Occupational Injuries and Occupational Safety and Health Regulations in Three Industries in North Cyprus, Opportunities for Improvement Identified

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ABSTRACT

The aim of this study is to identify the occupational injuries and occupational safety and health (OSH) standards in three selected industries (construction, wood working and aluminum) in North Cyprus.

The industrial sectors in need of attention were determined following an analysis of the data collected from the labor and social insurance office on the number of industrial accidents reported each year. In the past ten years, the highest number of accidents were reported from the construction industry followed by the production industry in general.

We used surveys designed to identify the extent to which the construction, woodworking and aluminum industries followed the rules and regulations stated in the OSH law requirements. Check lists were also used to identify possible OSH risks at construction sites.

The response rate to the employee surveys was 75% and the Minitab program was used for data analysis. 12.2% of construction workers responding to the survey reported having a serious accident on the job, 22.2% reported starting their job without any OSH training, 23.3% had no OSH training in the work place, 44% complained that their work place did not have first aid, 85% reported that safety belts were not used when working on scaffolds.

18.18% of aluminum workers responding to the survey reported having a serious accident on the job, 81.82% reported starting their job without any OSH training, 100% had no OSH training in the work place, 54.55% complained that they do not have any protective equipments to prevent falls, 72.73% reported that employers ensure that employees used personal protective equipment.

18.75% survey respondents in the woodworking industry reported having a serious accident on the job, 59.38% reported starting their job without any OSH training, 71.88% had no OSH training in the work place, 89.06% complained that their employer did not provide any written instruction about the equipments, 90.63% reported that their work place did not have any signage warning against obstacles or a risk of falls.

Some of the other work environment concerns raised by respondents included: repetitive activities that may lead to repetitive strain injuries and exposure to excessive heat, noise and dust.

This study shows that despite the presence of policies (Rules and Regulations) related to OSH, these policies were not adequately enforced, resulting in serious occupational illness. The implementation of systems to enforce these policies will be critical in preventing future occupational injuries and illnesses.

Keywords: Occupational injuries, occupational accidents, OSH training, OSH regulations

ÖZ

Bu çalışmanın amacı Kuzey Kıbrıs'ta alüminyum, mobilya ve inşaat sektörlerinde iş kazaları ve iş sağlığı ve güvenliği standartlarını tanımlamaktır.

Bu çalışmada göz önünde bulundurulan sektörler, Çalışma ve Sosyal Güvenlik Bakanlığından alınan yıllık kaza istatistikleri ele alınarak seçilmiştir. Geçmiş on yıllın kaza raporlarına göre, en yüksek kaza oranı inşaat sektöründedir. Genel imalat sektörü ise inşaat sektörünü ikinci sırada takip etmektedir.

İş sağlığı ve güvenliği standartlarının uygulanıp uygulanmadığını değerlendirebilmek için anket soruları, yasa göz önüne alınarak hazırlanmıştır. Anketlere katılım oranı %75'dir. Anketleri değerlendirmede Minitab program kullanılmıştır. İnşaat sektörü için ayrıca kontrol listelerinden faydalanılıp, değerlendirmeler yapılmıştır.

İnşaat sektöründe çalışan %12.2 çalışan, çalışma hayatları boyunca ciddi birer kaza geçirdiklerini bildirmiştir. %22.2 çalışan ise yaptıkları işe hiçbir iş sağlığı ve güvenliği eğitimi almadan başladıklarını savunmuşlardır. %23.3 ise iş yerinde iş sağlığı ve güvenliği ile ilğili eğitim almadıklarını bildirmiştir. %44 çalışan ise iş yerlerinde ilk yardım yeri bulunmadığını bildirmiştir. %85 çalışan ise yapı iskelelerinde çalışırken emniyet kemeri takmadıklarını bildirmişdir.

Aleminyum sektöründe çalışan %18.18 çalışan, çalışma hayatları boyunca ciddi birer kaza geçirdiklerini bildirmiştir. %81.82 çalışan ise yaptıkları işe hiçbir iş sağlığı ve güvenliği eğitimi almadan başladıklarını savunmuşlarıdır. Çalışanların tümü iş

yerlerinde verilen iş sağlığı ve güvenliği eğitimlerinin tekrarlanmadığını savunurken, %54.55 çalışan işveren tarafından kendilerine ıslak zeminden düşmelerini önleyecek koruyucular verilmediğini bildirmiştir. %72.73 çalışan ise işverenlerinin koruyucuları düzenli olarak kullanıp kullanmadığını kontrol etmediklerini belirtmişlerdir.

İnşaat sektöründe çalışan %18.75 çalışan, çalışma hayatları boyunca ciddi birer kaza geçirdiklerini bildirmiştir. %59.38 çalışan ise yaptıkları işe hiçbir iş sağlığı ve güvenliği eğitimi almadan başladıklarını savunmuşlardır. %71.88 ise iş yerinde iş sağlığı ve güvenliği ile ilğili eğitim almadıklarını bildirmiştir. %89.60 işverenlerinin kendilerine kullandıkları ekipman ve makinalar için yazılı talimat vermediğni belirtmişlerdir. %90.63 çalışan, işyerinde düşmeleri önleyecek herhangi bir güvenlik rengi ya da işaret bulunmadığını belirtmişlerdir.

Bu çalışma gösteriyor ki iş sağlığı ve güveliği ile ilgili yasa ve tüzükler olmasına rağmen uygulama yetersizdir. Bu duruma bağlı olarak ciddi iş hastalıkları gözlenmektedir. Denetlemelerin yapılması, ileriki zamanlarda oluşabilecek iş hastalıklarını ve kazalarını önüne geçmesini sağlayacaktır.

Anahtar Kelimeler: İş hastalığı, iş kazaları, iş sağlığı ve güvenliği eğitimleri.

To My Family

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INTRODUCTION

1.1 Occupational Health and Safety

In industrial environments, with plenty of machines and tools, workers are often exposed to various hazards. Occupational risk and accidents have increased with increasing technological development and its increasing application in production.

Occupational safety and health (OSH) is a very important issue that should be considered in every workplace. OSH rules and regulations should be followed for preventing injuries.

Occupational health and safety is a discipline with a broad scope involving many specialized fields. In its broadest sense, it should aim at:

- the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
- the prevention of working conditions that may adversely affect the safety and health of employees

Successful occupational health and safety practice requires the collaboration and participation of both employers and workers in health and safety programs, and

involves the consideration of issues relating to occupational medicine, industrial hygiene, toxicology, education, engineering safety, ergonomics and psychology.

Occupational health and safety is important because, work plays a central role in people's lives, since most workers spend at least eight hours a day in the workplace, whether it is on a plantation, in an office, factory, etc. Therefore, work environments should be safe and healthy. Yet this is not the case for many workers. Every day workers all over the world are faced with a multitude of health hazards, such as: exposure to excessive dusts, gases, noise, vibration and extreme temperatures.

Unfortunately some employers assume little responsibility for the protection of workers' health and safety. In fact, some employers do not even know that they have the moral and often legal responsibility to protect workers. As a result of the hazards and a lack of attention given to health and safety, work-related accidents and diseases are common in all parts of the world. (Introduction to occupational health and safety, 2011)

1.2 History of Occupational Health and Safety

The safety movement in the United States has developed steadily since the early 1990s. In that time period, industrial accidents were commonplace in this country; for example, in 1907 over 3,200 people were killed in mining accidents. Legislation, precedent, and public opinion all favored management. There were few protections for workers' safety.

Working conditions for industrial employees today have improved significantly. The chance of a worker being killed in industrial accidents is less than half of what it was

60 years ago. According to the National Safety Council (NSC), the current death rate from work-related injuries is approximately 4 per 100,000, or less than a third of the rate 50 years ago.

Improvements in safety until now have been the result of pressure for legislation to promote safety and health, the steadily increasing costs associated with accidents and injuries, and the professionalization of safety as an occupation. Improvements in the future are likely to come as a result of greater awareness of the cost effectiveness and resultant competitiveness gained from a safe and healthy workforce.

The safety and health movement has come a long way since the Industrial Revolution. Today, there is widespread understanding of the importance of providing a safe and healthy workplace. The tone was set during and after World War II when all the various practitioners of Occupational health and safety began to see the need for cooperative efforts. These practitioners included safety engineers, safety managers, industrial hygienist, occupational health nurses, and physicians.

