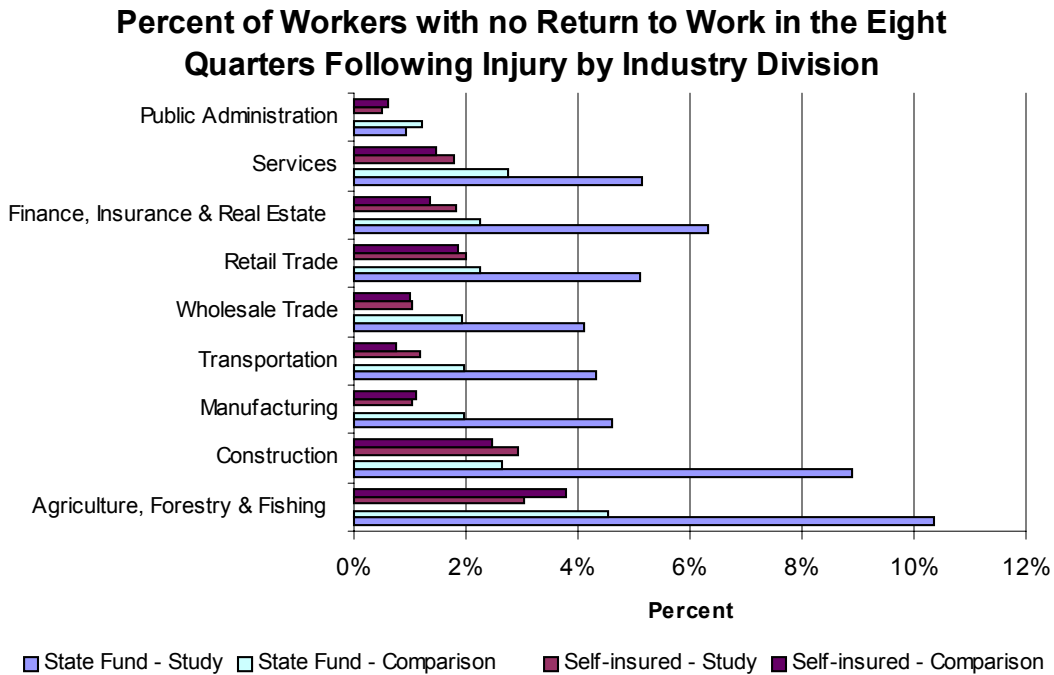
Chart 21



The comparison groups show an additional 15% of workers employed in agriculture, forestry and fishing in the quarter following injury for the state fund and 2.3% for the self-insured (not shown). In construction, an additional 15.9% of workers in the state

fund group and 4.0% in the self-insured group are employed in the quarter following injury. These figures represent the underemployment in the quarter following injury likely due to the injury itself as opposed to other factors.

Chart 22



The percent of workers with no work observed in the eight quarters following injury was higher in all divisions for the state fund study group than the comparison group with the exception of public administration in which the percentage in the comparison group was slightly higher than the study group. To the extent that the comparison group serves to represent workers without injury, this indicates that the small percent of workers who did not return to work in public administration during the eight quarters following injury may have been out of the workforce for reasons unrelated to the injury (Chart 22).

Differences in the percent of workers with no work observed in the eight quarters following injury were very slim between the self-insured comparison group and self-insured study group. This was true among all industrial divisions, emphasizing once again that workers employed by self-insured firms appear less likely to be out of work for an extended period following an injury due to the injury itself (Chart 22).

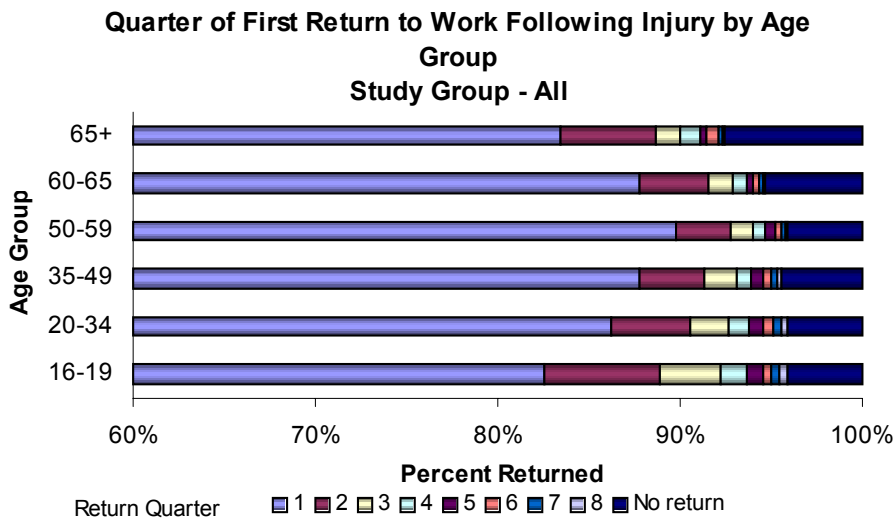
The number of claims in each industry category is presented by injury quarter in Appendix D.

