

**The Relationship of Work and Worker Characteristics To  
Utilization of Workers' Compensation Benefits.**

by

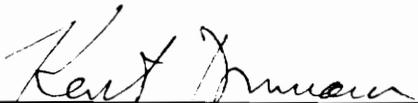
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in  
Management

APPROVED:



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(ABSTRACT)

It is well established that the frequency of claims filed for benefits under the workers' compensation program is dependent not only on the number of workers employed, but is influenced by work characteristics such as the nature of work performed, the type of job, and the level of employment. This thesis hypothesised that, in addition to work characteristics, the frequency of claims filed is significantly related to worker characteristics such as age and gender.

Using data on the actual number of claims filed for workers' compensation benefits by university employees, this study investigated the relationship between worker and job characteristics, and the incidence of claims for workers' compensation benefits.

It is found that, for the aggregated workforce in the institution, there are significant relationships between the claims filed and the function, sedentary / non-sedentary type of employment, the job-family, and the age of the worker. However, on disaggregation, no significant relationships were found between the claims filed by employees in administrative, faculty, and research positions, and their age, gender, and the type of their jobs. Non-sedentary nature of the job was found to be related to claims filed by male workers in technical jobs, and possibly related to claims filed by workers in the clerical category. Age of the worker was found to be significantly related to claims filed by younger workers in support activities such as maintenance, groundskeeping, and food services, and possibly related to professionals in similar activities. Gender was not found to be related to claims filed by workers in any category.

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# **Chapter 1**

## **Introduction**

### **The Nature of the Problem**

Work, like many other activities in life, has attendant risks attached. In particular, work in industry or industrial types of jobs is inherently hazardous. It is estimated that one of every ten workers in private industry each year suffers the effects of an accident or disease incurred while working (Chelius, 1977). The importance of work-related injuries and diseases is not confined to the number or frequency. Numbers aside, the true concern with work-related disabilities is that they strike men and women in their most productive years when they are most likely to have a dependent family (Report of the National Commission on State Workmen's Compensation Laws, 1972).

Work-related injuries and diseases are undesirable by-products of the creation of goods and services for consumers (Darling-Hammond and Kniesner, 1980). They impose a direct and

significant physical and financial burden on the worker. However, this burden is not confined to the worker alone, but extends to his employer and the consumers. To reduce this burden and to ensure that the disability cost is not imposed on society, a social insurance program is provided in the form of workers' compensation. As a public policy, workers' compensation requires that an employer enjoying the profit of a product or service should assume the cost of injuries. The costs of work-related injuries are to be allocated to the employer, not because of any presumption that he is to blame for every individual tragedy, but because of the inherent hazards of industrial employment (Darling-Hammond and Kniesner, 1980).

Workers' compensation in the United States is a compulsory system of social insurance that requires employers to provide no-fault insurance against occupational injury and disease in return for a limited liability for such events (Butler and Worrall, 1985). The costs involved in providing such insurance are related to a variety of factors such as the primary nature of business that the employer is engaged in and the attendant occupational hazards for workers, the physical environment in which the work is carried on, and the general health of the workers. In particular, the composition of the workforce has been found to be directly related to the costs incurred by employers for workers' compensation insurance. The movement towards unisex insurance legislation and 24-hour worker insurance coverage suggests that an employer's insurance costs may be affected by the demographic composition of the labor force (Worrall, Appel and Butler, 1987). Analysis of the relationship between demographic characteristics and utilization of workers compensation benefits is, therefore, important both to employers and the insurers of health-care risk.

## **The Significance of the Study**

Employers in general will be concerned because the changing demographic composition of the employees, particularly the aging of the work-force and the increasing proportion of women and singles in the labor-force, could have a significant effect on the future costs of insurance. As the costs of different benefits increase relative to total employee compensation, employers will need to closely monitor their effects on the financial health of their organizations, and examine differential usage of any given type of benefit by specific groups of employees. Such usage will affect organizations in several ways. For instance, increasing labor costs in any particular activity might lead to employers deciding on automation of such jobs, if possible, or sub-contracting the work. As a consequence, employment within the organization may have to be reduced. Second, increased costs for compensating disabilities might compel alterations in wage and benefits planning, with a greater proportion of money being allocated to risk and injury compensation and a correspondingly smaller proportion for future wage increases. Third, both the internal mobility of workers and the organization's productivity might be affected. The incidence of high risk among certain groups might compel employers to transfer high-risk workers to jobs where they would be less prone to suffer disabilities. However, such transfers may not always be to jobs in which the full productive capacity of the workers would be utilized. Alternately, such incidence of high risk may necessitate intensive training/education on occupational safety to try and reduce the incidence of work disabilities.

Workers' compensation costs are determined by the aggregation of costs for every compensated injury which includes the fractional replacement of lost wages, medical expenses, retraining and rehabilitation expenses, and disability or death awards. (In turn), the compensation cost for each injury is determined by the benefit provisions of the law, the worker's wage, the severity of the injury, and the worker's personal characteristics (Dillingham, 1983). It is possible

to quantify the effects on compensation cost of the legal provisions, the worker's wage and the injury severity, and express them in monetary terms. Experienced benefits administrators routinely compute these effects to a fair degree of precision. The influence of the worker's personal characteristics on compensation costs is, however, less obvious. It is important for personnel, risk, benefits, and occupational safety managers that these be analyzed. This is the focus of this thesis.

## **Approach to the Research**

Very little is known about how changes in the demographic composition of the workforce affect workplace injuries and corresponding compensation costs. There is some research evidence showing that work-related injury rates vary across age (Dillingham, 1983), occupation (Root and Sebastin, 1981) and experience on the job (Chelius, 1979). Some evidence is also available on gender-specific injury rates (Oi, 1974; Dillingham, 1981). Several studies have, however, documented the differential use of medical care by sex (Manning, Morris, Newhouse, et al., 1981; Sindelar, 1982; Wells, Manning, Duan, et al., 1982).

While the earlier studies have yielded some evidence, there is a major limitation to the findings. Most of the studies have been preliminary studies and have utilized aggregated data across large, heterogeneous occupation and industry groups. Studies at the institutional level within specific organizations have not been adequate, and the researchers have cautioned that considerable further research is required to validate the findings at the organizational level. If the findings are to be utilized by employers, studies relating to clearly identified work groups within specific organizations need to be conducted. In particular, precise and accurate data relating to disaggregated, homogeneous work groups should be analyzed.

This thesis is among the first attempts to examine, at the institutional level, the relationship between demographic and workplace characteristics, and workers' compensation utilization. Using data on the actual number of workers' compensation claims filed by employees in a major educational institution, the thesis examined whether a worker's personal characteristics of age and sex, and the type of job, have any relationship with the claims. It was hypothesised that the three characteristics have significant relationships with injuries suffered on the job, resulting in claims for benefits under the workers' compensation system. The following questions were specifically examined:

1. Is there evidence of differential usage of workers' compensation benefits by the workers in the institution?
2. If so, can such usage be explained by differences in age, sex, and job characteristics?

The results of the analysis in this thesis were used to determine the implications of the observed relationships on the staffing, compensation, risk management, and occupational safety needs of the institution.

This thesis seeks to add to the limited body of knowledge now available on the effects of demographic changes on workers' compensation.

## **Presentation of the Research**

Workers' compensation laws are state laws. Historically, the provisions of the laws varied across each of the fifty states. However, the publication of the report of the National Commission on State Workmen's Compensation Laws in 1972 propelled the states towards greater uniformity in the pattern of benefits provided under their laws. The first part of Chapter

2 reviews the history and objectives of the workers' compensation legislation in general and, specifically, the provisions of the law in the Commonwealth of Virginia.

Published empirical studies on workers' compensation have been limited in number. Studies relating to demographic characteristics in particular have been sparse. The second part of Chapter 2 provides a review of the earlier research on the relationship among demographic characteristics, reported injuries and claims for workers' compensation benefits.

Chapter 3 describes the data and the setting from which data used for this study has been drawn. The research questions and the methodology of the research are also presented and discussed.

In Chapter 4, the results of an empirical analysis of the relationship between workers' compensation claims and age, gender, and occupational variables are presented and discussed.

In Chapter 5, the implications for the staffing, compensation, risk management and occupational safety needs of the institution are examined.

## Chapter 2

# Workers' Compensation in U.S.A.

### History of Workers' Compensation<sup>1</sup>

Prior to the enactment of workers' compensation legislation, a liability system based on fault was used to assign damages arising from industrial accidents. The liability system itself was based on the tort system. With its roots in common law, the tort system sought to resolve disputes by compensating injured parties for their losses by assessing damages against the party or parties responsible for the injury. The party adjudged negligent in causing the accident was liable for the costs. While minimizing costs to society as a whole, linking compensation to fault or negligence

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<sup>1</sup> The following discussion is largely based on material from Chelius, "Workplace Safety and Health", (Washington, D.C.: The American Enterprise Institute for Public Policy Research, 1977) and Darling-Hammond and Kniesner, "The Law and Economics of Workers' Compensation", (Santa Monica: The Rand Corporation, 1980).

also implicitly encouraged loss prevention by penalizing those who did not adequately guard against potential accidents.

The basic duty of the employer was due care for employee safety. No negligence would be charged to him if he provided the safety precautions that a reasonably prudent man would take if he himself were in the employee's situation. However, there were no absolute standards of due care. In general, employers were responsible for providing a sufficient number of qualified employees and sufficient tools to perform the work. Employers also were responsible for promulgating and enforcing reasonable rules for the safe conduct of business, and to give warnings about any dangers of which employees might be ignorant.

Under common law, a jury had to determine whether an employer had failed to meet the standards of due care and was, therefore, negligent and liable for accident costs. To be compensated, the worker had to prove negligence on the part of his employer by demonstrating that the injury was not one commonly associated with the occupation, and that it had resulted from some identifiable and non-habitual act of negligence by the employer. The employer, on his part, could invoke three major defenses:

1. Contributory Negligence -- recovery was barred if the worker's own negligence could be shown to have contributed at all to his injury, and the injured worker could have avoided the consequences of the employer's negligence by the exercise of ordinary care.
2. Fellow-Servant Doctrine -- an employer was not liable for the negligence of co-workers to each other unless a co-worker was acting as the employer's representative.
3. Assumption of Risk -- by agreeing to an employment contract, an employee accepted any ordinary risks of that employment and any extraordinary risks that were known and accepted.

The advent of industrialization throughout Europe and the United States during the nineteenth century was accompanied by a concurrent rise in the rate of serious on-the-job injuries

suffered by workers. Common law remedies for injured employees came to be regarded as providing too few incentives for workplace safety and as being unfairly biased toward the employer's interests. By 1908, workers' compensation laws had replaced the tort-based compensation system in virtually all the Western industrialized nations except the United States. The early federal and state attempts to pass workers' compensation laws in the United States were hampered by challenges in the courts of law.

Beginning in 1911, the states started to enact workers' compensation statutes. Workers' compensation was based on "an entirely new economic principle -- liability without fault" (Larson, 1952). Regardless of who was at fault, the employer was automatically held liable for damages up to a specific limit, and the employee received pre-determined benefits. However, early judicial decisions held that imposing liability without fault deprived employers of property without due process of law, and rejected compulsory coverage of employers under the statutes. Therefore, in keeping with contemporary constitutional interpretations, all but six of the state laws passed between 1911 and 1920 generally authorized elective (or optional) coverage, and applied mainly to highly hazardous occupations. Under such laws, employers could choose not to have their employees covered by the workers' compensation provisions, but would then continue to be subject to tort actions by their employees. In 1919, the U.S. Supreme Court declared that compulsory coverage was constitutional. By 1949, all the states had established programs to provide income maintenance protection to workers disabled by work-related injury or illness.

For the next two decades, gradual improvements in the programs increased the scope of protection and benefit levels. Nonetheless, there were deficiencies in the laws in several states. Despite the ruling on the constitutionality of compulsory coverage, in 1968, 23 states still permitted elective coverage. Further, in 46 states, benefit ceilings remained far below wage levels, although the wage levels themselves had increased considerably. The low benefit ceilings restricted the amount of compensation that a disabled worker could receive. Consequently, a disabled

worker earning the state average weekly wage could not receive a benefit as envisaged by the legislated wage replacement rate.

In 1970, Congress passed the Occupational Safety and Health Act "to assure safe and healthful working conditions for working men and women". The Act also declared that "the vast majority of American workers and their families, are dependent on workmen's compensation for their basic economic security in the event such workers suffer disabling injury or death in the course of their employment; and that the full protection of American workers from job-related injury or death requires an adequate, prompt, and equitable system of workmen's compensation as well as an effective program of occupational health and safety regulation". This Act also established the National Commission on State Workmen's Compensation Laws to evaluate the existing programs and recommend improvements. In its report submitted to the President in 1972, the Commission recommended that the states broaden coverage and increase benefits. Eighty-four specific suggestions were made, of which nineteen were deemed essential to the Commission's notion of a well-functioning workers' compensation system. The Commission also urged issuance of federal standards and forcing compliance by the states if they did not meet the nineteen essential recommendations. The Commission's report resulted in substantial changes in both coverage and benefit levels in the state laws.