One of the earliest and most vocal proponents of the cooperative or integrated approach was H. G. Dyktor. He proposed the following objectives of integration (Corcoran, "The Hidden Value of Safety,"22.):

- Learn more through sharing knowledge about health problems in the workplace, particularly those caused by toxic substances.
- Provide a greater level of expertise in evaluating health and safety problems.
- Provide a broad database that can be used to compare health and safety problems experienced by different companies in the same industry.

- Encourage accident prevention.
- Make employee health and safety a high priority. (Goetsch, 2008)

1.2.1 Historical Background on Safety and Health Legislation

The first European directives on safety and health at work were adopted on the basis of the general market harmonization provisions. This was due to a lack of an explicit legislative competence in the Treaty in the field of safety and health at work until the mid-1980s. Until then occupational safety and health was seen as an annex to market harmonization and the economic policies of the European Economic Community. For example, Directive 77/576 EEC on the harmonization of national laws on safety signs at the workplace or Directive 78/610 EEC on the harmonization of occupational exposure limits to vinyl chloride monomers were adopted on this basis.

The Single European Act 1987 was a major step forward in that it introduced a new legal provision on social policy to the Treaty aiming at 'improvements, especially in the working environment, as regards the health and safety of workers'. By inserting this provision into the Treaty, the importance of safe working conditions was made evident. Moreover, the new Social Chapter authorized the European Commission to promote social dialogue between employers and labor representatives at a European level.

With the Treaty of Amsterdam in 1997, the legislative competence in the fields of European social policies was further strengthened by the incorporation of the social agreement into the EC Treaty. The Lisbon Treaty – apart from the renumbering of the Articles on social policy – kept the substance of the provisions of ex Articles 136 ff TEC. (European Directives. 2011)

1.3 Occupational Health and Safety in European Union (EU)

A wide variety of EU directives setting out minimum health and safety requirements for the protection of workers have since been adopted. Member States are free to adopt stricter rules for the protection of workers when transposing EU directives into national law, and so legislative requirements in the field of safety and health at work can vary across EU Member States. (European Directives. 2011)

Significant data from the European OSHA statistics; there are some significant data that shows the highest rate with respect to the different industries.

- Agriculture

The rate of the fatal accident for the old EU 15 member states is 12.6 per 100,000 workers. The rate of the accidents that requires more than 3 days absence is 6,000 per 100,000 workers. The list includes different rates for old and new member states. 4% of the working population in old member states work in agriculture, compared to 13.4% of the population in new member states.

- Education

Employees working in education sector encompass teachers, cookers and administrative staff. 15% of these employees have suffered physical or verbal abuse at work.

- Health care

The rate of occupational injuries in health care sector is 34% higher than the EU average of all injuries.

- Musculoskeletal Disorders (MSDs)

60-90% of employees will experience work related low back disorder at some point during their life. 15-42% experience back pain at least once while practicing their occupation.

- Noise

More than 60 million people that constitute one third of Europe's workers are exposed to high levels of noise more than a quarter of their working life.

- Construction

The rate of the fatal accidents in the construction sector is more than twice average of other sectors. Approximately 1,300 workers are killed annually which implies 13 workers out of 100,000.

- Small and medium-sized enterprises

There are almost 75 million people who worked in 19 million different small and medium size enterprises (SMEs) in the EU. SMEs record occupational injuries out of proportion to all occupational injuries in the EU at 82% with fatal accidents rising to about 90%.

- Stress

One worker out of four is affected by work related stress in the EU.

- Young workers

Workers aged 18 to 24 are more likely to be injured in the workplace compared to older and more experienced workers. (Statistics, 2011)

1.4 Occupational Health and Safety in Turkey

Occupational injuries became an important problem after the 1980s as a result of the rapid change in industry. In 2006 data there were 79.027 occupational injuries and 574 occupational illnesses in Turkey. Furthermore, recently fatal accidents' increased 100% and reached 1601. This data was taken from the social insurance department and is not complete understanding the true number since all companies are not registered. Therefore, these data are not reliable to analyze the current and are not reporting accidents, injuries of workers in the workplace. Nevertheless this data gives us an idea about the current OSH situation in Turkey. 21% of work injuries occurred due to trauma from falling objects and 12% due to employee falls. In Turkey, 14% of the occupational injuries happened in the production of metal goods and 9% is in construction industry. 25% of the fatal injuries happened in construction, 10% in transportation and 6% is in mining industries. According to this statistics Turkey has the highest rate of occupational injuries compared to other European Union and other candidate countries. In recent years, legislation of occupational health and safety improved by harmonizing with EU but implementation is inadequate. Although big companies have problems for implementing OSH standards, SMEs are unable to take the responsibility for occupational injuries because several reasons. The biggest problem for occupational health and safety is because of the subcontracting. With subcontracting, SMEs in Turkey pay employees lower salaries, do not apply legislation properly and do not take any responsibility as a company. Because of the globalization in production, use of subcontractors increased in SMEs. Most of the occupational injuries happened in such a workplace. Two -thirds of the private sector workforces are employed by SMEs. Because, OHS is not well applied in such a workplace; twice as many fatal accidents occur compared to big companies. The

main reason for occupational injuries in SMEs is inadequate training. The workers are not aware of the OHS rules and regulations. (Küreselleşme sürecinde gelişmekte olan ülkelerde ve Türkiye'de iş sağlığı ve güvenliği , 2011)

1.5 Occupational Health and Safety in North Cyprus

In 2009 Northern Cyprus, ministry of labor and social insurance labor office put into affect new OSH law consistent with these in the EU. Data for occupational injuries are available only since the year 2000. According to these statistics, the most accidents occurred in the construction industry followed by the production industry. The number of occupational injuries is listed in appendix H (on page 110).

1.5.1 Occupational Injuries

The aim of the ministry of labor and social insurance labor office is to monitor and inspect workplaces in order to understand the current OSH situation and determine any violation of OSH rules and regulations. However, after further consultation with the chair of the Cyprus Chamber of Industry, it became clear that there is a lack of inspection and hence data about this topic therefore the current understanding of the situation is incomplete (or questionable).

It is observed that the ministry of labor and social insurance labor office statistics are classified in two different ways which respect to the economic fields, and type of accidents occurred. In appendix H (on page 110) you can see this tables related with the occupational injuries. Another observation is that managers of companies only report serious accidents which employee cannot work for a while; however they do not report occupational illness such as arm and low back pain.

1.5.2 Industry

There are 600 members of the Cyprus Turkish Chamber of Industry (CTCOI).

Industries as ranked by size of workforce are;

- Food
- Mining and Quarrying of Sand
- Chemical, Petrol and Plastic Industry
- Fabricated Metal Product

Industries as ranked by number of industrial accidents occurred

- Construction
- Production

CTCOI categories workplaces into 10 different industries;

1. Information and Technology: Software and Network
2. Textile Product
3. Electrical Equipment and Shoe Industry
4. General Production
5. Food, Beverage and Tobacco products
6. Advertisement, Paper Products and Publishing& Printing
7. Chemical, Petrol and Plastic industry
8. Fabricated Metal Products
9. Woodworking and furnishing
10. Mining and Quarrying of Sand

1.5.3 Occupational Injuries Reporting

In order to report occupational injury the factory manager completes and submits specific forms to the ministry of labor and social insurance labor office. This is followed by investigation. An inspector from the labor office visits the company and completes different forms related with accident. The investigation is considered complete after the inspector writes the final report about the accident.

An inspector has the following responsibilities for determining possible risks in the workplace;

- To check all the machines, handlings and personal protective equipments(PPEs)
- To determine what type of machines are harmful for workers.
- In case they detect harmful (unsafe) machines to suggest to the company management the replacement of the machine and if not replaced to make sure that workers use appropriate PPE
- Periodically visiting the workplace with the aim of accident prevention and to investigate whenever an accident happens
- To make sure that the workplace applies all the occupational health and safety rules and regulations
- To organize OSH trainings and seminars
- To inspect technical equipment such as elevator, compressor, steam boiler and winch and give permission for their use if they pass inspection meeting required safety standards
- To test the technical equipment and give a warranty authority to engineer
- To help the employee and employer solve problems in the workplace
- To inspect workplaces to identify any undocumented employees

- To be sure that all rules and regulations are applied concerning employee wage and other employee rights

Table 1.1. shows the investigation and inspection statistics kept by inspectors in North Cyprus.