Return to Work – by Age Group

As with the analysis of return to work patterns by industry, return to work patterns by age group were also examined in the aggregate rather than across study quarters.

As expected, lower percentages of the elderly and young are employed in the first quarter following injury than those workers injured in their middle years. Overall, workers aged 50-59 were the most likely to return to work in the first quarter following a time loss injury. Among the comparison group (not shown), 35-49 year olds were just as likely as those aged 50-59 to be employed in the first quarter following injury (Chart 23).

Chart 23



The same pattern holds when looking at the state fund and self-insured study groups individually. The return to work pattern across the age groups is similar, but as expected, the self-insured show higher rates of return in the earlier quarters (Charts 24 and 25).

Chart 24

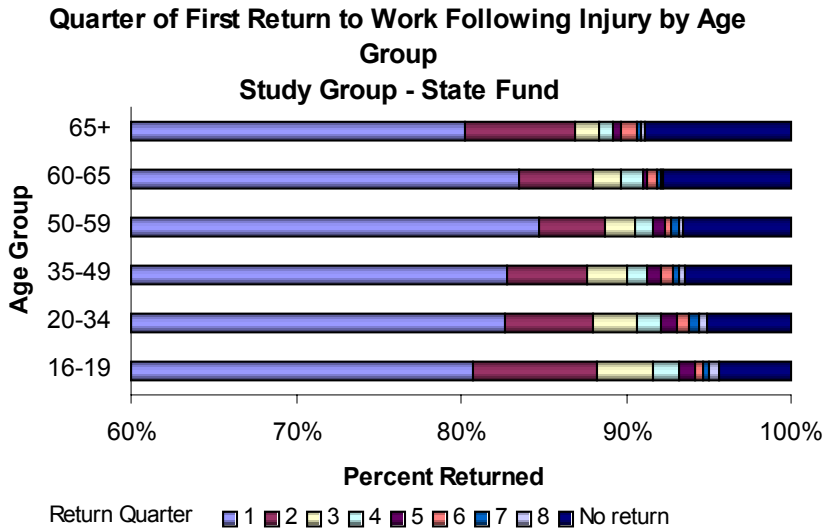
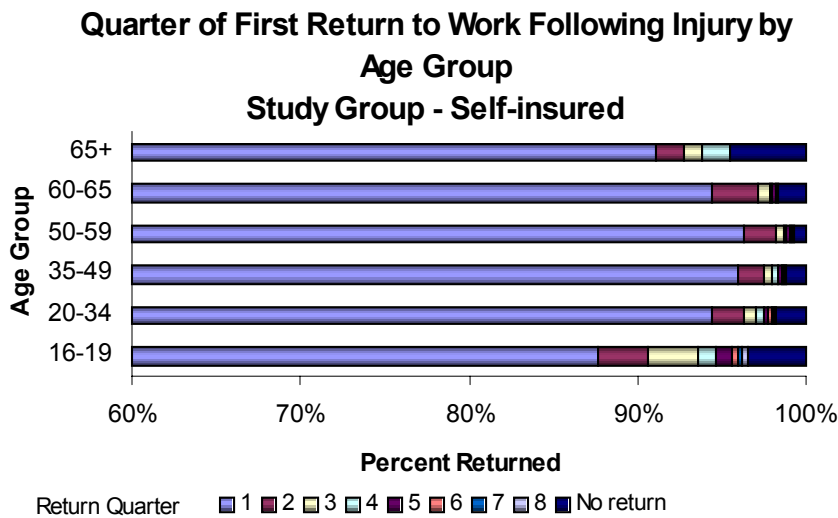