## **Objectives of Workers' Compensation<sup>2</sup>**

The Compendium on Workmen's Compensation lists five commonly accepted objectives for the evaluation of workmen's compensation programs. The programs can be evaluated by the extent to which they satisfy the objectives. Not all the objectives are equally important or accepted, and, sometimes, the objectives conflict with one another. However, they are often linked by the design of the programs. The different objectives are presented and discussed below.

### **Income Replacement**

A primary objective for workmen's compensation is to replace the wages lost by the workers disabled by a job-related injury or sickness. Such replacement should be adequate, equitable, prompt, and certain.

An adequate payment would cover the entire wage loss -- present and projected as well as fringe benefits -- less taxes and other expenses like job-related travel that do not continue. However, as an incentive for speedy rehabilitation and accident prevention in the future, the worker may be required to bear a small proportion of the loss.

To be equitable, all workers must be treated fairly under the program. One argument holds that most workers should have the same proportion of their wages replaced, with a guaranteed minimum income to provide for workers with low wages and a reasonable maximum limitation for high income workers. An alternative philosophy would argue in favor of a more substantial

<sup>2</sup> A comprehensive review of the objectives is available in the Compendium on Workmen's Compensation (Washington, D.C.: National Commission on State Workmen's Compensation Laws, 1973). This discussion is largely based on material covered in the review.

welfare component with a higher minimum benefit, low maximum benefit, and extra benefits when there are dependents.

To assure certainty and promptness of payments, workers should know in advance what benefits are available in case of injuries on the job and that the benefits will be paid regardless of the continued solvency of the employer. Benefit payment should commence as soon after the disability occurs as possible.

The National Commission recognized income replacement as a major objective for a modern workmen's compensation program. Stating that a high proportion of a disabled worker's lost earnings should be replaced by workmen's compensation benefits, the Commission's report listed "substantial protection against interruption of income" as one of the five major objectives.

## **Restoration of Disabled Workers**

Medical and vocational rehabilitation and return to productive employment is the second major objective, for which the worker should receive quality medical care at no cost to himself. The level of care should be such as to restore him as completely as possible to his former physical condition. If complete restoration is not possible, vocational rehabilitation that will enable him to maximize his earning capacity should be provided. Additionally, incentives to disabled workers and prospective employers to return the workers to productive employment should be included in the program.

The National Commission observed that the injured worker's physical condition and earning capacity should be promptly restored, and listed "provision of sufficient medical care and rehabilitation services" as another major objective.

## **Accident Prevention and Reduction**

The third objective is occupational accident prevention and reduction. People who consider this objective important believe that the pricing of workmen's compensation should reward good safety practices and penalize dangerous operations. Significant financial and other incentives should be included in the program for employers to introduce measures that will decrease the severity and frequency of accidents. By sharing losses, employees should also have some incentive to follow safe working practices.

Others, who minimize this objective, recognize the importance of safe workplaces and procedures, but believe that workmen's compensation rates and other incentives have little effect upon how employers behave. They favor other approaches like public safety inspections and criminal penalties.

Observing that economic incentives in the program should reduce the number of work-related injuries and diseases, the National Commission, in its report, listed "encouragement of safety" as a third major objective of workmen's compensation.

## **Proper Cost Allocation**

Supporters of this objective consider it equitable to allocate the costs of the program among employers and industries according to the extent to which they are responsible for the losses to employees and other expenses, because each employer and industry pays its fair share of the cost. In a competitive economy, such an allocation tends, in the long run, to shift resources from hazardous industries to safe industries and from unsafe employers within an industry to safe employers. Since higher compensation costs in hazardous operations result in a concomitant

decline in profits, employers in such operations will be forced to consider price increases for their products and services. To the extent that consumers resist the price increases, the employers' willingness to commit resources to this use will also decline. The economic effects are, therefore, considered desirable.

Critics of this objective, however, argue that workmen's compensation costs affect production costs to such a limited extent that they have little effect on resource allocations, if at all.

## **Efficiency**

The program should be designed in a manner that would minimize operating costs through efficient administration of the system. With achievement of justice in the program designed on a no-fault principle, litigation and legal costs should be reduced to the minimum.

The National Commission also recognized that the basic objectives of workmen's compensation should be met comprehensively and efficiently. In its report, the Commission listed an effective system for delivery of benefits and services as one of the major objectives of a compensation program.

## **Coverage**

In addition to the objectives noted above that were included in its report, the National Commission examined the question of coverage under the different state laws. The Commission observed that the coverage was inadequate and inequity resulted from the wide variations among the states in the proportion of their workers protected by workmen's compensation laws. Inequity

also resulted because the employees not covered usually were those most in need of protection: the low-wage workers such as farm-help, domestics, casual workers, and employees of small firms.

Stating that protection should be extended to as many workers as feasible, and all work-related injuries and diseases should be covered, the Commission listed "broad coverage of employees and of work-related injuries and diseases" as a major objective.

## **Workers' Compensation Law in Virginia**

Since data used for this thesis was obtained from a major employer to which the Virginia Worker's Compensation Act applies, a summary of the current provisions of the Act is presented below.

### **Coverage**

Coverage is compulsory for all employers who have three or more regular employees, irrespective of whether the employees are full-time or part-time employees. In agricultural operations, however, the workers are covered if their employer has three or more full-time employees. The coverage is to be provided by the employer at no cost to the employees.

While domestic workers are not covered, the law permits voluntary coverage of such workers by their employer.

### **Insurance Arrangements and Expenses**

Employers are permitted to insure through a private carrier or self-insure. The self-insurance may be of two types: by the individual employer or by a group of employers. In general, both under self-insurance and insurance by a carrier, benefits expenses -- medical, disability, rehabilitation, and death/dependants' benefits -- are to be borne by the employer or carrier. However, the Act created a "Second Injury Fund" to provide funds for compensation for total disability. The fund

is financed by a tax levied on employers and carriers, and is administered by the Industrial Commission. Employers and carriers are eligible for a partial reimbursement from this fund, of expenses incurred for medical treatment, wage loss compensation, and rehabilitation services for certain specified injuries.

## **Medical Benefits**

An employee is entitled to full medical benefits, i.e. there are no time or monetary limitations to the medical treatment necessary for work-related injuries or occupational disease. The employer is required to provide all necessary medical treatment at no cost to the employee. However, the employee's choice of physician is restricted to selection from a list maintained by the employer, and at the time of injury the employer must provide the employee with a panel of three physicians for selection.

If the employee selects his own doctor for treatment rather than choosing from the panel, the employer is not obliged to pay for the expense.

## **Disability Benefits**

In addition to the medical benefits, the law provides for disability payments for workers incapacitated due to work-related disabilities. Four different types of payments are provided for, depending on the nature of the disability.

### ***Temporary Total Disability***

A disabled worker is entitled to receive 66 2/3% of his average weekly wage, with a minimum guaranteed payment (currently, \$86) equal to 25% of the State's Average Weekly Wage or the worker's actual wage, whichever is less. The maximum payment (currently, \$344) is limited to 100% of the State's Average Weekly Wage. The duration of this payment is limited to a maximum of 500 weeks.

### ***Temporary Partial Disability***

If a worker recovers from his work-related disability to the point that he can return to light or part-time work, but, because of his injury, is not earning as much as he was before he was injured, he is entitled to recover 66 2/3% of his wage loss. Such recovery is, however, subject to the same monetary limitations as in the case of Temporary Total Disability.

### ***Permanent Total Disability***

The loss of both hands, both arms, both feet, both legs or both eyes, or any two of the above, in the same accident constitutes total and permanent incapacity under the law. An injury to the brain resulting in incurable imbecility or insanity also amounts to total and permanent incapacity. Based on medical evidence, the Industrial Commission may determine any other injury which results in total paralysis for all practical purposes as a permanent and total incapacity. Payment for permanent total disability is at the same rate as for temporary total disability. However, there

is no limitation on the duration of the payment, and the benefit is paid through the lifetime of the injured worker.

### ***Permanent Partial Disability***

The law has designated permanent injuries to certain parts of the body as scheduled injuries. It has also prescribed the duration of compensation payments for 100% loss of those parts of the body due to injuries. A worker is entitled to compensation for scheduled injuries, determined by applying the percentage of disability to the number of weeks designated for a 100% disability to that part of the body.

Compensation is also paid for unscheduled injuries, but on the basis applicable to temporary total disability.

### **Death Benefits**

If a work-related injury or occupational disease results in death of a worker, compensation is payable to the surviving spouse, minor children or others who are dependent on the worker at the time of death. The rates and duration of compensation payment are the same as for temporary total disability. Children receive benefits beyond 18 years of age if they are disabled, and until 23 years of age if they are full-time students.

In addition, burial expenses up to \$3000 and reasonable expenses up to \$500 for transporting the decedent's remains for burial are payable to the family.

## **Waiting Period**

There is a waiting period of 7 days before the disability benefits become payable. However, the compensation payment becomes retroactive from the date of injury if the disability continues for more than 3 weeks.

## **Rehabilitation**

The statute provides for physical and vocational rehabilitation of the injured worker. The employer is obligated to furnish all reasonable and necessary rehabilitation training services, and the worker is obligated to accept the services. During the vocational rehabilitation period, the worker is entitled to the same benefits as for temporary total disability. The penalty for unjustified refusal by the worker to accept rehabilitation services is suspension of compensation payments for the period of time the worker refuses rehabilitation.

## **Cost of Living Supplements**

Each year, the Industrial Commission of Virginia must determine the percentage of the cost of living increase based on the Average Consumer Price Index for the previous year ending in July. Effective October 1, for the next year, eligible open awards are increased by this percentage. This increase applies only to awards for total disability or for dependants on fatality claims.

## **Administration**

The Act is administered by the Industrial Commission of Virginia. The Commission consists of three Commissioners who are elected by the legislature for six-year terms. In addition, there are one Chief Deputy Commissioner and nine Deputy Commissioners.

The Act provides for compensation payments based on agreements reached between the employer and the worker. Such agreements, to become effective, must be approved by the Commission. A major responsibility of the Commission, therefore, is to review all agreements submitted for approval. Another major responsibility of the Commission is to hold hearings in cases in which the parties are unable to agree, and award decisions.

## **Virginia law and the Objectives of Workers' Compensation**

The appointment of the National Commission on State Workmen's Compensation Laws resulted in a major overhaul of the workers' compensation programs in the states. In its report, the Commission articulated the 5 objectives of a modern workers' compensation program and made several recommendations to achieve the objectives. Most of the states including Virginia acted upon the recommendations and revised the provisions of their workers' compensation laws. As a consequence, considerable uniformity has been achieved among the programs in different states.

The provisions contained in the Virginia statute are evaluated vis a vis the 5 objectives of workers' compensation noted by the Commission, and presented below.

### ***Coverage***

To achieve broad coverage of employees and of work-related injuries and diseases, the Commission concluded that mandatory universal coverage was warranted, subject to possible minor limits for administrative reasons. In the Commission's view, certain elements are essential to a program assuring broad coverage. The Commission's recommendations on these elements are compared with the Virginia provisions:

1. Coverage should be compulsory, not elective, and no waivers should be permitted. Under this condition, coverage cannot be avoided by action of an employee or his employer, or by agreement between them, or by other types of waiver.

Virginia's law mandates compulsory coverage, but permits waivers by employees under certain conditions such as voluntary coverage of exempted employers.

2. There should be no numerical or occupational exemptions to coverage of employers. Coverage should extend to farm workers, household workers, and casual workers, and coverage should be mandatory for all government employees. No exemptions should be permitted for any class of workers.

In Virginia, employers are exempted if they employ fewer than three employees. Also, domestic service is exempted from coverage, although voluntary coverage of such employees is permitted.

3. In addition to accidents, full coverage should be provided for work-related diseases.

Occupational diseases are fully covered under the law in Virginia.

### *Income Maintenance*

The goal of workers' compensation is to provide protection to workers against loss of income from work-related injuries and diseases. The Commission observed that the program must carefully weigh the worker's interest in substantial income benefits against factors such as the loss of incentive for rehabilitation. However, the essential elements of the income maintenance objective are adequate weekly cash benefits for total disability and fatality cases, and no arbitrary limits on duration or sum of benefits. The Commission's recommendations on these elements are compared with the Virginia provisions:

1. Waiting period for benefits should be no more than three days, and no more than 14 days should be required to qualify for retroactive benefits for days lost.

In Virginia, the waiting period is seven days, and compensation is retroactive only if the disability continues for more than three weeks from the date of injury.

2. The benefit payments for temporary total disability, permanent total disability, and death, should be at least 66 2/3% of the worker's gross weekly wage, and the maximum benefit should be at least 100% of the State's Average Weekly Wage. In cases of permanent total disability, the benefits should be paid for the duration of the disability, or for life, without any limitations as to dollar amount or time.

Benefit provisions under Virginia's law meet these standards.

The Commission recommended that the maximum benefit should progressively be raised to at least 200% of the State's Average Weekly Wage (SAWW) by July 1, 1981. However, only a few states such as Alaska, Illinois, Iowa, Maine and New Hampshire have raised the maximum beyond 100% of the SAWW. In fact, several states have yet to bring the maximum up to the 100% level.