Table 1.1 Statistics kept by inspectors in North Cyprus

Statistics kept by inspector			
Field of Statistics	**2006**	**2007**	**2008**
Workplace Controls	1176	1202	1304
Work Injuries Investigation	267	287	245
Working Permit Investigation	1312	2469	1342
Industrial Conflict	925	1726	1624
Others	457	358	842
Technical Equipment Investigation	2277	2052	1791
Fine	410,000 Euro	638,000 Euro	353,000 Euro
Sent to the Court	52	30	34

According to the information collected from the ministry of labor and social insurance labor office director the office started a process for training and certificating OSH experts. In addition to this the office is preparing surveys to determine risk in the workplace. Moreover, the manger says that they will classify the surveys for different workplace.

As it is mentioned before, there are rules and regulations but there is no enforcement. The new TRNC OSH law prepared in harmony with EU OSH low was accepted by the TRNC parliament members and published in the official newspaper on the 14th of July 2008 and came into force on the 15th of April 2009. The labor office is responsible from its implementation. The employer responsibilities are made clear in the new law. An important feature is to force employers to make risk analysis for their company and report the results to the labor office. This law also includes the matter that, employers' should give pre- employment to employees. Another

important matter is that the idea of employees should be take into accounting during the risk analysis.

1.5.4 Occupational Health and Safety Rules and Regulations

The aim of the occupational health and safety rules and regulations is ;

- To prevent occupational accidents and illness
- To defend the workers health and safety
- To avoid any possible accidents and risks in the workplace
- To inform and give advice to the workers
- To train company representatives and employees get some ideas from them and make sure that they attend those training programmers
- To protect the workers because of their age, gender and special problem and rearranged the rules and regulations for them
- Assess workplace compliance with rules and regulations applied

Responsibilities of the employers:

Employers required to maintenance occupational safety and health in the workplace. The following is a summary of the employers' responsibilities as stated by the TRNC OSH law.

1. To protect workers' health and safety, prevention of occupational risk and hazards, taking all necessary measures including education and information, providing personal protective equipments and suppliers.

2. To be brought into line with changing conditions consider the above mentioned health and safety measures and works and check compatibility in the workplaces with the occupational health and safety measures

3. In order to take health and safety precautions the following principles should be applied:

    a) Prevention of occupational risk and hazards
    b) Evaluation of unavoidable hazards
    c) Responding to danger at the source
    d) With to aim to make workplaces suitable for employees including workplace selection of equipments and the mode of operation and production methods. Particularly, the effect of the production planning for health and safety should be considered and repetitive activities should be reduced
    e) Harmony with the technical developments
    f) Replacing hazardous equipments or methods with non hazardous or less hazardous ones
    g) The accident prevention policy should be based on a model depending on technology business organization, working conditions, social relationships and work environment working interpedently
    h) Employers should prefer population based over individual protection and prevention
    i) Giving appropriate instructions to the employees

4. Considering the characteristics of work done in the workplaces, within the matters of the law mentioned above;

    a) The OSH risk should be evaluated in the workplace when selecting work equipment, chemical substances and preparations including issues such as employee's organization. Preventive measures will be taken according to the results of this evaluation: Production methods and way of working should raise the level of employee protection for occupational health and safety in the workplace. Also it must be applied at all levels of administrative structuring.
    b) The suitability of the employees occupational health and safety skills suitability should be considered before a new task is given
    c) When planning and implementing new technologies, employees or their representatives should be consulted about the effect of the new technology on occupational health and safety as it relates to business equipment, working environment and conditions
    d) To take appropriate precaution before entering hazardous places and moving sure that trained employees work in such places

5. Taking all financial responsibilities related with OSH in the workplace

All factories have to apply Occupational Health and Safety (OHS) Rules and Regulations. Moreover, employees should receive pre- employment training However, it is obvious that they have the rules under hand but they are not applied. For example, they should have some standards such as adequate lighting and

ventilation, emergency exit door and a first aid room. For each job, they should have specific standards as written in the OSH rules and regulations it is written. If the rules and regulations are followed this many result in serious occupational illness or injury.

1.6 Literature Review

As will be shown in the first section of this chapter, the current literature on occupational health and safety rules and regulations is very important for taking the OSH concept seriously. It has been shown and debated in peer reviewed papers that there are higher accidents rates in SMEs if compared with the case of LEs. (Micheil & Cagno, 2010)

It is general small firms have great difficulties in complying with legislative demands on work environment. They often lack basic OSH knowledge. Neither employers nor employees find it relevant and they make no effort to acquire the necessary information. (Jensen, Alstrup & Thoft, 2001)

According to the Peter Hasle, Pete Kines and Lars Peter Andersen;
In most countries small enterprises constitute a large majority of all enterprises and account for a considerable share of all employees. At the same time it has became clear that small enterprises have a higher injury risk than large enterprises, and it is difficult and expensive for preventive efforts to reach all small enterprises. (Hasle, Kines & Andersen, 2009)

Due to EU-regulation all member states of the European Union and candidate countries have to set up national legislation to make firms establish procedures for occupational risk assessment in enterprises of all sizes.

In this thesis, it is mentioned that three different industries will be examined construction, wood working and aluminum industries. Christina A. Halcroft and Laura Punnett states that wood product processing is a hazardous industry in addition to being economically important. (Holcroft & Punnet, 2009)

O. N. Aneziris, I. A. Papazoglou and O. Doudakmani state that occupational safety and health is a major concern to many countries. Traditional ways to deal with OSH is through legislation, regulation, standard and safety guidelines, accident investigations and safety inspections which provide information on causes of accidents amongst particular groups of employees. (Aneziris, Papazoglou & Doudakmani, 2010)

The second section of this chapter surveys different type of applications for different countries. In Northern Cyprus, employers are responsible from OSH and the Labor office is responsible for implementation. According to the Erkki Yranheikki and Heikki Savolainen; in Finland, occupational safety is the responsibility of the employer, while the occupational safety and health laws are enforced by the Labor Inspection Service, an organization of the state. (Yranheikki & Savolainen , 2000)

In Northern Cyprus most accidents occur in the construction and followed by the production industry. Erkki Yranheikki and Heikki Savolainen claim that the one quarter of fatal accidents occurs in the construction industry and the wood working

industry, metal manufacturing industry, machinery and related equipment production, and paper and pulp industry account for 10% each, of all fatal accidents. Workers aged 45 to 54 years have a 20% higher risk of fatal accident than average, while males are victims in 96% of all cases. (Yranheikki & Savolainen , 2000)

1.6.1 Occupational Health and Safety Studies in Northern Cyprus

There are no published studies on Occupational Safety and Health in the North of Cyprus (TRNC). It is important to examine the current situation of the small and medium size industries in TRNC because there is a high production volume this industry. Moreover, our study will serve as a guide for future studies and implementation of preventive measures.

1.7 Study Aim

The main goal of this thesis is to document the occupational injuries and occupational safety and health in North Cyprus aluminum, wood working and construction industries. The research has 3 main objectives: first, to understand and compare the occupational health and safety standards in Europe, Turkey and North Cyprus; second, to identify the injuries and the extent to which the selected industries comply with the OSH rules and regulations; third, to contribute to the improvement of occupational safety and health in North Cyprus by identifying the main OSH problems and suggesting improvements. The study aims were set after investigation of OSH in TRNC industry and realizing the lack of OSH inspection and enforcement. The industrial sectors in need of attention were determined following an analysis of the data collected from the labor and social insurance office on the number of industrial accidents reported each year. In the past ten years, the highest

numbers of accidents were reported from the construction industry followed by the production industry in general. Although TRNC doesn't have very big industries, that are responsible for meeting the production demand for the whole country.

1.8 Scope and Limitations of Thesis

- ❖ Limitations and Delimitations
- Limitations

The self reporting inherent in survey design is a limitation of this study possibly understanding the number and scope of health problems affecting the employees

The managers may not have allowed their employees to answer the survey thinking that it will affect their work and some employees may not have responded thinking that they will be punished by the employer. Not convinced that their answers will be kept confidential. Same managers did not take the survey because they thought it was time consuming.

Data is unavailable on non-respondents; therefore we are not sure how these may have differed from respondents.

- Delimitations

Lack of OSH knowledge of respondents.

Chapter 2

STUDY DESIGN

2.1 Setting

2.1.1 Selection of industries

The industrial sectors in need of attention were determined following an analysis of the accident data collected from the ministry of labor and social insurance labor office and the CTCOI. According to this analysis it was realized that most of the accidents occurred in the construction industry followed by production sector. The CTCOI also ranked the production industries based on the number of occupational accidents. From these statics and literature surveys it was understood that the construction, aluminum and wood processing sectors had the most OSH problems. Therefore these were selected for this study.