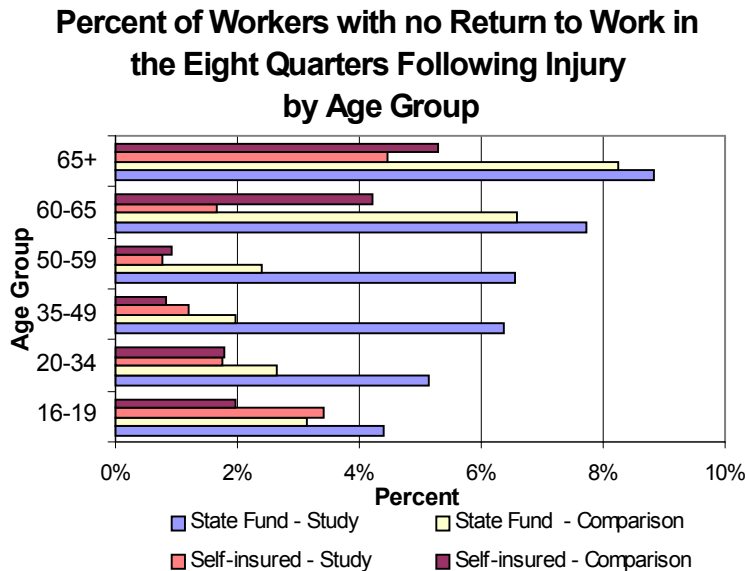
Chart 25



One observed difference in the return to work patterns by age groups is seen in the state fund study group. In this group, the percentage of workers with no observed work in the eight quarters following injury consistently increases with each successive age group; a trend not seen in the self-insured study group or the self-insured and state fund comparison groups. In those groups, the percentage of workers with no observed employment in the quarters following injury is larger in the older and younger age groups than in the middle age groups (Chart 26). This difference may be related to the minor severity of injuries in the two comparison groups and the more liberal return options available for self-insured claimants or medical management.

Another interesting difference observed when looking at return to work by age group is that the self-insured comparison group actually shows a higher percentage of workers with no employment in the eight quarters following injury in the older age categories than its respective study group.

Chart 26



Future Measures

Many factors other than those presented in this analysis affect return to work. Factors such as educational attainment, occupation, marital status, pre-injury income level etc., have all been shown to influence return to work. Future analysis may focus on some of these components.

Another area of interest is work stability: measures of first return to work are not adequate for acknowledging the long-term impacts of occupational injury. Brief periods of return to work after an injury are often followed by intermittent absences that are related to the initial injury.

The data system established for this analysis allows for future studies of the many complex factors influencing Washington workers' return to work. This analysis provides a good start and foundation for future studies.

Appendix A: Claim Characteristics

	<u>State fund study</u>	<u>State fund comparison</u>	<u>Self- insured Study</u>	<u>Self-insured Comparison</u>
Total Claims	60,667	219,733	33,535	75,371
Total Claims by Quarter				
19971	7,201	25,688	4,053	9,028
19972	7,686	28,421	4,245	9,433
19973	8,302	31,404	4,427	9,437
19974	7,415	26,299	4,176	9,474
19981	7,042	24,823	4,111	9,031
19982	7,564	27,500	4,207	9,473
19983	8,118	30,146	4,327	9,571
19984	7,339	25,452	3,989	9,924
Gender				
F	.29	.27	.42	.43
M	.71	.73	.58	.57
Age Group				
16-19	.04	.07	.02	.04
20-34	.39	.47	.31	.36
35-49	.43	.34	.47	.42
50-59	.12	.09	.16	.15
60-65	.02	.02	.03	.02
65+	.01	.01	.01	< .01
Marital Status				
Married	.49	.43	.57	n.a.*
Single	.51	.57	.43	n.a.*
SIC				
Agriculture, Forestry & Fishing	.06	.05	.01	.01
Construction & Mining	.20	.17	.02	.02
Manufacturing	.15	.17	.27	.30
Transportation, Communication & Utilities	.07	.05	.14	.08
Wholesale Trade	.07	.07	.04	.03
Retail Trade	.16	.20	.16	.18
Finance, Insurance & Real Estate	.02	.02	.01	.02
Services	.23	.22	.23	.23
Public Administration	.04	.03	.11	.09
Missing	.01	.01	< .01	.06