3. Death benefits should be paid to a widow or widower for life or until remarriage. Benefits for a dependent child should be continued at least until the child reaches the age of 18, or at least until age 25 if enrolled as a full-time student in any accredited educational institution.

Virginia law limits payment of death benefits to a maximum of 500 weeks. Children who are disabled, however, receive benefits beyond 18 years of age, and children who are students receive the benefits until they are 23 years of age.

## ***Medical Care and Rehabilitation***

Delivery of medical care and rehabilitation services for work-related injuries and diseases is as important as income maintenance. The National Commission observed that a proper medical care and rehabilitation program must provide for:

1. definitive medical care to restore the patient's abilities or functions.
2. vocational counselling and job retraining if the worker suffers a loss of endurance or skills needed to perform his previous duties.
3. the worker's actual return to productive employment.

In the Commission's view, the program should essentially provide for full medical and physical rehabilitation benefits without arbitrary limits. There should be no statutory limits of time or dollar amount for medical care or physical rehabilitation services for any work-related impairment, and the right to such benefits should not terminate by the mere passage of time. The employer should pay the costs of vocational rehabilitation necessary to return a worker to suitable employment.

Virginia's law fully meets these requirements. There are no limits under the law for medical care and rehabilitation services, and these benefits are provided by the employer at no cost to the disabled worker.

## ***Occupational Safety***

The Commission observed that encouragement of safety is a basic objective of workers' compensation since the program operates in at least two ways to reduce the frequency and severity of work-related injuries:

1. Although workers' compensation is only one of many programs directed at preventing injuries, it provides employers with preventive services, including safety engineering.
2. It is a primary force in injury prevention since it provides a monetary incentive to employers to improve their safety records.

The Commission recommended that, subject to sound actuarial standards, the experience rating principle should be extended to as many employers as possible.

In Virginia, experience-rating is permitted as the basis for an employer's insurance charges.

### *Effective Delivery System*

An effective delivery system is required in order to achieve the four basic objectives of complete coverage, adequate income maintenance, necessary medical care and rehabilitation, and safety incentives. The Commission noted that such a system enlists both private and public organizations including insurance carriers, courts, and workers' compensation agencies, and a variety of individuals including employers, employees, attorneys, and physicians.

The Commission made several recommendations to achieve an effective delivery system, the major ones among which are compared with the Virginia provisions:

1. A workers' compensation agency should be utilized to fulfill the administrative obligations of the program.

In Virginia, the Industrial Commission is responsible for the administration of the program.

2. An advisory committee should conduct a thorough examination of the state's workers' compensation law in the light of the Commission's report.

The Industrial Commission of Virginia appointed an advisory committee to advise and make recommendations to the Industrial Commission on legislation. The committee is comprised of representatives of employers, employees, physicians, the insurance industry, attorneys, and the general public, with an on-going term of office.

3. The time limit for initiating a claim should be three years after the date the claimant knows of the existence of impairment and its possible relationship to his employment, or within three years after the employee first experiences a wage-loss due to the work-related impairment.

In Virginia, the time limit for initiating claims is restricted to two years from the date of accident. In the case of occupational disease, the time limit is two years from the date a diagnosis of occupational disease is first communicated to the employee, or five years from the date of last injurious exposure in employment, whichever is earlier.

4. Attorneys' fees for all parties should be reported for each case, and the fees should be regulated by the workers' compensation administrator.

In Virginia, attorneys' fees of employers and insurance carriers are not regulated by statute or state regulations. Attorney fees for claimants are established by the Industrial Commission on an individual case basis. There is a statutory provision whereby attorney fees are added to the award in certain cases, and the approved attorney fees do not become liens against the

awards in any case. However, the law does not prohibit acceptance of unapproved fees. Further, laypersons are not permitted to represent claimants.

5. The workers' compensation agency should permit compromise and release agreements only rarely and only after a conference or hearing before the agency and after its approval.

Under Virginia's law, agreements reached between the employer and the employee should be approved by the Industrial Commission. According to the Industrial Commission, approximately 90% of all claims with the Commission are handled by employer-employee agreements.<sup>3</sup>

6. Private insurance, self-insurance and insurance under State funds should be permitted.

Virginia permits self-insurance and insurance with private carriers, but not State funds.

7. To compensate for inflation, a retroactive benefit fund should be established to increase the benefits to current levels for claimants still entitled to compensation and whose benefits began when the benefits were below current levels.

Virginia has not established a fund for compensating against inflation, but has provided for annual cost of living increases for open awards relating to death and permanent total disability.

In summary, it can be concluded that Virginia's statute substantially incorporates the recommendations of the National Commission.

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<sup>3</sup>"The Virginia Workers' Compensation Act of 1986" -- information brochure published by the Industrial Commission of Virginia.

## Literature Review

The present system of workers' compensation in U.S.A. has evolved over the last eighty years. The process of evolution has been marked by different stages of development of the system. The first and probably the most important development occurred in the early twentieth century with the replacement of the tort-based liability for fault by a no-fault exclusive liability for compensation. This development was significant since it represented both America's first social insurance program, and the inception of the workers' compensation system. The outcome of this development was the enactment of workers' compensation legislation in the different states.

The second stage of development of the system was marked by improvements in the laws. For a few decades after the inception of workers' compensation, the states improved their laws by "expanding coverage, raising benefits, and liberalising eligibility requirements" (Price, 1979).

The third stage of development was prompted by the federal government's concern for the workers' welfare. The substantial increase in injury rates during the 1960s that gave rise to widespread federal involvement in occupational safety and health also spawned a period of significant change in the workers' compensation system (Chelius, 1986). Congress, by the Occupational Safety and Health Act of 1970, provided for the National Commission on State Workmen's Compensation Laws. In response to the 1972 recommendations of the Commission, most states substantially broadened coverage and increased benefits for injured workers.

Currently, the compensation system is in the process of further reform and development. Concern has moved from issues like extending coverage to previously-excluded classes of workers, and benefit levels, to subtler matters like disease compensation, competitive rates of insurance, and efficiency of administration. Questions like the compensability of stress-related disability and low back disorders are the focus. While such issues are by no means settled, the developments mark a further refinement of the system.

There is a substantial body of literature pertaining to workers' compensation. A review of the literature reveals that researchers have by and large examined the trend of developments in the system. While some aspects of the system like inter-state variations, states' reforms of the program and the legal aspects have been researched in relatively greater detail, studies of other aspects like the economic and individual characteristics have been limited. Especially, studies on the demographic characteristics and their relationship to workers' compensation, with which this thesis is concerned, have been very few. Before proceeding to the discussion of the available literature on demographic characteristics, the findings of the studies on the other aspects are presented below.

## **Inter-state Variations in Compensation Costs**

Inter-state variations in compensation costs to employers have been examined by several researchers. The first major effort to explain the variation in compensation costs to employers in different states was undertaken in 1954 by Herman and Anne Somers. An important conclusion of this study was that "many factors in addition to benefits ... influence insurance costs". Subsequent studies (Burton, 1965; Elson and Burton, 1981) have focussed on the relationship between compensation premiums and variables like the level of medical and indemnity benefits, extent of coverage, insurance arrangements, and "legal generosity", and have also attempted to estimate the cost of workers' compensation premiums. Burton (1965) concluded that besides the identification of a strong positive relationship between benefits and workers' compensation costs, his study did "not seem to have isolated the other determinants of the inter-state variations in the employers' costs of workers' compensation". Elson and Burton (1981) concluded from their analysis that the average cost of workers' compensation insurance to employers had grown rapidly during the previous decade, and the variation in costs among states

had increased as well. Another study by Burton and Krueger (1986) examined the operation of workers' compensation in the states of New York, New Jersey, and Connecticut, and found that "inter-state differences in the levels of workers' compensation benefits are a major (though not the only) determinant of inter-state differences in the employers' costs of workers' compensation".

## **State Reforms**

In addition to inter-state differences in compensation costs, workers' compensation reforms in the states have also been researched. In 1986, papers documenting workers' compensation reforms in California (Tebb), Michigan (Hunt), Minnesota (Keefe), Florida, Louisiana, New Mexico, Delaware, and Alaska (Lewis) were presented at a conference jointly sponsored by Rutgers University, Cornell University, and the University of Connecticut.

## **Economic Aspects**

The third aspect of the compensation system that has attracted research efforts has been the economic aspect. Largely due to the states' efforts to bring benefits and coverage up to the levels recommended in the National Commission's 1972 report, the total cost of the compensation program has registered a significant increase. Butler and Worrall (1985) observed that the cost of the workers' compensation program as a percentage of covered payroll doubled during the period 1972 to 1978. In terms of absolute cost, the state and federal workers' compensation programs collectively cost over \$25 billion in 1980 (Leigh, 1985; Butler and Worrall, 1985). Apart from indemnity payments to the disabled workers, a considerable portion of the costs is accounted for

by medical care. The workers' compensation system mandates that all those who experience work-related injuries be treated at zero price to the employee, (and) medical care is virtually unlimited (Worrall, Appel, and Butler, 1987). In 1983, workers' compensation expenditures for health services and supplies were \$6.4 billion while hospital care and physicians' services were \$4.7 billion (Gibson, et al., 1984). The impact of the increased costs is reflected in the increased premiums employers are required to pay for workers' compensation insurance. It is not surprising, therefore, that this issue has been of utmost concern to employers, insurers and economists.

Despite the attention that the economics of the workers' compensation program has attracted, the existing body of knowledge on this aspect is limited. Only a handful of empirical studies of workers' compensation have been published (Leigh, 1985). The findings of these studies are presented below.

Chelius (1974, 1982), McCaffrey (1983), Butler and Worrall (1983) and Worrall (1983) examined the relationship between the size of state workers' compensation benefits and workers' compensation claims, and found evidence indicating a positive association between the size of benefits and the rates for both indemnity claims and reported injuries. But, as Worrall (1983) noted, "the research does not determine whether the increases in claims and reported injuries are the result of a reporting phenomenon or of more actual injuries resulting from additional risk bearing ... it is quite conceivable that the positive association reported between workers' compensation benefits and indemnity claims is due to both the more frequent reporting of temporary total disability claims and additional risk bearing (or less careful behavior)".

In an unpublished study (report currently under review), Chelius and Kavanaugh (1987) examined the relationship between benefit levels and injury rates in an educational institution. Their study is the only one conducted so far using data from an educational institution, and the results are particularly relevant to this thesis. A brief description of the study is, therefore, presented below.

Public institutions of higher education in New Jersey are covered by a special statute mandating workers' compensation benefits of 100% wages with no dollar maximum and no waiting period for temporary total disabilities. In 1980, the management of a community college in New Jersey discovered that it had been misinterpreting the benefit provisions, and the special statute applied only to the college faculty and administrators. Until then, its unionized maintenance employees had also been provided benefits under the special statute. Following negotiations with the maintenance employees, their benefits were lowered to the level mandated by the general workers' compensation statute, i.e. 70% of wages with a seven day waiting period. Chelius and Kavanaugh investigated whether the substantial decrease had any significant impact on reported injury rates among the maintenance employees. They used a comparison group from another community college where the benefit level was 100% with no waiting period throughout the duration of the study. They found that lower workers' compensation benefits were associated with a significantly lower frequency of injuries. This finding strengthens the consensus of other studies that have found a positive relationship between benefit levels and injuries.

### **Social Costs and Wage Premiums<sup>4</sup>**

Chelius (1977) has observed that, for a broad range of activities, society trusts private decision makers such as workers, consumers, unions, and firms to achieve through their interaction the desired amount of goods and services. An important question is whether the decisions individuals make about the production and consumption of occupational safety and health can be trusted. In occupational safety and health, the issue is whether there are any differences in costs to decision makers and in social costs which will cause a nonoptimal amount of safety to be supplied

<sup>4</sup> The following discussion on social cost and wage premium is based on material from Chelius, James R. "Workplace Safety and Health", (Washington, D.C.: The American Enterprise Institute for Public Policy Research, 1977).

in the absence of government regulation. A social cost problem might arise if the party bearing the costs of accident prevention is not the one who receives all the benefits of prevention. In many situations, the worker receives most of the benefits of accident prevention while both the worker and his employer each have a substantial role in prevention. To the extent that the employer does not receive adequate benefits from safety measures, his prevention expenditures will not fully reflect the total benefits of prevention. An optimal safety level can, however, be achieved if workers accurately perceive the risks of accidents and disease and if there are negligible costs of bargaining with employers. Under such circumstances, the cost of taking risks would be reflected in the wage structure, i.e. in order to attract workers to risky work the employer would have to pay a wage premium. The extra wages reflecting compensation for danger are the mechanism by which the firm is made to carry the burden of not preventing accidents and disease. Insofar as the employer devotes resources to prevention, the wage premium needed to attract workers will decrease, and the employer receives the benefit of a reduction in his wage bill. Thus, true social costs are made to be the employer's private costs. Since the relevant decision makers feel the full burden and rewards of both costs and benefits, this arrangement would yield the optimal amount of safety and health.