2.1.2 Selection of sampling sites

Companies located in Famagusta and Nicosia were selected from the member list of the CTCOI. This selection was based on the rate of production and is believed to be representative since companies are similarly designed in other cities of TRNC.

A total of 9 construction, 13 wood processing and 4 aluminum companies were included in this study. 2 companies were selected but failed to participate.

2.1.3 Specific Characteristics of Sampling Sites

The OSH requirements were the same for every industry as guided by EU regulations. For different industries working conditions are changed just like the goods and services produced. In some industries, working conditions are safer, while others are characterized by noisy, uncomfortable and dangerous work environments. In such a working place employees are required to wear Personal Protective Equipments (PPE). There are several PPEs for different purposes (figure 2.1) including PPE for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers. PPE is expected to be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment including chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

The employer is expected to provide training to each employee who is required by this section to use PPE. Each employee should be trained to know at least the following:

When the use of PPE is necessary;

What type of PPE is necessary;

How to use PPE properly;

The limitations of the PPE; and,

The proper care, maintenance, useful life and disposal of the PPE.

Employers, when necessary should repair or replace the PPE. During working hours employers should check to see whether workers are properly using PPE properly or not. (Occupational Safety and Health Standards., n.d.)

Based on types of industrial accidents and risk analysis how employees should protect themselves from possible accidents will established.

Figure 2.1 Examples of PPE

2.1.3.1 Aluminum

Aluminum sector is one of the major industries at risk for occupational injuries. Employees should use their PPE regularly and employers should assess for potential analyze the risk and make corrections as needed. The majority of accidents in aluminum sector consist of scratches and cuts which can lead to infection. Sometimes machines that are used can be sharp, so they can cause hand or finger amputation.

Table 2.1 Number of employee survey conducted in aluminum industry

#	Name of the company	Location	# Employee work in production area/#Respondets	Products
1	AA	Famagusta	4	window frames,blinds, gates & barriers
2	AB	Nicosia	4	window frames,blinds, gates & barriers
3	AC	Famagusta	3	window frames,blinds, gates & barriers
4	AD	Famagusta	1	window frames,blinds, gates & barriers
		TOTAL	12	

2.1.3.2 Wood Working

The most common health problems in the woodworking industry occur due to accidents. These accidents generally happen among young and inexperienced employees. There is a rising number of accidents due to a lack of professional training. The majority of these accidents consist of scratches and cuts which can lead to infection. Sometimes machines that are used can be sharp, so they can cause hand or finger amputation. In addition; poor posture while using machines, can lead to muscle- skeletal system disorders.

Employees involved with wood cutting are exposed to wood dust. The effects of this dust vary depending on the size of dust particles and time of exposure. Dust can affect eyes resulting in an allergic reaction. Contact with skin can cause contact dermatitis. The respirator track can also be affected by breathing the dust that irritating the nasal cavities, lungs or sinuses. This can lead to some diseases such as allergic rhinitis asthma and bronchitis. Cases of nasal sinus cancer have also been reported among wood workers in United States of America, United Kingdom, Netherlands, Italy, France, Finland, Denmark, Canada and Australia. (Ahşap ve mobilya imalat sektöründe iş sağlığı ve güvenliği., n.d.)

Therefore, employees should receive pre-employment OSH training and use PPE regularly. Table 2.2 shows the specific characteristics of the woodworking companies analyzed in this study.

Table 2.2. Specific Characteristics

#	Name of the company	Location	# Employees in production area/#Respondets	Products
1	WA	Famagusta	1	kitchen, bedroom & home furniture
2	WB	Famagusta	1	kitchen, bedroom & home furniture
3	WC	Famagusta	1	kitchen, bedroom & home furniture
4	WD	Famagusta	2	kitchen, bedroom & home furniture
5	WE	Famagusta	2	kitchen, bedroom & home furniture
6	WF	Famagusta	3	kitchen, bedroom & home furniture
7	WG	Famagusta	3	kitchen, bedroom & home furniture
8	WH	Famagusta	4	kitchen, bedroom & home furniture
9	WI	Famagusta	3	kitchen, bedroom & home furniture
10	WJ	Famagusta	8	kitchen, bedroom & home furniture
11	WK	Nicosia	18	kitchen, bedroom & home furniture
12	WL	Nicosia	18	kitchen, bedroom & home furniture
13	WM*	Nicosia	1	kitchen, bedroom & home furniture
		TOTAL	65	

* Not completed

2.1.3.3 Construction

According to the department of labor statistics, the highest rate of industrial accidents occurs in construction industry. Employees are affected by chemical hazards by inhaling fog, mist and odors and skin (organic solvents and pesticides). Liquid or semi liquid chemicals such as asphalt, tar, adhesive, glue and dust (cement dust) are also dangerous. There are physical hazards in all construction sites. The most important ones include noise, heat, cold, radiation, vibration and barometric pressure. Noise exposure is important because of an increase in the number of machines used in the workplace especially during the construction of buildings including cranes, grades and buckets excessive noise exposure can lead to hearing problems not only for the employees but also for the other people in that environment.

Therefore employees should use their PPE regularly and whenever necessary especially helmet, ear protection and respiratory protective masks.

Table 2.3 shows the specific characteristics of the construction sites analyzed in this study

Table 2.3 Specific characteristics of the construction sites analyzed in this study

#	Name of the company	Ongoing Activity	Number of Respondets	Number of Employees
1	CA	Famagusta Seaside	10	20
2	CB	Famagusta	10	15
3	CC	Karakol District	10	20
4	CD	Next to Yaşam Hospital	10	10
5	CE	Ayluga District	10	15
6	CF	Karakol District	10	10
7	CG	Opposite Deniz Plaza	10	10
8	CH	Karakol District	10	15
9	CJ	Yeni Boğaziçi	10	10
		Total	90	125

Chapter 3

METHODOLOGY

We reviewed the TRNC OSH regulations which are based on the EU Standards. Collected data related with accidents from the ministry of labor and social insurance labor office. After several consultations with the manager of labor office, chair of CTCOI and director of Famagusta municipality information was collected on TRNC industry and OSH problems. The industries for this study were selected after these consultations and by analyzing the accident statistics collected from the labor office and CTCOI.

3.1 Questionnaire Design

Employee and employer surveys were designed to collect descriptive information as well as information regarding perceived occupational risk and any reported injury or disease. Most of the survey questions were based on the new TRNC OSH law. The surveys were administrated by visiting the companies. Those surveyed were informed of the confidential nature of their responses. Data was analyzed collectively de-identifying any individual respondent.

3.1.1. Employee Survey

The survey was designed based on TRNC OSH law rules and regulations to identify to what extent employees reported compliance. The employee survey for aluminum and wood processing industries is given in Appendix B (p. 58) and in appendix D (p. 67) for construction industries. Part of the data collected was descriptive data including age, gender, education level, duration at current job and personal habits. Additionally information was collected on prior OSH training, injuries or diseases and questions related with perception of risk. These were collected on a Yes/No scale. Finally questions were directed towards the frequency of symptoms and work activities that might put employees at risk for occupational injuries or disease. This was related on a 5 point likert scale (1= none, 5 = too often).

3.1.2. Employer Survey

Employer survey collected descriptive data on type of industry, number of employees and the position of the survey respondent Additional information was collected to assess knowledge regarding occupational risk and hazards. This was collected on a Yes/No scale and a 5 point likert scale (1=none, 5=very often). The employer survey for aluminum and wood processing industries is given in Appendix A (p. 55) and in appendix C (p. 63) for construction industries.

3.2 OSH Checklists

OSH checklists were used during site visits of construction companies to assess to what extent the observations were consistent with survey responses. 7 out of 9 construction sites were visited.

3.3. Data Analysis

Minitab statistical software and MS Excel was used for data analysis.

3.3.1. Logistic Regression Analysis

Logistic regression is part of a category of statistical models called generalized linear models.

The dependent variable in logistic regression is usually dichotomous, that is, the dependent variable can take the value 1 with a probability of success θ, or the value 0 with probability of failure 1-θ. This type of variable is called a Bernoulli (or binary) variable. The independent or predictor variables in logistic regression can take any form. That is, logistic regression makes no assumption about the distribution of the independent variables. They do not have to be normally distributed, linearly related or of equal variance within each group. The relationship between the predictor and response variables is not a linear function in logistic regression, instead, the logistic regression function is used, which is the logit transformation of θ:

$$\theta = \frac{e^{(\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_i x_i)}}{1+e^{(\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_i x_i)}}$$

Where α = the constant of the equation and, β = the coefficient of the predictor variables.