	<u>State fund study</u>	<u>State fund comparison</u>	<u>Self-insured Study</u>	<u>Self-insured Comparison</u>
URBAN/RURAL				
Urban	.68	.69	.78	.73
Rural	.27	.28	.17	.22
Unknown	.04	.02	.05	.04
Out of State	< .01	< .01	< .01	< .01
Distressed County				
Not Distressed	.74	.72	.79	.76
Distressed	.24	.23	.16	.19
Unknown	.02	.04	.05	.04
Out of State	< .01	< .01	< .01	< .01
Monthly average wages at injury¹:				²
1997Q1	\$2,027	\$1,962	\$2,394	\$2,421
1997Q2	\$1,987	\$1,972	\$2,404	\$2,413
1997Q3	\$1,991	\$1,990	\$2,411	\$2,448
1997Q4	\$2,058	\$2,025	\$2,426	\$2,510
1998Q1	\$2,057	\$2,043	\$2,480	\$2,385
1998Q2	\$2,071	\$2,034	\$2,514	\$2,374
1998Q3	\$2,049	\$2,061	\$2,507	\$2,609
1998Q4	\$2,134	\$2,102	\$2,573	\$2,456

¹ Average monthly wages at the time of injury are calculated from monthly wage data reported to the department of Labor and Industries. All claims in the Department database with an injury date during the analysis period and a monthly wage amount of > 0\$ and < 20,000\$ were included; Data for some claims that were excluded from the computation of return to work measures may be included here.

² This value was reported for a small number of cases in this group.

Appendix B: Counts – Employed During First and Second Year Following Injury

Employed during year following injury													
Year Quarter	All				State Fund				Self-Insured				
	Study		Comparison		Study		Comparison		Study		Comparison		
	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	no
19971	8,601	2,653	29,291	5,425	5,061	2,140	21,112	4,576	3,540	513	8,179	849	
19972	9,291	2,640	31,915	5,939	5,575	2,111	23,434	4,987	3,716	529	8,481	952	
19973	9,998	2,731	34,601	6,240	6,096	2,206	26,111	5,293	3,902	525	8,490	947	
19974	9,071	2,520	30,294	5,479	5,411	2,004	21,792	4,507	3,660	516	8,502	972	
19981	8,673	2,480	28,453	5,401	5,077	1,965	20,401	4,422	3,596	515	8,052	979	
19982	9,075	2,696	31,054	5,919	5,448	2,116	22,679	4,821	3,627	580	8,375	1,098	
19983	9,687	2,758	33,536	6,181	5,939	2,179	25,180	4,966	3,748	579	8,356	1,215	
19984	8,770	2,558	30,092	5,284	5,296	2,043	21,363	4,089	3,474	515	8,729	1,195	
Total	73,166	21,036	249,236	45,868	43,903	16,764	182,072	37,661	29,263	4,272	67,164	8,207	
Employed during second year following injury													
19971	8,034	3,220	27,098	7,618	4,779	2,422	19,569	6,119	3,255	798	7,529	1,499	
19972	8,544	3,387	29,277	8,577	5,119	2,567	21,472	6,949	3,425	820	7,805	1,628	
19973	9,121	3,608	31,743	9,098	5,558	2,744	23,944	7,460	3,563	864	7,799	1,638	
19974	8,370	3,221	27,926	7,847	5,011	2,404	20,097	6,202	3,359	817	7,829	1,645	
19981	7,988	3,165	26,257	7,597	4,737	2,305	18,870	5,953	3,251	860	7,387	1,644	
19982	8,465	3,306	28,622	8,351	5,110	2,454	20,949	6,551	3,355	852	7,673	1,800	
19983	8,918	3,527	30,700	9,017	5,417	2,701	22,959	7,187	3,501	826	7,741	1,830	
19984	7,990	3,338	27,602	7,774	4,798	2,541	19,547	5,905	3,192	797	8,055	1,869	
Total	67,430	26,772	229,225	65,879	40,529	20,138	167,407	52,326	26,901	6,634	61,818	13,553	

Appendix C: Return to Work Wages as a Percent of Pre-injury Wages during the First and Second Year Following Injury