Payment of wage premiums or "compensating differentials" to workers for bearing risk has been found in studies by Smith (1979), Dorsey and Walzer (1983), Butler and Worrall (1983), Dorsey (1983) and Butler (1983). These studies found such differentials not only for fatal injury, i.e. elevated risk of death, but also for increased risk of injury. Dorsey (1983) found that the premium for risk bearing is paid in both wages and fringe benefits and the percentage risk premium paid for non-wage compensation is twice as large as the premium for wage compensation.

## Demographic Characteristics

Although wage differentials are paid to workers for bearing risk, the relationship between the two is not straightforward. The relationship is complicated by worker-characteristics such as attitude towards risk and sensitivity to changes. Butler's (1983) study on wage differentials found that workers were not only responsive to benefit changes, they appeared to be sensitive to changes in job riskiness as well, i.e. they were risk-averse. The relationship between worker-characteristics and workers' compensation has attracted some research. Despite its importance, however, the available evidence is limited. Among the characteristics that have been found to be associated with workers' compensation utilization are age, gender, race, experience on the job and type of work performed (blue collar/ white collar). An important caveat of these findings should, however, be noted. The researchers have cautioned that their findings are tentative results on the basis of selective/limited data. These studies have been preliminary, and considerable further research is necessary to verify the findings.

Some of the characteristics have been found to be individually related to workers' compensation as well as being inter-related to other characteristics. The findings on the individual and inter-relationships are separately presented below:

### *Age*

Age of a worker and its relationship to workers' compensation has been examined in some studies. Kossoris (1940) and Dillingham (1981) found that younger workers have higher injury frequency rates than older workers. Dillingham (1983) also found that young males (less than 25 years old) had an injury rate that was twice the rate for two older groups of males - 25 to 44 years old, and 45 years old and over. A possible explanation for the difference in injury rates between

older and younger workers is that the younger workers are inexperienced on the job and are not as familiar with job hazards as older workers (Chelius, 1979). Another possible explanation is that, relatively, younger workers are risk-takers while older workers are risk averse.

Data from Dillingham's (1983) study shows that for females in similar age groups, the injury rate for the older females was higher. Females in the 45 years and older group had the highest rate, followed by the 25 to 44 years group and females below 25 years with the lowest of the three groups. The differences, however, are not large.

In an unpublished study (report currently under review), Worrall, Butler, Borba, and Durbin found that the duration of non-work spells (work-time lost due to injury) is sensitive to the structure of workers' compensation benefits and that age is a prime determinant of the duration of a non-work spell. The duration of non-work spells for older workers is more than that for younger workers. Earlier, Dillingham (1979) also found that older workers tend to have more serious injuries, and to lose more time per injury than younger workers.

These studies appear to suggest that although younger workers have a greater frequency of injuries, the injury experience of older workers is more costly than that of younger workers.

## *Gender*

Some studies have been conducted on the relationship of gender differences to workers' compensation. Oi (1974) and Dillingham (1981, 1983) found gender associated with the frequency of workers' compensation claims, with the injury frequency rates of males exceeding those of females. Similar findings were reported by Worrall, Appel, and Butler (1987). They found that males are more likely to be injured on the job than females. Worrall et al. also found that females spend less, on average, for injuries in general.

These results appear to suggest that injury experience of females is less costly than that of males.

There is no available literature directly relating to the observed differences in injury rates between males and females. However, an explanation is indirectly suggested by Leigh (1983). While examining sex differences in absenteeism, Leigh conceptualized that men and women have different absence rates in aggregate data because (i) they occupy different jobs, (ii) they have acquired different attributes (e.g., years of schooling) and responsibilities (e.g., child care), and (iii) they are intrinsically different (i.e., at identical jobs, with the same responsibilities, men and women have different absentee rates). He postulated that the disparity in absence rates would decrease if the differences between men and women could be narrowed. His finding was that sex differences in absenteeism have been overstated in previous discussions, and in some respects, men's and women's absence behavior is strongly similar.

It is possible that differences in injury rates between males and females as reported in previous studies may be explained on similar lines as the differences in absence rates. In general, women have typically been homemakers in the past. Only in recent years, women have entered the labor-force in greater numbers. Further, even such women have typically occupied relatively low injury-risk jobs such as office workers, bank tellers, nurses, and school teachers. Employment of women in high injury-risk activities such as construction, manufacturing, and mining has been relatively low. Recent legislation prohibiting discrimination in employment on the basis of sex has enabled women to enter jobs which were denied to them in the past. Therefore, future studies may well find that differences in the injury-rates between men and women have been narrowed.

## *Nature of Work/ Workplace*

Data collected by the federal government reveals that injury frequency rates vary across industries. Injury rates are highest in construction, mining, manufacturing, transportation, communications, and utilities industries while the rates are lowest in the trade and service sectors (U.S. Department of Labor, 1979).

Dillingham (1979) found that blue-collar workers faced considerably higher risk of workplace injury than white-collar workers -- unskilled workers were found to face twenty-five times the injury risk that professional and technical workers faced on average. Root and Sebastin (1981) found that blue-collar workers in general suffered four to five times as many accidents and illnesses as white-collar workers.

## *Inter-Relationship of Factors*

The findings of the various studies indicate that workplace injuries, and correspondingly utilization of workmens' compensation benefits, are influenced by a variety of demographic factors. Further, a combination of more than one factor can affect the utilization at the same time. Dillingham (1983) has examined the combined effects of these factors on compensation costs. The findings of his study are reviewed below.

Data from New York State's workers' compensation system, the 1970 Census, and individual accident records was used to calculate age-, sex-, industry-, and occupation-specific injury rates, exposure to injury risk and compensation costs for the 1970 New York workforce. Injury rate for this purpose was defined as the number of injuries per million employee hours, or per five hundred full-time workers. Estimates of the annual hours worked for each cell were derived as a measure of exposure to injury risk. Compensation cost was defined as the dollar awards paid

in injury cases for medical expenses, lost wages, and disability or death awards. The injury rates were calculated for a detailed matrix consisting of two sex, three age, eight major occupation and twenty seven industry groups, and aggregated.

### ***Compensation Costs by Sex and Age***

The greatest cost variation occurred across age groups, and the patterns were similar for males and females: costs for workers below 25 years of age averaged about 40% of the costs for workers above 44 years of age. Between sexes, costs for males exceeded the costs for females in all the three age groups: below 25, between 25 and 44, and above 44 years of age. While the age and sex differences reflected in part the differences in the occupation and industry distributions, adjustment for these other influences did not alter the key result for compensation cost per unit of exposure to injury risk. Compensation cost per unit of exposure was higher for males than females, and compensation cost per unit of exposure tended to increase as cohort age increased, although the relationship tended to vary somewhat by sex and occupation category.

### ***Compensation Costs by Industry and Occupation***

Blue-collar employment generated the highest compensation cost per unit of exposure, and within this occupational sector the least skilled work generated the highest cost. Construction, mining, and manufacturing generated the highest cost per unit of exposure.

## *Economywide Compensation Costs*

As the composition of employment changes, differences in compensation costs per unit of exposure for the age, sex, industry and occupation groups will cause changes in aggregate economywide compensation cost per unit of exposure. Based on the compensation cost estimates and employment trends since 1960, economywide compensation cost per unit of exposure should have decreased between 1960 and 1980. Dillingham's analysis revealed that the economywide estimates, as expected, did decline by roughly 20% over the period. The actual compensation cost per unit of exposure as per his calculations was \$14,501 in 1960 and the cost had declined to \$13,005 by 1978. The decrease occurred largely because increased numbers of young and female workers combined with decreased numbers of older workers exerted a steady downward pressure on costs over the 20-year period. Further, most of the decrease (about 80%) occurred between 1960 and 1970, since changes in the industry and occupation mix of the economy had their biggest influence on costs during this period. Between 1960 and 1970, there was both a demographic and economic (industry-occupation) effect, but between 1970 and 1980 the economic effect was greatly reduced.

Based on the middle growth assumption of the Bureau of Labor Statistics and the economywide estimates for 1960-78 actual compensation costs, Dillingham estimated the projected costs for 1990 and 1995. The projected economywide compensation costs are expected to decrease from the 1978 level of \$13,005 to \$12,261 by 1990. However, by 1995, the costs are expected to increase. The estimated cost for 1995 is \$12,302. The turnabout is expected to occur for a combination of reasons. The increased participation of women in the labor force has contributed to depress costs in the past. By 1995, however, labor force projections incorporate a slower rate of increase in female labor force participation, and the depressing force on costs is expected to be weaker. Also, until 1990, the share of males above 45 years of age in the labor

force is expected to decline. Since this group of workers is the highest cost group, a corresponding decline in economywide costs can be expected. However, after 1990, the labor force age distribution is projected to shift towards the older groups among both males and females.

### *Implications*

Dillingham's study revealed that compensation cost per unit of exposure (500 full-time employees or million employee hours) varies markedly by age and sex group, as well as by industry and especially occupation category. In general, the high-cost groups for each of the four categories are older workers; males; construction, mining, and manufacturing activities; and blue-collar workers, especially unskilled labor. However, these findings are derived from data on employment groups that are highly aggregated and include considerable heterogeneity in work and workplace. Therefore, for well-defined employment groups that are homogeneous in work and workplace, the actual injury compensation costs might be different. The results do not imply that a younger or female worker will always cost an employer less than an older or a male worker.

Further, the decreased share of males and older workers in general, and the decreased share of blue-collar employment, particularly in manufacturing and construction, reduced economywide workers' compensation cost per unit of exposure between 1960 and 1980. The decrease was, however, offset by inflation, wage increases and workers' compensation benefit liberalization, all of which increased average cost of compensation per injury. The net change in unit cost in the 1970s was, therefore, probably positive.

The decreasing trends in unit compensation costs will also be reversed by 1995 because the high-cost demographic groups' portion of the labor force will increase and that of the low cost groups shrinks. Therefore, the projected demographic changes in the labor force of the 1990s suggest higher workers' compensation costs even if inflation and benefit reform are totally halted.

Demographic and economic trends will not offset cost increases during the 1990s, as they did between 1960 and 1980.

## **Conclusions**

Based on the above literature review, it can be concluded that demographic characteristics have a significant impact on the pattern of utilization of workers' compensation benefits in an organization. Changes in the demographic composition of the workforce can result in considerable changes in the costs incurred by employers for providing workers' compensation insurance. For instance, earlier research has revealed that blue-collar employees, especially unskilled labor, are a high-cost group in an organization. Second, male workers in general, are a high-cost group. Third, among all workers - male and female - the older workers are a high-cost group. Combining these three findings, it can be concluded that unskilled jobs in which older and male workers are predominantly employed, would account for a substantial portion of an organization's compensation costs. An effective strategy to control the costs would be to reduce or eliminate the impact of the high-cost group. This can be achieved in several ways. The most effective way of eliminating the high-cost group's impact is to resort to automation of jobs. However, automation may not be possible in all cases. Therefore, an alternative would be to alter the composition of the workforce in such jobs by greater mobility of workers within an organization. Taking care to ensure that anti-discrimination laws are not violated, if younger workers and females are transferred and inducted in greater proportions into such jobs, according to the available evidence compensation costs would be depressed. However, it must first be established that males and older workers actually account for higher costs of compensation in specific jobs in the organization. In other words, characteristics such as age, gender and the nature of work/workplace should empirically be shown to have influenced the rate of injuries and

corresponding costs of compensation. If such a finding is arrived at based on the organization's previous history of compensation claims, it would be reasonable to conclude that controlling these characteristics would enable controlling compensation costs.

## **Limitations**

The previous findings on demographic characteristics have an important caveat attached: they are tentative results based on preliminary research, and considerable further research is necessary for validity generalization. Particularly, Dillingham's (1983) results are based on highly aggregated sets of data extending over the entire New York State. Before employers can utilize the earlier findings for compensation cost control in their organizations, the results need to be verified across disaggregated employment groups at the institutional level. The literature review reveals that, till date, such studies pertaining to a specific organization have not been reported. A definite need, therefore, exists for studies at the institutional level to be conducted.

## **Objectives of proposed research**

This thesis is among the first attempts to study the effects of worker and workplace characteristics on compensation costs at the organizational level. It will focus on the influence, if any, of the characteristics of age, gender, and type of job, on the workers' compensation experience of a specific organization. Thereby, it seeks to add to the existing body of knowledge currently available on this subject.

Apart from fulfilling the research need to a limited extent, the thesis expected to fulfill a specific organizational need. The organization selected for study is experiencing an increasing trend in the number of workers' compensation claims, resulting in increasing compensation costs. Owing to budget constraints, the organization needs to immediately examine and implement cost-control measures. The organization also needs to focus on preventive measures such as occupational hazard reduction and safety training. The thesis is expected to provide data which would aid development of a strategy to combat the problem of increasing number of disability claims and resultant costs.

The thesis attempted to answer the following questions:

1. Is the incidence of work-related disabilities in any given type of employment independent of the nature of work performed? If it is not independent but is related to the nature of work performed, are there differential rates of incidence among the different types of employment?
2. Is the incidence of disability independent of the age of a worker or is it related to age?
3. Is the incidence of disability independent of the gender of a worker or is it related to gender?