An alternative form of the logistic regression equation is:

$$\text{logit}\left[\theta(x)\right] = \log\left[\frac{\theta(x)}{1-\theta(x)}\right] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i$$

The goal of logistic regression is to correctly predict the category of outcome for individual cases using the most parsimonious model. To accomplish this goal, a model is created that includes all predictor variables that are useful in predicting the response variable. Several different options are available during model creation. There are two main uses of logistic regression. The first is the prediction of group membership. Since logistic regression calculates the probability or success over the probability of failure, the results of the analysis are in the form of an odds ratio. Logistic regression also provides knowledge of the relationships and strengths among the variables.

Logistic regression investigates the relationships between a response variable and one or more predictors. Logistic regression techniques are used with categorical response variable. Minitab provides three logistic regression procedures that can use to assess the relationship between one or more predictor variables and a categorical response variable of the binary, ordinal and nominal types. In this thesis binary and ordinal variable types are used. For binary there are 2 categories which is appropriate for Yes/No scaled questions and for ordinal 3 or more categories which is appropriate for 5 point likert scaled questions. The basic characteristic of binary type is two level and for ordinal, its natural ordering of the levels. Logistic regression methods estimate parameters in the model so that the fit of the model is optimized. (Logistic Regression.,n.d.)

Chapter 4

RESULTS

4.1 Aluminum Industry

In aluminum industry four companies visited and surveys are conducted. The employer of three out of four companies reported that they gave OHS training to their employees and it's repetitive. However 81.82% of employee reported that, they did not have any OHS training before they started to work. Employers reported that they have security colors and illuminated signs at necessary places in the workplaces. On the other hand 54.55% employees reported that they don't have any security colors and illuminated signs in the necessary places. Both employers and employees reported that the employees are aware of the danger of the machines and equipments whether they use or not. Three out of four employers reported that they were not given any written instructions about the machines and equipments used in the workplace and there is no warning or sign on the machine. All employers reported that they inform and give training to their employee about the maximum load they can carry. As shown in the figure below, all employers supply the PPE but they do not check if the employees used them properly or not.

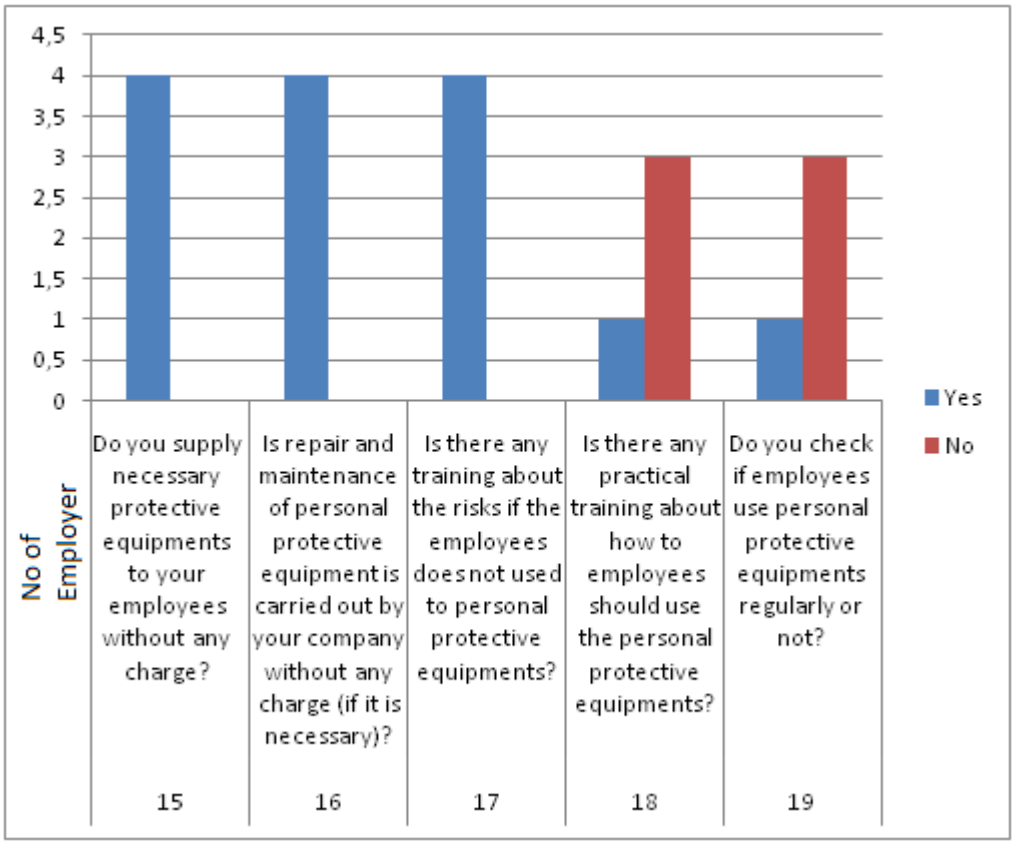

Figure 4.1 Charts related with the use of PPE in Aluminum Industry as the employers reported

According to the employers, employees protect themselves from the harmful level of external factors such as noise and dust. However just one company take some measures for protect the employees from slippery surfaces at the workplace.

As it shown in figure 4.2 age frequency is high between 26 years old to 30 years old.

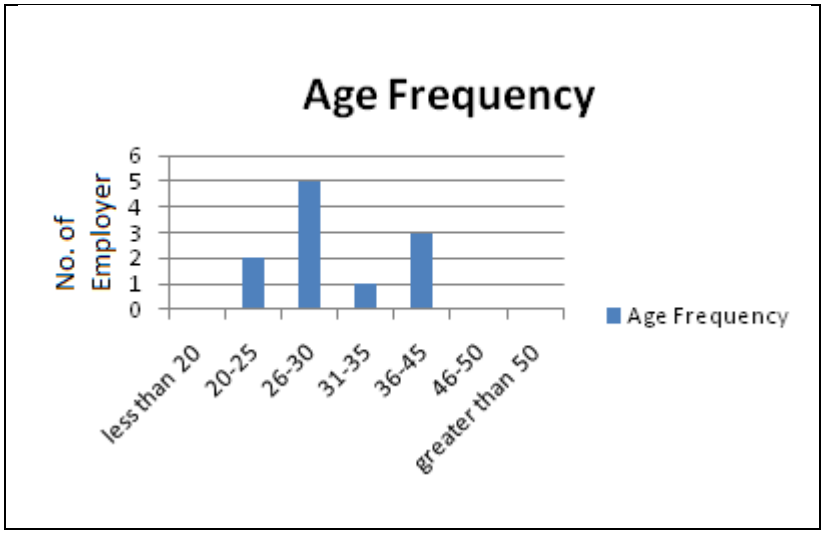

Figure 4.2. Age Frequency of labor in Aluminum industry

According to the survey result; 63% of employees have primary level education and 37% of them have secondary level education. Personal habits of the workers are collected to see if the working conditions affect their habits or not. But as it seems from the figure below, employees who worked in aluminum industry they do not have any personal habits like smoking, drinking alcohol or participating in sports. From the face to face interviews its understood that after the work they are tired and they don't have any energy for specific physical activity. Moreover, because of the economic conditions most of the employees do not want to spend their money for smoking and drinking alcohol. Figure 4.3 shows the personal habits of employees who responded to the survey.