Return to work wages as a percent of pre-injury wages during the first year following injury																			
Year Quarter	All						State Fund						Self-Insured						
	Study		Comparison				Study		Comparison				Study			Comparison			
	<80%	>=80%	No Return	<80%	>=80%	No Return	<80%	>=80%	No Return	<80%	>=80%	No Return	<80%	>=80%	No Return	<80%	>=80%	No Return	
19971	3,219	6,826	1,209	5,908	26,775	2,033	2,237	3,935	1,029	4,662	19,315	1,711	982	2,891	180	1,246	7,460	322	
19972	3,239	7,355	1,337	5,540	29,534	2,780	2,117	4,409	1,160	4,219	21,819	2,383	1,122	2,946	177	1,321	7,715	397	
19973	3,419	7,761	1,549	6,370	30,955	3,516	2,388	4,609	1,305	5,206	23,172	3,026	1,031	3,152	244	1,164	7,783	490	
19974	3,414	6,776	1,401	6,857	26,247	2,669	2,313	3,892	1,210	5,380	18,677	2,242	1,101	2,884	191	1,477	7,570	427	
19981	3,670	6,404	1,079	6,517	25,357	1,980	2,406	3,713	923	4,932	18,216	1,675	1,264	2,691	156	1,585	7,141	305	
19982	3,120	7,424	1,227	5,522	28,936	2,515	2,097	4,418	1,049	4,177	21,160	2,163	1,023	3,006	178	1,345	7,776	352	
19983	3,263	7,728	1,454	6,191	30,351	3,175	2,290	4,593	1,235	4,845	22,576	2,725	973	3,135	219	1,346	7,775	450	
19984	3,416	6,592	1,320	7,029	25,996	2,351	2,391	3,835	1,113	5,249	18,282	1,921	1,025	2,757	207	1,780	7,714	430	
Total	26,760	56,866	10,576	49,934	224,151	21,019	18,239	33,404	9,024	38,670	163,217	17,846	8,521	23,462	1,552	11,264	60,934	3,173	
Return to work wages as a percent of pre-injury wages during the second year following injury																			
19971	2,553	6,678	2,023	6,320	23,980	4,416	1690	3924	1587	4,880	17,169	3,639	863	2,754	436	1,440	6,811	777	
19972	2,736	7,007	2,188	6,275	26,188	5,391	1771	4179	1736	4,746	19,232	4,443	965	2,828	452	1,529	6,956	948	
19973	3,011	7,321	2,397	7,390	27,337	6,114	2044	4360	1898	5,879	20,440	5,085	967	2,961	499	1,511	6,897	1,029	
19974	2,781	6,711	2,099	6,888	23,925	4,960	1851	3941	1623	5,219	17,100	3,980	930	2,770	476	1,669	6,825	980	
19981	2,792	6,448	1,913	6,893	22,641	4,320	1810	3748	1484	5,069	16,278	3,476	982	2,700	429	1,824	6,363	844	
19982	2,568	7,039	2,164	6,413	25,312	5,248	1678	4204	1682	4,769	18,515	4,216	890	2,835	482	1,644	6,797	1,032	
19983	2,975	7,118	2,352	7,435	26,242	6,040	2019	4252	1847	5,656	19,619	4,871	956	2,866	505	1,779	6,623	1,169	
19984	2,893	6,249	2,186	7,363	23,218	4,795	1943	3683	1713	5,294	16,491	3,667	950	2,566	473	2,069	6,727	1,128	
Total	22,309	54,571	17,322	54,977	198,843	41,284	14,806	32,291	13,570	41,512	144,844	33,377	7,503	22,280	3,752	13,465	53,999	7,907	

Appendix D: Quarter of Return to Work Following Injury by Industry Division

All - Study	Return Quarter								No return	Total
	1	2	3	4	5	6	7	8		
Agriculture, Forestry & Fishing	2,774	286	163	79	43	28	31	15	374	3,793
Construction	9,706	909	443	209	162	116	79	69	1,106	12,799
Manufacturing	16,414	512	228	130	79	56	50	38	507	18,014
Transportation	8,347	255	99	58	45	27	15	17	242	9,105
Wholesale Trade	5,063	203	78	54	37	21	16	14	188	5,674
Retail Trade	13,301	537	270	149	92	86	55	52	602	15,144
Finance, Insurance & Real Estate	1,408	54	30	17	11	6	7	5	88	1,626
Services	19,214	810	358	177	132	102	68	52	862	21,775
Public Administration	5,688	71	26	15	11	7	5	3	38	5,864
Unknown	331	17	11	5	6	5	3	3	27	408
Total	82,246	3,654	1,706	893	618	454	329	268	4,034	94,202
State Fund Study										
Agriculture, Forestry & Fishing	2,548	266	156	79	42	26	31	15	366	3,529
Construction	9,224	884	434	207	158	111	79	68	1,090	12,255
Manufacturing	7,653	403	185	97	67	43	44	35	412	8,939
Transportation	3,706	201	82	46	31	20	12	15	186	4,299
Wholesale Trade	3,657	177	69	49	34	17	14	11	173	4,201
Retail Trade	8,197	427	205	123	71	72	49	43	493	9,680
Finance, Insurance & Real Estate	1,097	49	27	15	11	5	7	5	82	1,298
Services	11,911	598	308	151	110	92	56	43	722	13,991
Public Administration	2,052	48	10	8	6	5	4	1	20	2,154
Unknown	246	16	11	5	6	5	3	3	26	321
Total	50,291	3,069	1,487	780	536	396	299	239	3,570	60,667
Self-insured Study										
Agriculture, Forestry & Fishing	226	20	7		1	2			8	264
Construction	482	25	9	2	4	5		1	16	544
Manufacturing	8,761	109	43	33	12	13	6	3	95	9,075
Transportation	4,641	54	17	12	14	7	3	2	56	4,806
Wholesale Trade	1,406	26	9	5	3	4	2	3	15	1,473
Retail Trade	5,104	110	65	26	21	14	6	9	109	5,464
Finance, Insurance & Real Estate	311	5	3	2		1			6	328
Services	7,303	212	50	26	22	10	12	9	140	7,784
Public Administration	3,636	23	16	7	5	2	1	2	18	3,710
Unknown	85	1							1	87
Total	31,955	585	219	113	82	58	30	29	464	33,535