4. Are there differential rates of disabilities among workers employed in sedentary jobs (jobs requiring minimum physical mobility) and non-sedentary jobs (jobs requiring greater physical mobility)?
5. Are there differential rates of disabilities among workers employed in professional or skilled jobs and among workers employed in unskilled jobs?
6. If the incidence of disabilities is related to any or all of the characteristics indicated above, what are the implications of the observed relationships?

The analysis is expected to be useful for several functions in the organization: manpower planning and staffing, benefits administration, risk management, and occupational safety and accident prevention.

# Chapter 3

## Research Method

### Research Site

The research was conducted in a large institutional setting. The organization selected is one of the largest public sector employers in the Commonwealth of Virginia and is primarily engaged in academic instruction and research. Its current employment is over 5500 employees in different fields of activity ranging from highly qualified professionals to unskilled workers. A major portion of the employment (61.33%) is comprised of support services to academic units, which account for the remaining 38.67% of employment. While the academic units are largely made up of professionally qualified instructional faculty, there is considerable employment of unskilled and low-skilled workers (24.19%) in the support services.

## **Research Data**

Data required for the study was obtained from the records of the institution. Different sets of data, as detailed below, were used for analysis:

1. Distribution of employees in different functional departments.
2. Age distribution of employees in individual departments.
3. Gender distribution of employees in individual departments.
4. Distribution of employees classified by the nature of employment in individual departments.
5. Details of claims for workers' compensation benefits filed by the employees of the institution over the last two years.

It should be noted that work-related disabilities suffered by workers in the institution fall into two categories. The first category is first-aid injuries which involve minor disabilities requiring no more than immediate treatment. Such disabilities typically do not involve extended medical care or result in work-time loss. Therefore, no claims for workers' compensation benefits result from such disabilities. Since no compensation costs were incurred by the institution on account of such disabilities, they were not considered for the purposes of this thesis.

The second category of disabilities comprises of work-related injuries and illnesses which require medical care extending beyond immediate treatment. Such disabilities also result in lost work-time in several instances. Therefore, claims received from the disabled workers may involve payment of medical benefits (expenses for medical treatment) and disability benefits (income replacement for lost work-time). However, due to the waiting period of seven days required under the statute, payment of disability benefits will not occur in cases involving less than seven days of lost work-time. Approximately 450 claims for benefits were filed between July 1985 and June 1987 by workers in the institution. A substantial portion of the claims resulted in payment of

medical benefits only, although work-time was lost in all the cases. However, this thesis dealt with the incidence of claims filed, and not with the quantum of costs incurred by the institution. Therefore, all cases were considered irrespective of the actual benefits paid. The number of claims considered for analysis (442 claims) was sufficiently large to permit a meaningful analysis.

## **Research Methodology**

Since data pertaining to actual compensation claims processed by the institution was used, the accuracy and appropriateness of the data was established.

For analysis, the frequency rate of compensation claims was defined as the ratio of the number of employees filing compensation claims to the total number of employees. Frequency rates were calculated separately across departments, age groups, gender groups, and employment groups classified on the basis of the nature of jobs. For this purpose, the actual number of claims recorded in the institution was converted into frequency rates of claims.

Statistical procedures of analysis were used to determine whether there are any relationships between the frequency of claims and age, gender and occupational variables. For each variable, data to be used in the analysis is in the nominal scale. This permitted comparison of observed frequencies of occurrence with theoretical frequencies.

For each variable, theoretical frequency of a compensation claim occurring was calculated based on the total employment in the institution. The actual claim data was used to determine the observed frequency, and the two frequencies will be subjected to the "goodness of fit" test. Chi-Square values were obtained to explain whether differences, if any, between the theoretical and observed frequencies can be attributed to sampling fluctuation.

## Research Questions

The primary question is whether there is any differential usage of workers' compensation benefits among specific groups of employees. This question was examined by investigating the relationship between the frequency of claims filed for workers' compensation benefits and the personal and occupational characteristics of the workers filing the claims. Such investigation involved several analyses described below.

### *Claims frequency in different functional departments*

This analysis investigated two different aspects of work in any functional area, and their relationship to utilization of workers' compensation benefits. First, the analysis examined whether the frequency of claims is related to the number of employees working in a specific functional area. With this examination, it was possible to determine whether there is evidence of differential rates of claims among the various functional activities.

The hypothesis was that the frequency of claims in any function is dependent only on the number of employees in the department, and is independent of any other factor. In other words, the frequency of claims in any function among all the claims in the institution, is in the same proportion as the proportion of employees in that function among all the employees of the institution.

Second, the analysis determined whether the physical location of the workplace has any significant relationship to compensation claims. Employees in most departments of the institution have fixed work locations, and largely sedentary work. Minimum physical mobility is required of them in the day-to-day performance of their jobs, and such mobility is confined to fairly well-defined areas. For instance, workers in many academic and administrative departments have

fixed work stations and have very little requirement to move beyond the immediate surroundings of their work stations. Their movement is largely restricted to the specific buildings in which they are located. Employees in some other departments, however, do not have a fixed work station, but operate over a large geographical area. Examples of such employees are the campus police, physical plant employees, and workers in the horticultural department.

The hypothesis was that the frequency of claims for workers in sedentary jobs is the same as the frequency of claims for workers in non-sedentary jobs.

With these two analyses, it was possible to establish whether workplace characteristics affect the utilization of workers' compensation benefits.

### *Claims frequency and nature of work*

While the above analyses related to characteristics between functional areas, this analysis related to differences within a functional area. The analysis permitted examination of the relationship between the claims frequency and the nature of work performed such as academic jobs, administrative jobs, clerical work, professional work (like managers and engineers), technical work (like laboratory technicians, and computer technicians), and unskilled work (manual work like janitorial service, food service, and groundskeeping).

The hypothesis was that the frequency of claims remains the same for different employee groups classified according to the nature of work performed.

### ***Claims frequency and age***

This analysis was aimed at examining whether claims frequency rates in the institution vary across age groups, and permitted determining whether employees in any particular age group have differential claims rates as compared to employees in other age groups.

The hypothesis was that claims frequency remains the same for employees classified into different age groups.

### ***Claims frequency and gender***

This analysis determined whether gender is related to the frequency of claims filed, and facilitated investigating whether differential rates of claims exist between males and females.

The hypothesis was that claims frequency for male workers is equal to the claims frequency for female workers.

### ***Claims frequency and inter-related variables***

Analyses of the relationship between claims frequency and age, gender, and nature of work variables were first performed individually for the aggregated number of employees in the entire institution. The results were next considered in relation to the analysis of claims frequency in different functions. As necessary, further analyses of the relationship between claims frequency and age, gender, and nature of work were performed for disaggregated groups of employees in departments where differential claims frequency was evident. By performing the analyses for such disaggregated employee groups, contamination of results due to heterogeneity of work/workplace

was sought to be overcome. Finally, for the disaggregated groups, inter-relationships of age x gender, age x type of job, and gender x type of job, were analyzed.

## **Summary**

The overall analysis facilitated identification of the effects that age, gender, and type of job characteristics have on the claims experience of the institution. In conclusion, the implications of the observed effects are discussed in relation to the staffing, compensation, injury risk management, and occupational safety aspects in the institution.

## Chapter 4

### Results

In Chapter 3, the frequency rate of compensation claims was defined as the ratio of the number of workers filing compensation claims to the total number of workers employed. If the frequency rate is independent of work characteristics such as the nature and type of work performed, and the skill level, as well as worker characteristics such as the age, and the gender of the worker, the number of claims filed will be dependent only on the number of workers employed in each age-group, job-type, etc. In other words, if the frequency rate of claims is not influenced by any other factors, the number of claims filed will be proportionate to the number of employees in the various age-groups, job-types, etc.

The conceptual hypothesis in this thesis is that the frequency rate of claims is not independent of the work characteristics of (i) nature of work, (ii) type of job, and (iii) the job classification; nor is the incidence of claims independent of the worker characteristics of age and gender.

To facilitate statistical analysis of the conceptual hypothesis, operational hypotheses were developed as presented below. The total population in the institution, i.e. the aggregated workforce, was broken down into disaggregated groups based on function (nature of work performed), job-type (sedentary or non-sedentary type), job-group (based on the institution's classification of jobs), age-group, and gender. The total number of claims filed by employees between July 1, 1985 and June 30, 1987 were also similarly broken down into disaggregated groups as above. Only claims processed as valid claims under the workers' compensation program were considered, and claims that were denied and not processed were ignored. In a few cases, employees had filed more than one claim, but these pertained to different incidences of disability. Such claims were considered as separate claims.

Breaking up the total number of claims filed into disaggregated groups as above yielded the number of claims filed for each group and also the number of claims for each cell within the group. The values for each cell and group denote the observed frequency of claims. To determine the expected frequency, calculations were made as per the following formula :

Expected frequency of each cell = ( Number of employees in the cell / Total number of employees in the study group) x Total number of claims in the group during the study period.

Disaggregation of the total population in the organization into different groups for analysis, as well as determining the claims filed by employees in the various groups, was achieved using the SAS software system for data analysis. However, the Chi-Square algorithm in the SAS system does not facilitate determination of the expected frequency as per the formula indicated above. A simpler but laborious alternative is to manually calculate the expected frequency. This procedure, however, assures the accuracy of results. Therefore, the expected frequency was calculated manually.

With the expected and observed frequencies of claims as determined above, Chi-Square values were calculated to determine whether the differences were statistically significant. The results are presented below.

## **Definitions**

### ***Function***

The operations in the institution were categorized into 4 functions:

Academic, comprising of all research, teaching, and instruction departments.

Administration, comprising of departments such as the offices of the President, the various Vice Presidents, the Registrar, the Treasurer, the Provost, the Deans of the various colleges, the Graduate School, the Admissions Office, and the Financial Aid Office.

Extension, comprising of the various extension centers and satellite experiment stations located in different places in Virginia.

Support, comprising of departments such as the Library, the Computer Center, the Learning Resources Center, the utilities, the food services, health services, and housing.

### ***Job-Type***

The previous studies have examined job-type in terms of blue-collar / white-collar categorization. There have been no reported studies of jobs categorized into sedentary and non-sedentary types. Traditionally, the American economy has been dominated by the manufacturing and production sector in which a substantial portion of jobs are of the manual and non-sedentary type. Consequently, the non-sedentary type of job has been considered a relatively high injury-risk type, and the sedentary type a low injury-risk type. However, with the increasing shift to the service sector of business currently occurring in the economy, the proportion of the sedentary, office-type jobs has been rapidly increasing. Correspondingly, the emerging focus and interest is on back

disorders and stress-related disabilities leading to compensation claims. A definite need is, therefore, established for examining the relationship between the claims experience and the sedentary/non-sedentary nature of work. Accordingly, the various jobs in the university were categorized into 2 types:

Sedentary, comprising of jobs with fixed work-stations and requiring minimal physical mobility from the workers. This category also included employees who are physically mobile but operate within specific and restricted geographical areas such as the dining hall workers, laboratory aides, printing press workers, and storekeepers.

Non-Sedentary, comprising of jobs with no fixed work-stations and requiring considerable physical mobility from the workers. This category included maintenance workers such as plumbers, electricians, painters, and locksmiths, police officers, custodial workers, buildings and grounds supervisors, and motor vehicle operators.

### ***Job-Group***

The employees were categorized into 7 job-groups using the institution's existing classification system:

Administrative, comprising of employees such as the President, the Vice Presidents, the Registrar, the Treasurer, the Provost, and the Deans of the various colleges.

Clerical, comprising of employees such as office services aides and supervisors, secretaries, switchboard operators, and fiscal technicians.

Faculty, comprising of Professors, Associate Professors, Assistant Professors, and instructors.

Professional, comprising of employees such as managers and directors in different departments (accounting, employee relations, audit, airport, etc.), electrical, mechanical and computer engineers, systems analysts, and programmers.

Research, comprising of research associates.

Support, comprising of employees such as mechanics, electricians, plumbers, painters, housekeepers, and storekeepers.

Technical, comprising of employees such as laboratory technicians and specialists, television system technicians, medical technicians, x-ray technicians, drafting technicians, and geologist technicians.

### ***Age-Group***

Studies in the past have examined the claims experience in broad age-groups. For instance, Dillingham's 1983 study classified the workers into three age-groups: (i) less than 25 years old, (ii) 25 to 44 years old, and (iii) 45 years old and over. To facilitate closer analysis in this thesis, the employees were grouped into narrower age-groups. Accordingly, the employees were classified into 5 age-groups:

- 25 years of age and below.
- 26 - 35 years.
- 36 - 45 years.
- 46 - 55 years.
- Above 55 years.

### ***Gender***

The employees in the institution were classified into male and female employees.

## Hypothesis 1

The primary analysis was to determine whether the total number of claims in the institution was influenced by any of the 5 hypothesised factors. For this purpose, it was hypothesised as follows:

" For the total population in the institution (i.e. the aggregated workforce), the total number of claims filed is independent of function, job-type, job-group, age-group, and gender variables."

This hypothesis was tested separately for each variable.

**H<sub>0</sub> 1.1. The total number of compensation claims filed in the total population is independent of function.**

Table 1 provides the expected frequency and observed frequency of claims across the 4 functions, and the Chi-Square value.