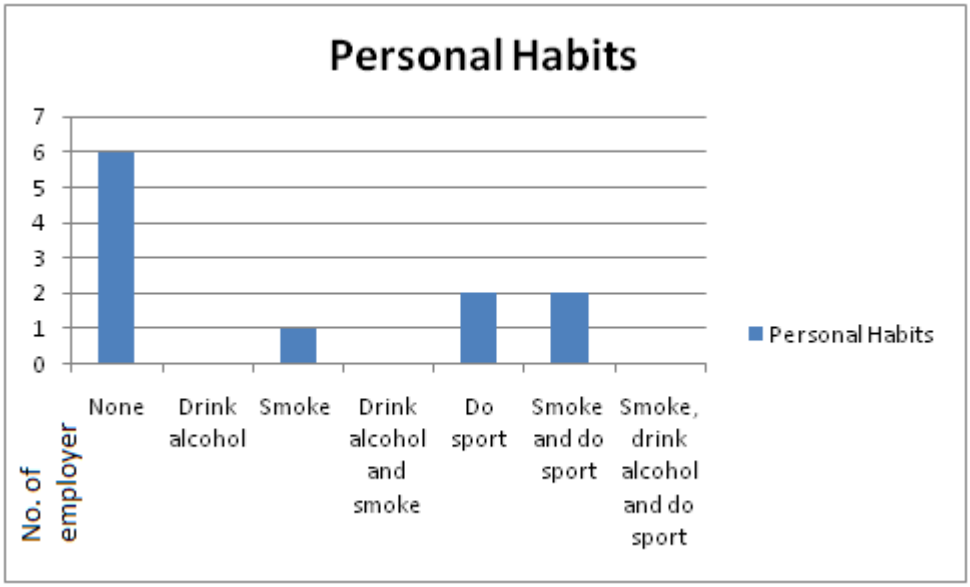

Figure 4.3 Personal habits of employees in aluminum industry

Three employees out of eleven have serious accident during the working life. The accident types which are reported by employees are; broken arm, neck incision and finger cut. Although employers reported that they give information about the load carried to the employers, 36.36% of employees reported that they were not informed by their employers about the maximum load they can carry and 45.45% of employees reported that they don't have any idea about the risks of incorrect handling. Just like the employer's most of the employees also reported that employers provide PPE but they do not control whether if they use them properly or not. Figure 4.4 summarizes the responses related with PPE.

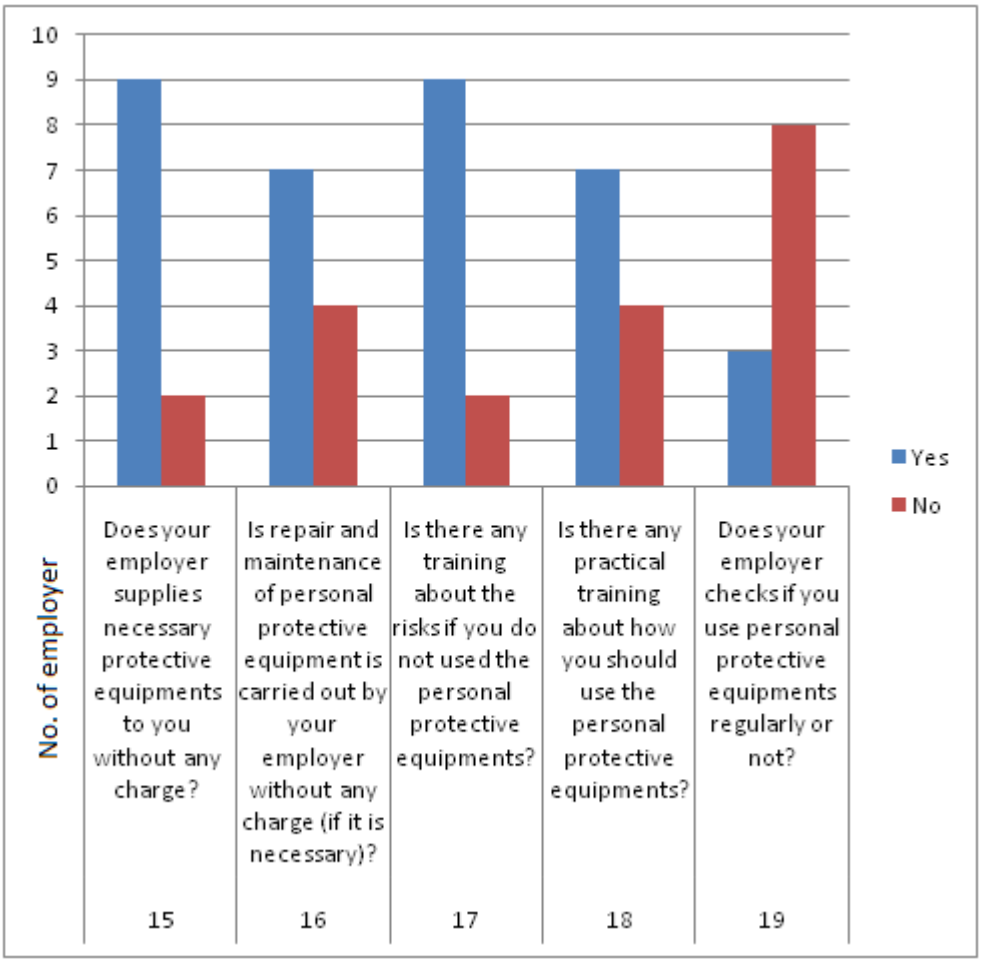

Figure 4.4 Charts related with the use of PPE as employees reported

From the data collected from surveys it is observed that, employees are suffering from repetitive movements and carrying load. Most of the employees reported that they do not have serious occupational disease. However from face to face interviews it's understood that because they are doing their job for a long time, they get used to live with all sorts of pains and they do not consider them as a serious problem. However, it should be considered very carefully and try to find solutions should be found for these problems because in long time period it can cause more serious health problems. According to the employees work place temperature is normal level (between 19.4-22.8 0C), humidity is acceptable, illumination and ventilation is adequate. And level of the noise and dust at the work place is not too much. From

figure 4.5 and 4.6 you can see frequency of symptoms and work activities that might put employees at risk for occupational injuries or disease.