Appendix D: Quarter of Return to Work Following Injury by Industry Division, continued

All Comparison	Return Quarter								No return	Total
	1	2	3	4	5	6	7	8		
Agriculture, Forestry & Fishing	10,872	515	222	126	37	47	35	30	561	12,445
Construction	35,096	1,325	464	213	135	82	89	50	1,010	38,464
Manufacturing	56,493	963	353	191	106	87	61	52	965	59,271
Transportation	15,665	269	80	60	32	15	17	14	253	16,405
Wholesale Trade	17,228	373	109	76	38	12	19	13	334	18,202
Retail Trade	53,457	1,259	504	320	177	129	99	67	1,241	57,253
Finance, Insurance & Real Estate	6,027	101	33	24	15	9	7	11	133	6,360
Services	62,005	1,459	565	347	188	134	88	70	1,609	66,465
Public Administration	13,352	159	75	44	23	10	14	11	127	13,815
Unknown	5,776	179	51	39	12	10	14	10	333	6,424
Total	275,971	6,602	2,456	1,440	763	535	443	328	6,566	295,104
State Fund Comparison										
Agriculture, Forestry & Fishing	10,478	498	218	119	37	43	33	27	544	11,997
Construction	33,788	1,285	450	206	130	80	88	50	975	37,052
Manufacturing	34,706	770	276	140	89	74	49	36	718	36,858
Transportation	9,912	217	65	36	19	11	16	14	208	10,498
Wholesale Trade	15,287	337	101	71	35	11	18	12	314	16,186
Retail Trade	40,303	1,103	440	267	146	109	84	56	985	43,493
Finance, Insurance & Real Estate	4,868	92	33	22	13	9	7	11	117	5,172
Services	45,659	1,170	506	308	161	119	79	63	1,358	49,423
Public Administration	6,951	102	47	31	17	7	10	9	87	7,261
Unknown	1,343	102	26	26	9	9	9	9	260	1,793
Total	203,295	5,676	2,162	1,226	656	472	393	287	5,566	219,733
Self-insured Comparison										
Agriculture, Forestry & Fishing	394	17	4	7		4	2	3	17	448
Construction	1,308	40	14	7	5	2	1		35	1,412
Manufacturing	21,787	193	77	51	17	13	12	16	247	22,413
Transportation	5,753	52	15	24	13	4	1		45	5,907
Wholesale Trade	1,941	36	8	5	3	1	1	1	20	2,016
Retail Trade	13,154	156	64	53	31	20	15	11	256	13,760
Finance, Insurance & Real Estate	1,159	9		2	2				16	1,188
Services	16,346	289	59	39	27	15	9	7	251	17,042
Public Administration	6,401	57	28	13	6	3	4	2	40	6,554
Unknown	4,433	77	25	13	3	1	5	1	73	4,631
Total	72,676	926	294	214	107	63	50	41	1,000	75,371