Table 1. Claims Across Functions – Total Population		
Function	Exp. Claims	Obs. Claims
Academic	217	121
Administration	56	46
Extension	71	61
Support	98	214

$$\chi^2 = 182.95 \quad [\text{C.V.} = 11.345 (\alpha = .01, \text{df} = 3)]$$

The null hypothesis that the number of claims is independent of function is rejected.

**H<sub>0</sub> 1.2. The total number of compensation claims filed in the total population is independent of job-type.**

Table 2 provides the expected and observed frequency of claims across the 2 job-types, and the Chi-Square value.

<b>Table 2. Claims Across Job-Types – Total Population</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	99	241
Sedentary	343	201

$$\chi^2 = 262.45 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-type is rejected.

**H<sub>0</sub> 1.3. The total number of compensation claims filed in the total population is independent of job-group.**

Table 3 provides the expected and observed frequency of claims across the 7 job-groups, and the Chi-Square value.

<b>Table 3. Claims Across Job-Groups – Total Population</b>		
<b>Job-Group</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Administrative	16	7
Clerical	86	45
Faculty	141	38
Professional	72	51
Research	15	3
Support	66	216
Technical	46	82

$$\chi^2 = 484.64 \quad [\text{C.V.} = 16.812 (\alpha = .01, \text{df} = 6)]$$

The null hypothesis that the number of claims is independent of job-groups is rejected.

**H<sub>0</sub> 1.4. The total number of compensation claims filed in the total population is independent of age-group.**

Table 4 provides the expected and observed frequency of claims across the 5 age-groups, and the Chi-Square value.

<b>Table 4. Claims Across Age-Groups – Total Population</b>		
<b>Age-Group</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
25 & below	20	55
26 - 35	127	148
36 - 45	142	101
46 - 55	99	80
Above 55	54	58

$$\chi^2 = 141.51 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is rejected.

**H<sub>0</sub> 1.5. The total number of compensation claims filed in the total population is independent of gender.**

Table 5 provides the expected and observed frequency of claims across sexes, and the Chi-Square value.

<b>Table 5. Claims Across Gender – Total Population</b>		
<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	198	180
Male	244	262

$$\chi^2 = 2.96 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

The foregoing analysis revealed that the number of claims for the aggregated workforce was influenced by four of the five variables: function, job-type, job-group, and age-group. Only the gender variable did not appear to have any influence on the number of claims.

## Hypothesis 2

The previous analysis indicated that, for the aggregated workforce, the number of claims was influenced by at least four factors. To verify whether similar influences were observed in disaggregated workforces (functional groups), it was hypothesised as follows: " Within functions, the number of claims for each function is independent of the job-type, job-group, age-group, and gender variables." Controlling for function, the hypothesis was tested separately for each variable.

### *Function: ACADEMIC*

**H<sub>0</sub> 2.1 - 1. The total number of compensation claims filed in the academic function is independent of job-type.**

Table 6 provides the expected and observed frequency of claims across job-types, and the Chi-Square value.

Table 6. Claims Across Job-Types – Function: Academic		
Job-Type	Exp. Claims	Obs. Claims
Non-Sedentary	8	46
Sedentary	113	75

$$\chi^2 = 193.28 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-type is rejected.

**H<sub>0</sub> 2.1 - 2. The total number of compensation claims filed in the academic function is independent of job-group.**

For the administrative job-group in this function, the expected frequency of claims is "0". The corresponding observed frequency is also "0". Further, for the support job-group in this function, the expected frequency is "4" and the corresponding observed frequency is "10". Since the expected frequencies for the two job-groups are less than 5, Chi-Square is not a valid test if these job-groups are retained in the analysis. Therefore, they are excluded from the analysis.

Table 7 provides the expected and observed frequency of claims across job-groups (excluding administrative, and support job-groups), and the Chi-Square value.

Table 7. Claims Across Job-Groups – Function: Academic		
Job-Group	Exp. Claims	Obs. Claims
Clerical	18	12
Faculty	67	34
Professional	5	8
Research	7	1
Technical	14	56

$$\chi^2 = 141.19 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of job-group is rejected.

**H<sub>0</sub> 2.1 - 3. The total number of compensation claims filed in the academic function is independent of age-group.**

Table 8 provides the expected and observed frequency of claims across age-groups, and the Chi-Square value.

Table 8. Claims Across Age-Groups – Function: Academic		
Age-Group	Exp. Claims	Obs. Claims
25 & below	7	19
26 - 35	36	49
36 - 45	37	25
46 - 55	26	15
Above 55	15	13

$$\chi^2 = 34.07 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is rejected.

**H<sub>0</sub> 2.1 - 4. The total number of compensation claims filed in the academic function is independent of gender.**

Table 9 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

<b>Table 9. Claims Across Gender – Function: Academic</b>		
<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	43	54
Male	78	67

$$\chi^2 = 4.36 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

**Function: ADMINISTRATION**

**H<sub>0</sub> 2.2 - 1.** The total number of compensation claims filed in the administration function is independent of job-type.

Table 10 provides the expected and observed frequency of claims across job-types, and the Chi-Square value.

<b>Table 10. Claims Across Job-Types – Function: Administration</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	6	26
Sedentary	40	20

$$\chi^2 = 76.66 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is rejected.

**H<sub>0</sub> 2.2 - 2. The total number of compensation claims filed in the administration function is independent of job-group.**

The expected frequency of claims for the faculty job-group in this function is "3", and the corresponding observed frequency is "0". Further, the expected and observed frequencies for the research job-group are both "0", and for the technical job-group, the expected frequency is "1" with a corresponding observed frequency of "0". Since the expected frequencies for these job-groups are less than 5, Chi-Square is not a valid test if these job-groups are retained in the analysis. Therefore, they are excluded from the analysis. However, it may be noted that the observed frequencies for the three job-groups are consistent with the expected frequencies.

Table 11 provides the expected and observed frequency of claims across job-groups (excluding faculty, research, and technical job-groups), and the Chi-Square value. .

Table 11. Claims Across Job-Groups – Function: Administration		
Job-Group	Exp. Claims	Obs. Claims
Administrative	7	2
Clerical	19	14
Professional	13	4
Support	7	26

$$\chi^2 = 63.68 \quad [C.V. = 11.345 (\alpha = .01, df = 3)]$$

The null hypothesis that the number of claims is independent of the job-groups is rejected.

**H<sub>0</sub> 2.2 - 3. The total number of compensation claims filed in the administration function is independent of age-group.**

The expected frequency of claims for the "25 & below" age-group in this function is "1", with a corresponding observed frequency of "4". Since the expected frequency is less than 5, Chi-Square is not a valid test if this age-group is retained in the analysis. Therefore, it is excluded from the analysis. However, it may be noted that the observed frequency is consistent with the expected frequency.

Table 12 provides the expected and observed frequency of claims across age-groups, and the Chi-Square value.

Table 12. Claims Across Age-Groups – Function: Administration		
Age-Group	Exp. Claims	Obs. Claims
26 - 35	12	14
36 - 45	14	14
46 - 55	11	9
Above 55	5	5

$$\chi^2 = 0.69 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

**H<sub>0</sub> 2.2 - 4. The total number of compensation claims filed in the administration function is independent of gender.**

Table 13 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

<b>Table 13. Claims Across Gender – Function: Administration</b>		
<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	29	26
Male	17	20

$$\chi^2 = 0.84 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

**Function: EXTENSION**

**H<sub>0</sub> 2.3 - 1. The total number of compensation claims filed in the extension function is independent of job-type.**

Table 14 provides the expected and observed frequency of claims across job-types, and the Chi-Square value.

<b>Table 14. Claims Across Job-Types – Function: Extension</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	36	44
Sedentary	25	17

$$\chi^2 = 4.33 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is retained.

**H<sub>0</sub> 2.3 - 2. The total number of compensation claims filed in the extension function is independent of job-group.**

The administrative, research, and support job-groups in this function had expected frequencies less than 5. Chi-Square is not a valid test if cells with frequencies less than 5 are retained in the analysis. Hence, these job-groups were excluded from the analysis. However, it may be noted that the observed frequencies for these job-groups were consistent with the expected frequencies as detailed below:

Administrative Job-Group: Exp. Claims = 0, Obs. Claims = 0.

Research Job-Group: Exp. Claims = 1, Obs. Claims = 2.

Support Job-Group: Exp. Claims = 2, Obs. Claims = 3.

Table 15 provides the expected and observed frequency of claims across job-groups (excluding administrative, research, and support job-groups), and the Chi-Square value.

Table 15. Claims Across Job-Groups – Function: Extension		
Job-Group	Exp. Claims	Obs. Claims
Clerical	14	5
Faculty	7	4
Professional	25	27
Technical	10	20

$$\chi^2 = 17.23 \text{ [C.V.} = 11.345 \text{ (}\alpha = .01, \text{ df} = 3\text{)]}$$

The null hypothesis that the number of claims is independent of job-groups is rejected.

**H<sub>0</sub> 2.3 - 3. The total number of compensation claims filed in the extension function is independent of age-group.**

The "25 & below" age-group in this function had an expected frequency of "2" and the corresponding observed frequency was "0". Since the expected frequency is less than 5, Chi-Square is not a valid test if this age-group is retained in the analysis. Hence, this group was excluded from the analysis. However, it may be noted that the observed frequency in this group was consistent with the expected frequency.

Table 16 provides the expected and observed frequency of claims across age-groups above 25 years, and the Chi-Square value.

Table 16. Claims Across Age-Groups – Function: Extension		
Age-Group	Exp. Claims	Obs. Claims
26 - 35	17	16
36 - 45	18	19
46 - 55	16	16
Above 55	10	10

$$\chi^2 = 0.11 \quad [\text{C.V.} = 11.345 (\alpha = .01, \text{df} = 3)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

**H<sub>0</sub> 2.3 - 4. The total number of compensation claims filed in the extension function is independent of gender.**

Table 17 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

Table 17. Claims Across Gender – Function: Extension		
Sex	Exp. Claims	Obs. Claims
Female	36	23
Male	25	38

$$\chi^2 = 11.45 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of gender is rejected.

**Function: SUPPORT**

**H<sub>0</sub> 2.4 - 1. The total number of compensation claims filed in the support function is independent of job-type.**

Table 18 provides the expected and observed frequency across job-types, and the Chi-Square value.

<b>Table 18. Claims Across Job-Types – Function: Support</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	75	125
Sedentary	139	89

$$\chi^2 = 51.31 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is rejected.

**H<sub>0</sub> 2.4 - 2. The total number of compensation claims filed in the support function is independent of job-group.**

In this function, the Faculty job-group (Exp. Claims = 4, Obs. Claims = 0), and Research job-group (Exp. Claims = 0, Obs. Claims = 0) had expected frequencies less than 5. Since Chi-Square is not a valid test if such groups are retained in the analysis, they were excluded from the analysis. However, it may be noted that the observed frequencies were consistent with the expected frequencies.

Table 19 provides the expected and observed frequency of claims across job-groups (excluding Faculty and Research job-groups), and the Chi-Square value.

Table 19. Claims Across Job-Groups – Function: Support		
Job-Group	Exp. Claims	Obs. Claims
Administrative	15	5
Clerical	32	14
Professional	33	12
Support	112	177
Technical	14	6

$$\chi^2 = 72.44 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of job-groups is rejected.

**H<sub>0</sub> 2.4 - 3. The total number of compensation claims filed in the support function is independent of age-group.**

Table 20 provides the expected and observed frequency of claims across age-groups, and the Chi-Square value.

<b>Table 20. Claims Across Age-Groups – Function: Support</b>		
<b>Age-Group</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
25 & below	9	29
26 - 35	63	71
36 - 45	67	44
46 - 55	47	40
Above 55	28	30

$$\chi^2 = 54.52 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is rejected.

**H<sub>0</sub> 2.4 - 4. The total number of compensation claims filed in the support function is independent of gender.**

Table 21 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

Table 21. Claims Across Gender – Function: Support		
Sex	Exp. Claims	Obs. Claims
Female	96	77
Male	118	137

$$\chi^2 = 6.82 \quad [C.V. = 6.635 (\alpha = .01, df = 1)]$$

The null hypothesis that the number of claims is independent of gender is rejected.

The above analysis revealed that the influence of the job-group variable was observed in all four functions.

Influence of the job-type variable was observed in three of the four functions: academic, administration, and support.

Age-group influence was observed in two of the four functions: academic, and support.

Influence of the gender variable which was not observed in the aggregated workforce was observed in two of the functions: extension, and support.

The influence of all four variables is observed in the support function.

### **Hypothesis 3**

In the previous analyses, the influence of the job-group variable was observed both in the aggregated workforce and the disaggregated groups. The influence of one or more of the other variables along with the job-group variable was also observed. It was, therefore, considered appropriate to examine the influences of the job-type, age-group, and gender variables within job-groups. For this purpose, it was hypothesised as follows: "Within job-groups, the number of claims in each job-group is independent of the job-type, age-group, and gender variables." Controlling for job-group, this hypothesis was tested for each variable.

**Job-Group: ADMINISTRATIVE**

There are no non-sedentary jobs in this job-group. Therefore, testing for the job-type variable did not arise.