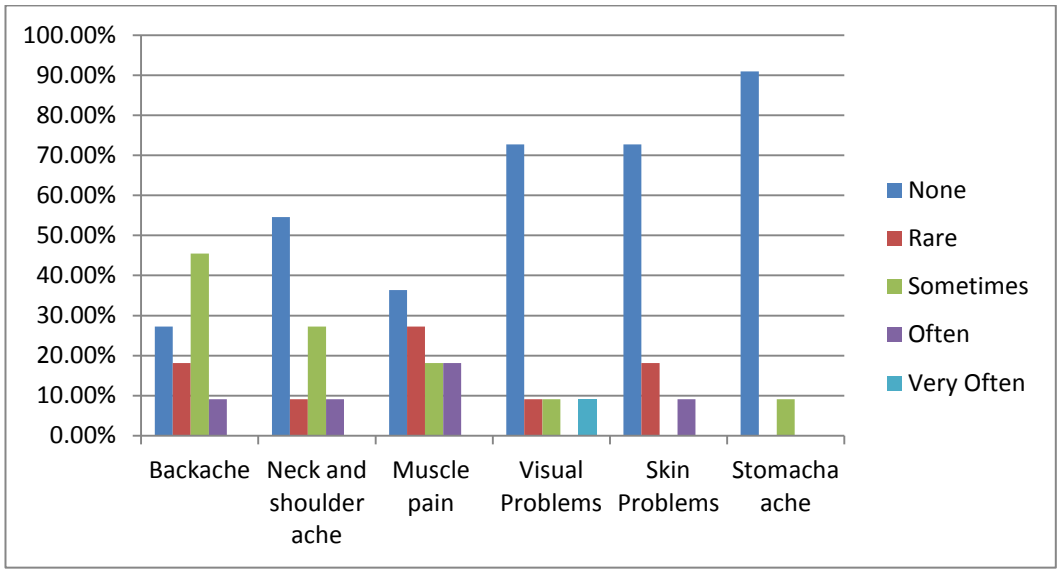

Figure 4.5 Frequency of symptoms in aluminum industry

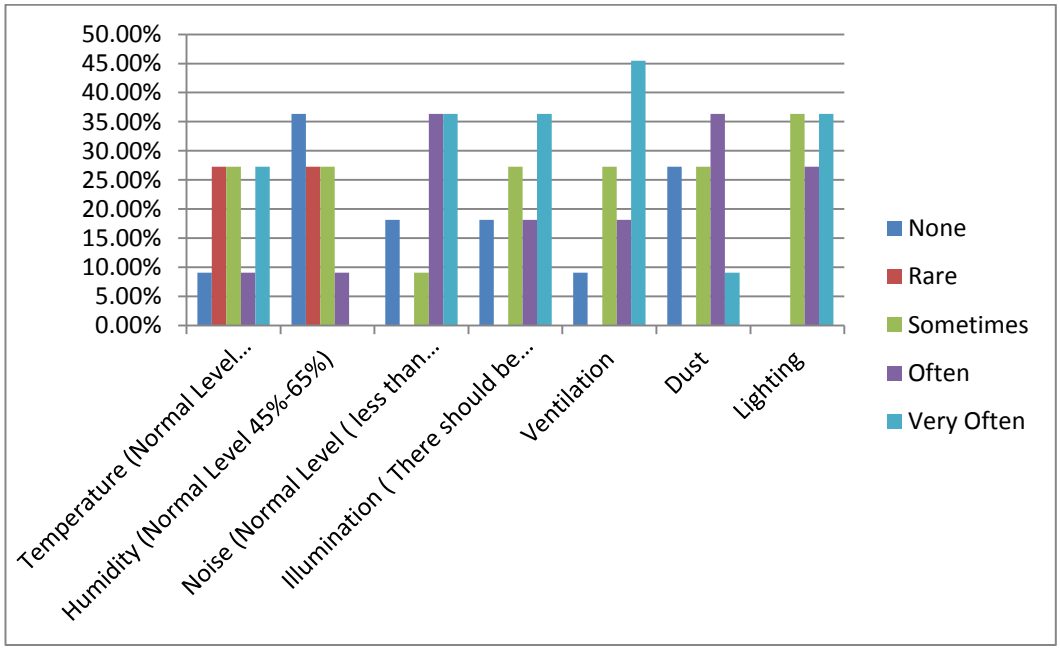

Figure 4.6 Frequency of work activities in aluminum industry

Binary and Ordinal Logistic Regression Model is applied. Logistic Regression Table shows the estimated coefficients, standard error of the coefficients, z- values, and p-values. It also shows the odds ratio and a 95% confidence interval (CI) for the odds ratio (OR).

For aluminum industry ten different combinations are made. Table 4.1 shows the Minitab results for aluminum industry.

Table 4.1 Minitab results for aluminum industry

#	Response	Model	Analysis	Odds Ratio and 95% Confidence Interval Value	p- Value	p < 0.05
1	Occupational Diseases	Age	Regression	X	0.514	No
		Weight			0.077	No
		Education			0.371	No
		Work Experience			0.307	No
2	Trainings about the Load Carried	Backaches	Binary Logistic Regression	(OR : 1.12, CI : 0.19, 6.67)	0.901	No
		Neck and shoulder ache		(OR : 0.95, CI : 0.17, 5.12)	0.948	No
		Muscle pain		(OR : 0.71, CI : 0.21, 2.45)	0.591	No
3	PPE's of employees maintenance carried	Visual Problem	Binary Logistic Regression	(OR : 0.50, CI : 0.15, 1.72)	0.273	No
		Skin Problem		(OR : 1.04, CI : 0.22, 4.86)	0.956	No
4	Employees protect themselves from harmful level of external factors	Visual Problem	Binary Logistic Regression	(OR : 0.39, CI : 0.09, 1.60)	0.190	No
		Skin Problem		(OR : 0.79, CI : 0.16, 3.86)	0.768	No
5	Employees have any accident in the workplace	Falls because of the greasy ground	Binary Logistic Regression	(OR : 0.05, CI : 0.03, 7.99)	0.624	No
6	Employee confronted with overload	Backaches	Ordinal Logistic Regression	(OR : 1.22, CI : 0.25, 6.04)	0.804	No
		Neck and shoulder ache		(OR : 0.37, CI : 0.07, 1.93)	0.240	No
		Muscle pain		(OR : 1.01, CI : 0.34, 3.04)	0.979	No
7	Employer provides ear protectors	Level of noise	Binary Logistic Regression	(OR : 0.77, CI : 0.32, 1.88)	0.567	No
8	Employers provide written instructions	Confronted with vibration	Binary Logistic Regression	(OR : 0.45, CI : 0.11, 1.80)	0.258	No
		Confronted with tighten your hands and arms		(OR : 0.48, CI : 0.11, 2.20)	0.347	No
9	Trainings about the risk of incorrect handling	Confronted with overload	Binary Logistic Regression	(OR : 0.39, CI : 0.11, 1.38)	0.144	No
		Neck and shoulder ache		(OR : 1.03, CI : 0.15, 7.00)	0.977	No
		Backaches		(OR : 1.46, CI : 0.23, 9.39)	0.687	No
10	Employers provide written instructions	Provide written instruction	Regression Analysis	X	0.170	No
		Aware of danger of machines and equipmets			1.000	No
		Appropriate warning signs on the equipments			0.351	No

The combinations were made to see if there is a significant relation between;

1. Occupational diseases and employees' age, weight, education, and experience
2. Trainings about the load carried by employees and back, neck, shoulder aches and muscle pain (Question(Q) 14 and Q30, Q31, Q32)
3. PPE's of employees maintenance carried by employer and visual and skin problems (Question(Q) 16 and Q33, Q34)
4. Employees protect their self' from harmful level of external factors and visual and skin problems (Question(Q) 23 and Q33, Q34)
5. Employees have any accident in the workplace and employer protect the employees from falls at the greasy ground in the workplace (Question(Q) 5 and Q24)
6. Employee confronted with overload and back, neck, shoulder aches and muscle pain (Question(Q) 27 and Q30, Q31, Q32)
7. Employer provides ear protectors when the noise exposure exceeds the minimum exposure action values and level of the noise (Question(Q) 20 and Q38)
8. Employers provide written instructions about the equipment that is used and confronted with vibration and confronted with tighten your hands and arms (Question(Q) 10 and Q28, Q29)
9. Training given by employer about the risks of incorrect handling and confronted with overload and back, neck and shoulder ache. (Question(Q) 14 and Q27, Q30, Q31)
10. Accidents in the workplace and written introduction about the machines and equipments used, aware of danger of machines and equipments used and

training about the risk of incorrect handling (Question(Q) 5 and Q10, Q11, Q12)

There is no combination which has sufficient evidence that the coefficients are not zero using alpha level of 0.05. These outputs can be seen in Appendix E (on page 74)

4.2 Woodworking Industry

In woodworking industry twelve companies were visited and surveys are conducted. Ten out of twelve companies employer reported that they gave OSH training to their employees and 7 employers stated that the trainings are periodic. However 59.38% of employee reported that, they did not have any OSH training before they started to work. 71.88% of them stated that OSH training is not periodic. Five of the employers reported that they have security colors and illuminated signs at necessary places in the workplaces. On the other hand 90.63% employees reported that they don't have any security colors and 39.06% of them reported that they do not have illuminated signs in the necessary places. Both employers and employees reported that the employees are aware of the danger of the machines and equipments whether they use them or not. However 89.06% employees reported that their employers did not give them any written instruction about the machines and equipments used in the workplace. Employers reported that they inform their workers about the danger of the machines and on the machines and equipments they have necessary warnings and signs. All employers reported that they inform and give training to their employees about the maximum load they can carry. And 84.38% of employees agree on their

employers. As it shown in figure 4.7, all employers supply the PPE and most of them check if the employees used them properly or not.

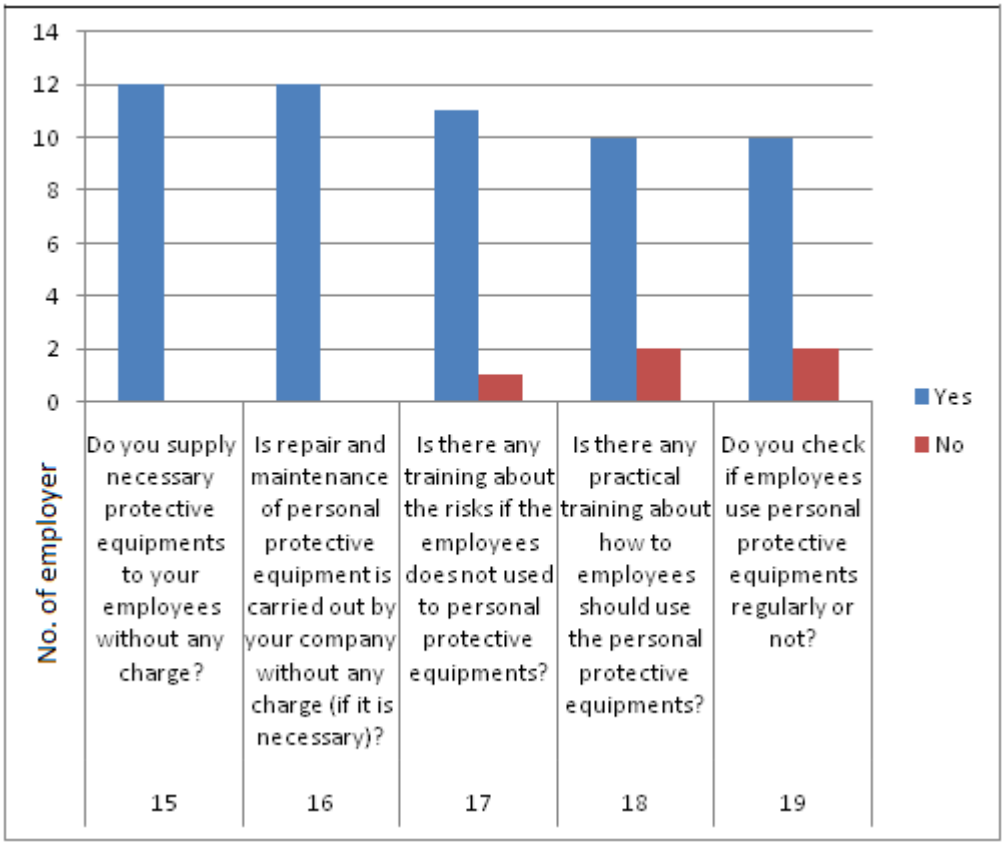

Figure 4.7 Charts related with the use of PPE in the wood working industry as reported by employers