Appendix E: Quarter of Return to Work Following Injury by age Group

All - Study age group	Return Quarter									Total
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>No return</u>	
16-19	2,419	185	96	42	29	12	11	14	121	2,929
20-34	29,363	1,470	707	387	249	204	156	119	1,393	34,048
35-49	36,582	1,498	707	353	266	190	124	110	1,839	41,669
50-59	11,472	388	159	85	66	36	33	22	519	12,780
60-65	1,911	82	29	19	6	8	4	2	117	2,178
65+	499	31	8	7	2	4	1	1	45	598
Total	82,246	3,654	1,706	893	618	454	329	268	4,034	94,202
State Fund - Study										
16-19	1,723	161	73	33	22	9	9	11	94	2,135
20-34	19,490	1,278	622	347	222	179	138	107	1,210	23,593
35-49	21,452	1,256	628	304	230	168	116	99	1,649	25,902
50-59	6,175	287	135	74	56	28	32	19	477	7,283
60-65	1,115	59	23	18	4	8	3	2	103	1,335
65+	336	28	6	4	2	4	1	1	37	419
Total	50,291	3,069	1,487	780	536	396	299	239	3,570	60,667
Self-insured - Study										
16-19	696	24	23	9	7	3	2	3	27	794
20-34	9,873	192	85	40	27	25	18	12	183	10,455
35-49	15,130	242	79	49	36	22	8	11	190	15,767
50-59	5,297	101	24	11	10	8	1	3	42	5,497
60-65	796	23	6	1	2		1		14	843
65+	163	3	2	3					8	179
Total	31,955	585	219	113	82	58	30	29	464	33,535
All - Comparison										
16-19	15,602	685	409	286	105	60	49	44	526	17,766
20-34	122,463	3,133	1,191	683	405	272	220	170	3,260	131,797
35-49	101,802	2,046	645	336	201	158	129	87	1,753	107,157
50-59	29,887	561	153	94	43	35	27	18	593	31,411
60-65	4,871	126	39	24	8	8	12	7	315	5,410
65+	1,346	51	19	17	1	2	6	2	119	1,563
Total	275,971	6,602	2,456	1,440	763	535	443	328	6,566	295,104

**Appendix E: Quarter of Return to Work Following Injury by age Group,
continued**

State Fund - Comparison <u>age group</u>	Return Quarter								No return	Total
	1	2	3	4	5	6	7	8		
16-19	12,964	609	363	244	95	53	44	39	469	14,880
20-34	96,177	2,759	1,067	591	358	242	199	154	2,773	104,320
35-49	70,823	1,707	558	282	161	138	112	75	1,492	75,348
50-59	19,046	457	125	76	33	30	21	13	489	20,290
60-65	3,248	99	32	21	8	7	11	4	242	3,672
65+	1,037	45	17	12	1	2	6	2	101	1,223
Total	203,295	5,676	2,162	1,226	656	472	393	287	5,566	219,733
Self-insured - Comparison										
16-19	2,638	76	46	42	10	7	5	5	57	2,886
20-34	26,286	374	124	92	47	30	21	16	487	27,477
35-49	30,979	339	87	54	40	20	17	12	261	31,809
50-59	10,841	104	28	18	10	5	6	5	104	11,121
60-65	1,623	27	7	3		1	1	3	73	1,738
65+	309	6	2	5					18	340
Total	72,676	926	294	214	107	63	50	41	1,000	75,371

Appendix F: Matching Records from Labor and Industries with those of Employment Security. *Prepared by Bill Blanford*

Employment Security (ESD) data was joined to Labor and Industry (LNI) data using Social Security number. The matching was refined using the name fields from both sources of data. A data integrity issue existed because of an inexact match between the ESD (last) name field and the 3 available LNI name fields (first name, last name, middle/other name). Further checking revealed that there were three primary issues with matching names:

1. The ESD (last) name field actually contained a single name or a combination of abbreviated last, first, and middle names;
2. The single ESD name field held fewer characters than the three LNI name fields; And,
3. Often the same person's name was listed in different ways (for instance using nicknames, initials, name fragments, and changed name order) in the ESD file.

In addition, it appeared, that previously, the ESD name field had held fewer characters. Many names had been truncated to 6, 8, 10 or 12 characters. It was rare, that the entire 18 character length was used.

The approach

We found that a single approach was not sufficient to address the previously mentioned issues. We adopted two strategies. They are described in detail in the following sections.

Strategy 1: LNI Last name is contained in ESD name field

- A. Remove special characters (. - , (blank) _) from both the ESD name field and the LNI last name field.
- B. Compute the length of the shortest field (ESD name field, LNI last name field).
- C. Truncate the LNI last name field to the "shortest length" from step 1.B.
- D. If the truncated LNI last name was found in the ESD name field, set a flag to indicate ESD and LNI names match.