Table 22 provides the expected and observed frequency of claims across age-groups. Since the expected frequency for each age-group was less than 5, Chi-Square is not a valid test and no test was performed. However, it may be noted that the observed frequencies were consistent with the expected frequencies.

Table 22. Claims Across Age-Groups – Job-group: Administrative		
Age-Group	Exp. Claims	Obs. Claims
25 & below	0	2
26 - 35	1	0
36 - 45	3	3
46 - 55	2	2
Above 55	1	0

Table 23 provides the expected and observed frequency of claims across gender. Since the expected frequency of claims in both sexes was less than 5, Chi-Square was not a valid test. Therefore, no test was performed. However, it may be noted that the observed frequencies were consistent with the expected frequencies.

Table 23. Claims Across Gender – Job-Group: Administrative		
Sex	Exp. Claims	Obs. Claims
Female	3	2
Male	4	5

***Job-Group: CLERICAL***

Table 24 provides the expected and observed frequency of claims across job-types. Since the expected frequency for the non-sedentary job-type was less than 5, Chi-Square was not a valid test. Therefore, no test was performed.

<b>Table 24. Claims Across Job-Types – Job-Group: Clerical</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	1	7
Sedentary	44	38

**H<sub>0</sub> 3.1. The total number of compensation claims filed in the clerical job-group is independent of age-group.**

In this job-group, the "25 & below" age-group (Exp. Claims = 4, Obs. Claims = 6) and the "Above 55" age-group (Exp. Claims = 3, Obs. Claims = 7) had expected frequencies less than 5. Therefore, Chi-Square was not a valid test if these groups were retained in the analysis, and they were excluded from the analysis. However, it may be noted that the observed frequencies were consistent with the expected frequencies.

Table 25 provides the expected and observed frequency of claims across age-groups (excluding "25 & below" and "Above 55" age-groups), and the Chi-Square value.

Table 25. Claims Across Age-Groups – Job-group: Clerical		
Age-Group	Exp. Claims	Obs. Claims
26 - 35	13	9
36 - 45	13	17
46 - 55	6	6

$$\chi^2 = 2.46 \quad [\text{C.V.} = 9.210 (\alpha = .01, \text{df} = 2)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

Table 26 provides the expected and observed frequency of claims across gender. Since the expected frequency for the male group was less than 5, Chi-Square was not a valid test. Therefore, no test was performed.

<b>Table 26. Claims Across Gender – Job-Group: Clerical</b>		
<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	43	36
Male	2	9

**Job-Group: FACULTY**

There are no non-sedentary jobs in this job-group. Therefore, testing for the job-type variable did not arise.

**H<sub>0</sub> 3.2 - 1. The total number of compensation claims filed in the faculty job-group is independent of age-group.**

In this job-group, the "25 & below" age-group had an expected frequency of "0" and a corresponding observed frequency of "2". Chi-Square is not a valid test if cells with frequencies less than 5 are retained in the analysis. Therefore, this group was excluded from the analysis. However, it may be noted that the observed frequency is consistent with the expected frequency.

Table 27 provides the expected and observed frequency of claims across age-groups (excluding the "25 & below" age-group), and the Chi-Square value.

Table 27. Claims Across Age-Groups – Job-Group: Faculty		
Age-Group	Exp. Claims	Obs. Claims
26 - 35	7	8
36 - 45	12	11
46 - 55	10	9
Above 55	7	8

$$\chi^2 = 0.46 \quad [\text{C.V.} = 11.345 (\alpha = .01, \text{df} = 3)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

**H<sub>0</sub> 3.2 - 2. The total number of compensation claims filed in the faculty job-group is independent of gender.**

Table 28 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

Table 28. Claims Across Gender – Job-Group: Faculty		
Sex	Exp. Claims	Obs. Claims
Female	7	12
Male	31	26

$$\chi^2 = 4.37 \text{ [C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

**Job-Group: PROFESSIONAL**

**H<sub>0</sub> 3.3 - 1. The total number of compensation claims filed in the professional job-group is independent of job-type.**

Table 29 provides the expected and observed frequency of claims across job-types, and the Chi-Square value.

<b>Table 29. Claims Across Job-Types – Job-Group: Professional</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	25	33
Sedentary	26	18

$$\chi^2 = 5.01 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is retained.

**H<sub>0</sub> 3.3 - 2. The total number of compensation claims filed in the professional job-group is independent of age-group.**

In this job-group, the "25 & below" age-group (Exp. Claims = 2, Obs. Claims = 8) and the "Above 55" age-group (Exp. Claims = 4, Obs. Claims = 2) had expected frequencies less than 5. Therefore, Chi-Square was not a valid test if these two age-groups were retained in the analysis. Hence, the two groups were excluded from the analysis.

Table 30 provides the expected and observed frequency of claims across age-groups (excluding "25 & below" and "Above 55" age-groups), and the Chi-Square value.

Table 30. Claims Across Age-Groups – Job-Group: Professional		
Age-Group	Exp. Claims	Obs. Claims
26 - 35	15	15
36 - 45	17	15
46 - 55	9	11

$$\chi^2 = 0.68 \quad [C.V. = 9.210 (\alpha = .01, df = 2)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

**H<sub>0</sub> 3.3 - 3. The total number of compensation claims filed in the professional job-group is independent of gender.**

Table 31 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

Table 31. Claims Across Gender – Job-Group: Professional		
Sex	Exp. Claims	Obs. Claims
Female	20	14
Male	31	37

$$\chi^2 = 2.96 \quad [C.V. = 6.635 (\alpha = .01, df = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

**Job-Group: RESEARCH**

There are no non-sedentary jobs in this job-group. Therefore, testing for the job-type variable did not arise.

Table 32 provides the expected and observed frequency of claims across age-groups. The expected frequencies for all the age-groups are less than 5. Therefore, Chi-Square is not a valid test and no test was performed. However, it may be noted that the observed frequencies are consistent with the expected frequencies.

<b>Table 32. Claims Across Age-Groups – Job-Group: Research</b>		
<b>Age-Group</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
25 & below	0	0
26 - 35	2	1
36 - 45	1	2
46 - 55	0	0
Above 55	0	0

Table 33 provides the expected and observed frequency of claims across gender. It may be noted that the observed frequencies for both sexes are consistent with the expected frequencies.

<b>Table 33. Claims Across Gender – Job-Group: Research</b>		
<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	1	1
Male	2	2

**Job-Group: SUPPORT**

**H<sub>0</sub> 3.4 - 1. The total number of compensation claims filed in the support job-group is independent of job-type.**

Table 34 provides the expected and observed frequency of claims across job-types, and the Chi-Square value.

<b>Table 34. Claims Across Job-Types – Job-Group: Support</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	134	147
Sedentary	82	69

$$\chi^2 = 3.32 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is retained.

**H<sub>0</sub> 3.4 - 2. The total number of compensation claims filed in the support job-group is independent of age-group.**

Table 35 provides the expected and observed frequency of claims across age-groups, and the Chi-Square value.

<b>Table 35. Claims Across Age-Groups – Job-Group: Support</b>		
<b>Age-Group</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
25 & below	12	24
26 - 35	55	76
36 - 45	50	47
46 - 55	55	40
Above 55	44	29

$$\chi^2 = 29.4 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is rejected.

**H<sub>0</sub> 3.4 - 3. The total number of compensation claims filed in the support job-group is independent of gender.**

Table 36 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

<b>Table 36. Claims Across Gender – Job-Group: Support</b>		
<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	74	76
Male	142	140

$$\chi^2 = 0.08 \quad [C.V. = 6.635 (\alpha = .01, df = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

**Job-Group: TECHNICAL**

**H<sub>0</sub> 3.5 - 1. The total number of compensation claims filed in the technical job-group is independent of job-type.**

Table 37 provides the expected and observed frequency of claims across job-types, and the Chi-Square value.

<b>Table 37. Claims Across Job-Types – Job-Group: Technical</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	36	54
Sedentary	46	28

$$\chi^2 = 16.04 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is rejected.

**H<sub>0</sub> 3.5 - 2. The total number of compensation claims filed in the technical job-group is independent of age-group.**

Table 38 provides the expected and observed frequency of claims across age-groups, and the Chi-Square value.

Table 38. Claims Across Age-Groups -- Job-Group: Technical		
Age-Group	Exp. Claims	Obs. Claims
25 & below	8	11
26 - 35	30	40
36 - 45	20	10
46 - 55	15	11
Above 55	9	10

$$\chi^2 = 10.63 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

**H<sub>0</sub> 3.5 - 3. The total number of compensation claims filed in the technical job-group is independent of gender.**

Table 39 provides the expected and observed frequency of claims across gender, and the Chi-Square value.

<b>Sex</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Female	47	39
Male	35	43

$$\chi^2 = 3.19 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of gender is retained.

The foregoing analyses revealed that no significant influences were observed in the following job-groups: administrative, clerical, faculty, professional, and research.

Influence of the job-type variable was observed in the technical job-group.

Influence of the age-group variable was observed in the support job-group.

## Hypothesis 4

In the earlier analysis, influence of the job-type variable was observed in the technical job-group as a whole. It was deemed appropriate to examine whether similar influences were observed separately for male and female workers. Therefore, it was hypothesised as follows: "Within gender-groups, the number of claims is independent of the job-type variable." This hypothesis was tested separately for male and female workers.

**H<sub>0</sub> 4.1.** The total number of compensation claims filed by females in the technical job-group is independent of job-type.

Table 40 provides the expected and observed frequency of claims for female employees across job-types, and the Chi-Square value.

<b>Table 40. Claims Across Job-Types – Female Technical Workers</b>		
<b>Job-Type</b>	<b>Exp. Claims</b>	<b>Obs. Claims</b>
Non-Sedentary	13	20
Sedentary	26	19

$$\chi^2 = 5.65 \quad [\text{C.V.} = 6.635 (\alpha = .01, \text{df} = 1)]$$

The null hypothesis that the number of claims is independent of job-types is retained.

**H<sub>0</sub> 4.2.** The total number of compensation claims filed by males in the technical job-group is independent of job-type.

Table 41 provides the expected and observed frequency of claims for male employees across job-types, and the Chi-Square value.

Table 41. Claims Across Job-Types – Male Technical Workers		
Job-Type	Exp. Claims	Obs. Claims
Non-Sedentary	25	34
Sedentary	18	9

$$\chi^2 = 7.74 \quad [C.V. = 6.635 (\alpha = .01, df = 1)]$$

The null hypothesis that the number of claims is independent of job-types is rejected.

The above analysis reveals that the influence of the job-type variable is observed only for male workers but not for female workers.

## Hypothesis 5

In the earlier analyses, influence of the age-group variable was observed in the support job-group as a whole. It was deemed appropriate to examine whether similar influences are observed for male and female workers separately. Therefore, it was hypothesised as follows: "Within gender-groups, the number of claims is independent of the age-group variable."

**H<sub>0</sub> 5.1. The total number of compensation claims filed by females in the support job-group is independent of age-group.**

In this job-group, the expected frequency for females in the age-group "25 & below" was 2, and the corresponding observed frequency was 8. Since the expected frequency was less than 5, Chi-Square is not a valid test if this age-group was retained in the analysis. Therefore, it was excluded from the analysis.

Table 42 provides the expected and observed frequency of claims for female employees across age-groups (excluding "25 & below" age-group), and the Chi-Square value.

Table 42. Claims Across Age-Groups – Female Support Workers		
Age-Group	Exp. Claims	Obs. Claims
26 - 35	9	16
36 - 45	14	19
46 - 55	20	14
Above 55	19	13

$$\chi^2 = 10.91 \quad [\text{C.V.} = 11.345 (\alpha = .01, \text{df} = 3)]$$

The null hypothesis that the number of claims is independent of age-groups is retained.

**H<sub>0</sub> 5.2.** The total number of compensation claims filed by males in the support job-group is independent of age-group.

Table 43 provides the expected and observed frequency of claims for male employees across age-groups, and the Chi-Square value.

Table 43. Claims Across Age-Groups – Male Support Workers		
Age-Group	Exp. Claims	Obs. Claims
25 & below	8	14
26 - 35	42	57
36 - 45	32	25
46 - 55	31	24
Above 55	21	14

$$\chi^2 = 15.29 \quad [\text{C.V.} = 13.277 (\alpha = .01, \text{df} = 4)]$$

The null hypothesis that the number of claims is independent of age-groups is rejected.

The above analysis reveals that the influence of the age-group variable is observed for male support workers, but not for female support workers.

## Summary of Results

### *Hypothesis 1 (Aggregated Workforce)*

"For the total population in the institution (i.e. the aggregated workforce), the total number of compensation claims filed is independent of function, job-type, job-group, age-group, and gender variables."

<b>Table 44. Results – Aggregated Workforce</b>	
<b>Variable</b>	<b>Statistical Significance</b>
Function	Significant
Job-Type	Significant
Job-Group	Significant
Age-Group	Significant
Gender	Not Significant

***Hypothesis 2 (Controlling for Function)***

“Within functions, the number of claims for each function is independent of job-type, job-group, age-group, and gender.”