Last names that matched

<u>ESD Name</u>	<u>LNI Last name</u>
JOHN SMITH	SMITH
J. SMITH, JR.	SMITH
SMITH, JOHN	SMITH
LENA VAN HORN	VANHORN
LENA VANHORN	VAN HORN
LENA VAN HORNE	HORN

Last names that did not match

<u>ESD Name</u>	<u>LNI Last name</u>	<u>Reason</u>
MARY SMITH	SMITH-KENNEDY	KENNEDY not in ESD name

Strategy 2: Determine the PC/SAS “transformation” score of converting the ESD name to the LNI name. ESD and LNI names match if the transformation score is less than 60.

Terminology

PC/SAS – a data processing and statistical programming language
 Transformation score – an estimate of how different the ESD and LNI names are as computed by the PC/SAS SpeDis function. (See the transformation scoring, with examples (using SpeDis) at the end of this appendix. For a discussion of this approach, contact the authors.)

Word – a group of characters separated by one of the following special characters:

(blank) . < (+ & ! \$ *) ; ^ - / , % |

We are using the PC/SAS “Scan” function to break the ESD name field into the separate Name components (i.e., “words”).

A. Count the number of words (Name components) in the ESD name.

Examples

<i>ESD Name</i>	<i>Word 1</i>	<i>Word 2</i>	<i>Word 3</i>	<i>#</i>
HERNANDEZ	HERNANDEZ			1
J. BROWN	J	BROWN		2
LENA VAN HORN	LENA	VAN	HORN	3
SMITH, MARY PAT	SMITH	MARY	PAT	3
WILLIAMS, ROBERT J.	WILLIAMS	ROBERT	J	3
HANK WILLIAMS, JR.	HANK	WILLIAMS	JR	3

B. Compute the transformation score for converting each ESD word into each LNI name.

Example

ESD name: SMITH, MIKE

LNI

1st Name: MICHAEL

Middle Name: J.

Last Name: SMITH

Transformation Scores converting ESD Words into LNI names

		ESD Word 1: SMITH	ESD Word 2: MIKE
LNI 1 st Name:	MICHAEL	52	43
LNI Middle Name:	J.	400	350
LNI Last Name:	SMITH	0	77

C. Compute all possible total name scores. (A name can only be used one time per score.)

- ESD Word 1(LNI 1st Name) + ESD Word 2(LNI Middle Name)
SMITH(MICHAEL) + MIKE(J)
 $= 52 + 350 = 402$
- ESD Word 1(LNI 1st Name) + ESD Word 2(LNI Last Name)
SMITH(MICHAEL) + MIKE(SMITH)
 $= 52 + 77 = 129$
- ESD Word 1(LNI Middle Name) + ESD Word 2(LNI 1st Name)
SMITH(J) + MIKE(MICHAEL)
 $= 400 + 43 = 443$
- ESD Word 1(LNI Middle Name) + ESD Word 2(LNI Last Name)
SMITH(J) + MIKE(SMITH)
 $= 400 + 77 = 477$
- ESD Word 1(LNI Last Name) + ESD Word 2(LNI 1st Name)
SMITH(SMITH) + MIKE(MICHAEL)
 $= 0 + 43 = 43$
- ESD Word 1(LNI Last Name) + ESD Word 2(LNI Middle Name)
SMITH(SMITH) + MIKE(J)
 $= 0 + 350 = 350$

D. If the smallest total name score was less than 60, the ESD and LNI names match.

- ✓ ESD Word 1(LNI Last Name) + ESD Word 2(LNI 1st Name)
SMITH(SMITH) + MIKE(MICHAEL)
 $= 0 + 43 = 43$
(ESD and LNI names match.)

Note: in this example, the names would also have matched based on criteria 1.

Transformation Score using PC/SAS SpeDis function

The PC/SAS SpeDis (Spelling Distance) function applies a weighted point system to each transformation required to convert one word into another word. The transformations and their weights are:

PC/SAS SpeDis Transformations and Points

<u>Transformation</u>	<u>Points</u>	<u>Explanation</u>
match	0	no change
singlet	25	delete one of a double letter
doublet	50	double a letter
swap	50	reverse the order of two consecutive letters
truncate	50	delete a letter from the end

append	35	add a letter to the end
delete	50	delete a letter from the middle
insert	100	insert a letter in the middle
replace	100	replace a letter in the middle
firstdel	100	delete the first letter
firstins	200	insert a letter at the beginning
firstrep	200	replace the first letter

To compensate for words of different lengths, the SpeDis function divides the sum of the transformation scores by the total number of letters in the original word.

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