***Function: ACADEMIC***

Table 45. Results – Function: ACADEMIC	
Variable	Statistical Significance
Job-Type	Significant
Job-Group	Significant
Age-Group	Significant
Gender	Not Significant

***Function: ADMINISTRATION***

Table 46. Results – Function: ADMINISTRATION	
Variable	Statistical Significance
Job-Type	Significant
Job-Group	Significant
Age-Group	Not Significant
Gender	Not Significant

**Function: EXTENSION**

Table 47. Results – Function: EXTENSION	
Variable	Statistical Significance
Job-Type	Not Significant
Job-Group	Significant
Age-Group	Not Significant
Gender	Significant

**Function: SUPPORT**

Table 48. Results – Function: SUPPORT	
Variable	Statistical Significance
Job-Type	Significant
Job-Group	Significant
Age-Group	Significant
Gender	Significant

### ***Hypothesis 3 (Controlling for Job-Group)***

“Within job-groups, the number of claims filed in each job-group is independent of the job-type, age-group, and gender variables.”

#### ***Job-Group: ADMINISTRATIVE***

No tests could be carried out because cell frequencies were small.

#### ***Job-Group: CLERICAL***

<b>Table 49. Results – Job-Group: CLERICAL</b>	
<b>Variable</b>	<b>Statistical Significance</b>
Job-Type	Test not performed
Age-Group	Not significant
Gender	Test not performed

***Job-Group: FACULTY***

<b>Table 50. Results – Job-Group: FACULTY</b>	
<b>Variable</b>	<b>Statistical Significance</b>
Job-Type Age-Group Gender	Test not required Not Significant Not Significant

***Job-Group: PROFESSIONAL***

<b>Table 51. Results – Job-Group: PROFESSIONAL</b>	
<b>Variable</b>	<b>Statistical Significance</b>
Job-Type Age-Group Gender	Not Significant Not Significant Not Significant

***Job-Group: RESEARCH***

No tests could be carried out because cell frequencies were small.

***Job-Group: SUPPORT***

<b>Table 52. Results – Job-Group: SUPPORT</b>	
<b>Variable</b>	<b>Statistical Significance</b>
Job-Type	Not Significant
Age-Group	Significant
Gender	Not Significant

***Job-Group: TECHNICAL***

<b>Table 53. Results – Job-Group: TECHNICAL</b>	
<b>Variable</b>	<b>Statistical Significance</b>
Job-Type	Significant
Age-Group	Not Significant
Gender	Not Significant

***Hypothesis 4 (Controlling for Job-Group and Gender)***

“Within gender-groups in the technical job-group, the number of claims filed is independent of the job-type variable.”

<b>Table 54. Results – Job-Group: TECHNICAL</b>	
<b>Gender</b>	<b>Statistical Significance</b>
Female	Job-Type Not Significant
Male	Job-Type Significant

***Hypothesis 5 (Controlling for Job-Group and Gender)***

“Within gender-groups in the support job-group, the number of claims is independent of the age-group variable.”

<b>Table 55. Results – Job-Group: SUPPORT</b>	
<b>Gender</b>	<b>Statistical Significance</b>
Female	Age-Group Not Significant
Male	Age-Group Significant

# Chapter 5

## Conclusions and Implications

This thesis hypothesised that the frequency rate of claims for workers' compensation benefits is dependent not only on the number of workers employed, but is influenced by three work characteristics, i.e. nature of work, type of job, and the classification of the job. This is well known in the literature, and is the reason why insurance companies develop actuarial tables. Such tables are typically developed at the macro-level, i.e. across industries, and broad occupational classifications. However, the experience at the micro-level, i.e. at the individual organization, is less clear. Since what happens at one level of analysis may be unrelated to what happens at another level of analysis, any study at the organizational level is of value.

This thesis also hypothesised that worker characteristics of age and gender influenced the frequency rate. By statistical analysis of the claims experience of an organization employing a large workforce, the relationships between the frequency rate of claims and the work/worker characteristics were sought to be determined. The objective of the analysis was to identify

employee-clusters within the organization that would be affected by the relationships, and study the implications for the organization.

## **Discussion of findings**

Conclusions based on the results of the analysis are presented and discussed below. Their implications for the organization are also discussed.

The study found that, at the organizational level, the frequency rate of claims is related to the nature of work performed, the type of job, the job classification, and the age of the worker. However, this finding only represented the relationship with an aggregated and heterogeneous group of workers. It was, therefore, necessary to examine the relationship with disaggregated and homogeneous workgroups. Such examination was conducted at two levels of disaggregation. First, the aggregated workforce was disaggregated at the functional department level, and second, further disaggregated at the job-level within departments. By this process, contamination of results due to heterogeneity was sought to be avoided.

When the relationships at the disaggregated levels were examined, an interesting finding was noted. The relationship of gender with the frequency of claims which was not observed at the aggregated level, appeared on disaggregation into functional departments. Partitioning the workforce, therefore, helped reveal relationships masked by the cumulation.

With the addition of the gender relationship, the findings at the functional department level of disaggregation were similar to the findings for the aggregated workforce. The frequency rate of claims was found to be related to all the five variables.

However, on further disaggregation of the workforce to the job-level within departments, some of the relationships were no longer found to exist:

a) For five of the seven job-groups - administrative, clerical, faculty, professional and research - the frequency rate of claims was found to be unrelated to the type of job, the age, and the gender of the worker.

b) In the other two job-groups, frequency rate of claims was found to be related to either job-type or age. These relationships are discussed below.

### ***Job-Type***

1. Job-type was found to be related to the frequency rate of claims in the technical job-group. Inspection of the claims data for this job-group revealed that the non-sedentary type contributed a value of 9 and the sedentary type contributed a value of 7.04 to the statistically significant Chi-Square value of 16.04.<sup>1</sup> Since the relative contribution of each job-type was found to be almost equal, the technical job-group was partitioned into male and female employees. It was then found that job-type was related to the frequency rate of claims only for male employees, but not for female employees. Within the male employee group, the relative contribution of the non-sedentary type was found to be almost equal to the contribution of the sedentary type.

On the basis of the above findings, it is concluded that job-type, in general, is significantly related to the frequency rate of claims among male technical employees.

2. Due to the expected frequency being less than 5 in some of the job-groups such as administrative, clerical, and research, Chi-Square tests could not be performed. Inspection of the claims data, however, revealed an inconsistency between the expected and observed frequency in the clerical job-group. Against an expected claim of "1", there were "7" observed claims in the

<sup>1</sup> Since the Chi-Square value is computed over all categories and does not specify which categories have caused the statistical significance, Hinkle, Wiersma, and Jurs (1979) suggest inspection of the data categories to determine large contributors to the Chi-Square value.

non-sedentary job-type. No definite conclusions can be drawn in the absence of a valid statistical test. However, the inconsistency appears to indicate the possibility of a relationship between the frequency rate of claims and the non-sedentary type of jobs in the clerical category.

### *Age*

1. Age was found to be related to the frequency rate of claims in the support job-group. On partitioning the job-group into male and female employees, age was found to be related to the frequency rate of claims only for males but not for females.

Inspection of the claims data for male employees revealed that relatively larger contributions to the statistically significant Chi-Square value were made by the "25 & below" and "26 - 35" age-groups. To the Chi-Square value of 14.25, the "25 & below" age-group contributed a value of 4.5, and the "26 - 35" age-group contributed a value of 5.35. The relative contribution of the three other age-groups was more or less equal.

Although the 204 employees in the two age-groups constitute only 37.43% of the male employees in the support job-group, the 71 claims filed by these groups account for 52.98% of the total number of claims filed by all the male employees. Within the two age-groups, the 71 claims filed convert to a claims rate of 34.8%. The relative contribution of these two age-groups to the overall frequency rate of claims in the support job-group is, therefore, considered significant.

On the basis of the above findings, it is concluded that age is significantly related to the frequency rate of claims among younger employees, i.e. employees below 35 years of age. The relationship is not observed among all job-groups, but is restricted to young male support workers.

2. Expected frequencies of less than 5 did not permit statistical analysis of the claims within age-groups in certain categories such as administrative, research, and professional. Inspection of the claims data, however, revealed an inconsistency in the "25 & below" group in the professional job-group. While the expected claims in this age-group were "2", the observed claims were "8". No conclusions can be drawn regarding this inconsistency in the absence of a valid statistical test. However, the possibility of a relationship between the frequency rate of claims and age for this group of workers is indicated.

### ***Gender***

Statistical analysis of the claims within gender-groups could not be conducted in certain job-groups such as administrative, clerical, and research since the expected frequencies were less than 5. Inspection of the claims data, however, revealed an inconsistency in the clerical job-group. It was noted that the 42 male employees in the job-group constitute only 3.73% of the total clerical employment. However, this group filed 9 claims accounting for 20% of all the claims filed in the clerical job-group. The claims filed by the male employees convert to a 21.43% claims rate among males as compared to a 3.38% claims rate among females. The relative contribution of the male employees to the overall frequency rate of claims in the job-group is, therefore, considered significant.

A possible explanation for the large difference in claims rates for males and females is suggested by the inconsistency observed between job-types in the clerical job-group. The non-sedentary type of job appears to be related to the frequency rate of claims in the clerical job-group. It is found that 40% of the male clerical employees are employed in non-sedentary type of jobs as compared to only 0.75% of females employed in non-sedentary type of jobs.

## ***Summary***

1. The findings indicate that the influence of the type of job, age, and gender characteristics on the frequency rate of claims for disaggregated and homogeneous work-groups is restricted only to a few specific groups. The administrative, faculty, and research job-groups account for 38.67% of the total employment in the organization. No significant relationships are found between the job-type, age, and gender characteristics and the frequency rate of claims for these three job-groups.

2. The support job-group accounts for 14.84% of the total employment in the organization. The younger male employees in this job-group account for 3.65% of the total employment. The frequency rate of claims for the younger male employees is only found to be significantly related to age.

3. The technical job-group accounts for 10.45% of the total employment in the organization. The male employees in this job-group account for 4.4% of the total employment. The frequency rate of claims for male employees is only found to be significantly related to the type of job.

4. The professional job-group constitutes 16.34% of the total employment in the organization. Within this group, the younger males constitute 0.36% of the total employment. Their claims experience appears to be influenced by the age characteristic.

5. The clerical job-group constitutes 19.69% of the total employment in the organization. Within this group, employees in non-sedentary type of jobs constitute only 0.45% of the total

employment. Their frequency rate of claims appears to be influenced by the job-type characteristic.

6. In the aggregate, the claims experience of only about 8% of the total employment in the organization is found to be influenced by the job-type and age characteristics. Though unconfirmed by statistical tests, the possibility that the frequency rate of an additional 0.8% of the employees may be influenced by job-type, age, and gender characteristics, is also indicated.

## **Implications**

1. The support job-group is predominantly composed of trades such as electrical maintenance, mechanical maintenance, civil engineering, housekeeping, and custodial services. Typically, such jobs involve greater physical skills than mental skills.

The professional job-group also includes workers in electrical engineering, mechanical engineering, civil engineering, computer engineering, etc. Similar to the support group, such employees also are required to use their "hand-skills" although to a lesser extent than the trades-people.

Skill development in such jobs is largely dependent on vocational training and on-the-job experience. Safe working habits are also developed over time. It is reasonable to expect that older workers who have spent a greater amount of time on the job would be less liable to suffer work-related disabilities than comparatively younger workers.

The research findings indicate that age is a primary influence on the claims experience of younger support workers, and possibly on younger professionals. The findings suggest that greater emphasis and training on occupational safety and health, and closer supervision of younger employees are called for. It would be worthwhile to undertake further research to identify potential occupational hazards as well as training needs of such groups of workers.

2. The type of job, especially the non-sedentary type, is found to influence workers in the technical job-group, and possibly in the clerical job-group. This finding suggests that workers in such groups may be exposed to greater risk of disability than workers in other job-groups. The scope of this study did not extend to the analysis of individual job requirements and attendant occupational hazards. This is a potential area for further research. Detailed examination of the job-content to identify and eliminate potential occupational hazards, and greater emphasis and training on occupational safety and health for the workers are recommended.

3. The findings indicate that more than 90% of the jobs in the organization are relatively free of influences of the job-type, age, and gender characteristics. Therefore, no other implications are noted.

## **Recommendations**

The thesis sought to determine whether the incidence of work-related disabilities in the organization was related to the following:

1. The nature of work performed, i.e. the function.
2. The job classification.
3. The type of job.
4. Age of the worker.
5. Gender of a worker.

From the analysis and the foregoing discussion, it is evident that significant relationships are found only for a small segment of the population in the institution. The limited extent to which the relationships are observed, does not warrant major changes in the deployment of workers within the organization, or in compensation and benefits planning. At the present level, the relationships are also not considered as posing serious problems in budgeting, and risk management. As noted earlier, there is, however, a need for increasing the training and education of workers on issues of occupational safety and health. A concerted effort in this direction is, therefore, recommended. It is expected that such an effort would prove effective in controlling the relationships observed in the analysis.

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## Vita

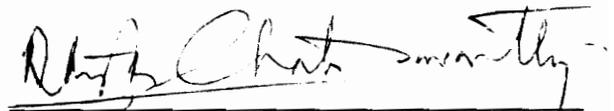
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