According to the employers, employees protect their self's from the harmful level of external factors such as noise and dust. Except three companies, other companies take same measures for protecting the employees from slippery surfaces at the workplace.

As it is shown in figure 4.8 age frequency is high between 31 years old to 35 years old.

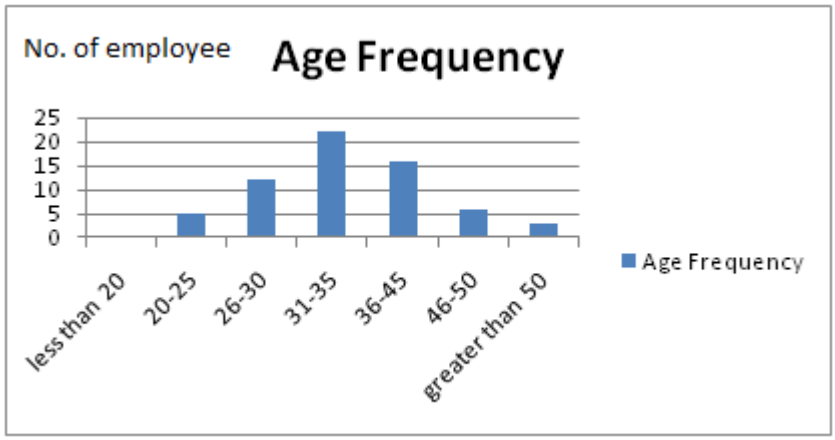

Figure 4.8 Age frequency in woodworking industry

According to the survey result; 73% of employers have primary level education and 27% of them have secondary level education. Personal habits of the workers are collected to see if the working conditions affect their habits or not. As it seems from the figure below, 39 employees smoke. 26 of them smoke and drink alcohol. There are only 2 employees who are participating in sport regularly.

Figure 4.9 Personal habits of employees in woodworking industry

Twelve employees out of sixty four had a serious accident during their working life. The accident types which are reported by employees are; neck incision and finger cuts. Just like employer's most of the employees also reported that employers provide PPE and they control whether if they use properly or not. This can be seen in figure 4.10.

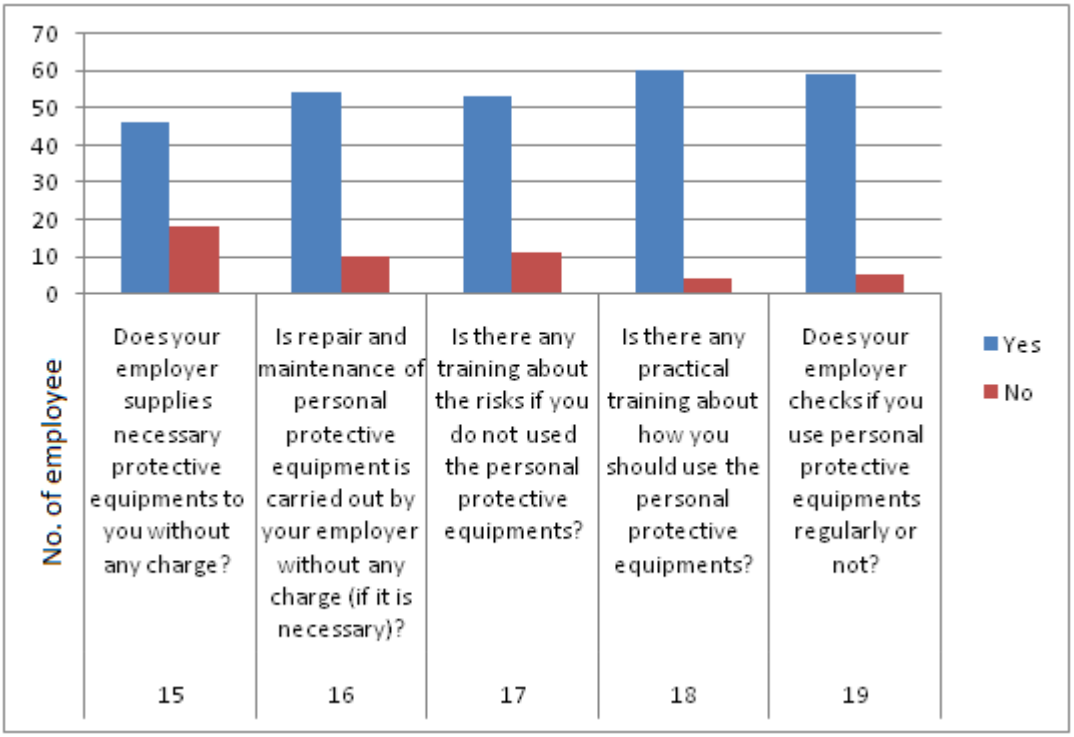

Figure 4.10 Charts related with the use of PPE in wood working industry

From the data collected from surveys it is observed that, employees are suffering from repetitive movements and carrying load like aluminum industry. Most of the employees reported that they do not have serious occupational disease. 30% of employee reported that they have back, neck, shoulder ache, and muscle pain. According to the employees work place temperature is at normal level (between 19.4-22.8 ^{0}C), humidity is acceptable, illumination and ventilation is adequate. And level of the noise and the dust at the work place is not too much.

From figure 4.11 and 4.12 you can see frequency of symptoms and work activities that might put employees at risk for occupational injuries or disease.

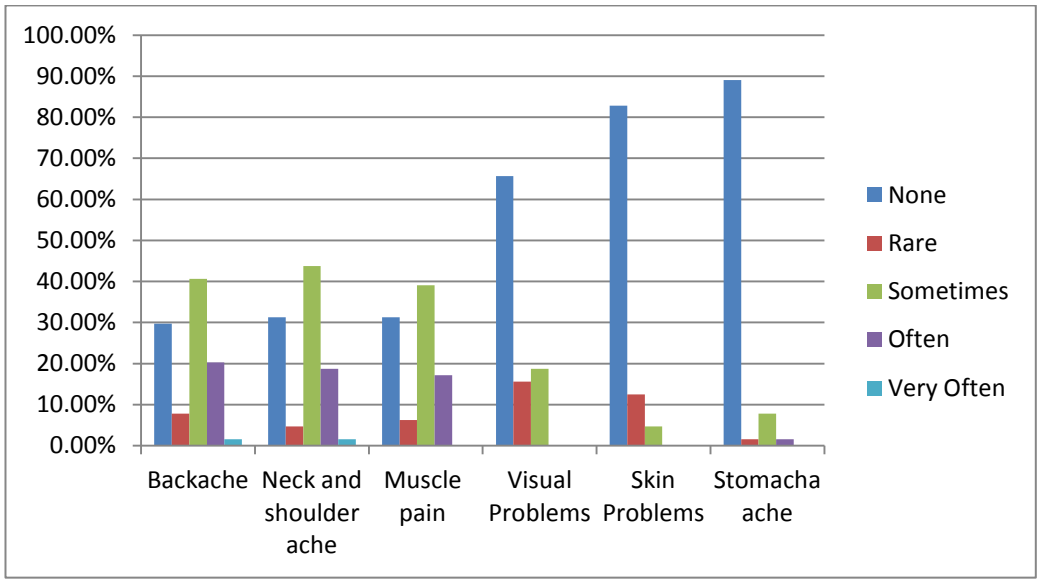

Figure 4.11 Frequency symptoms in wood working industry

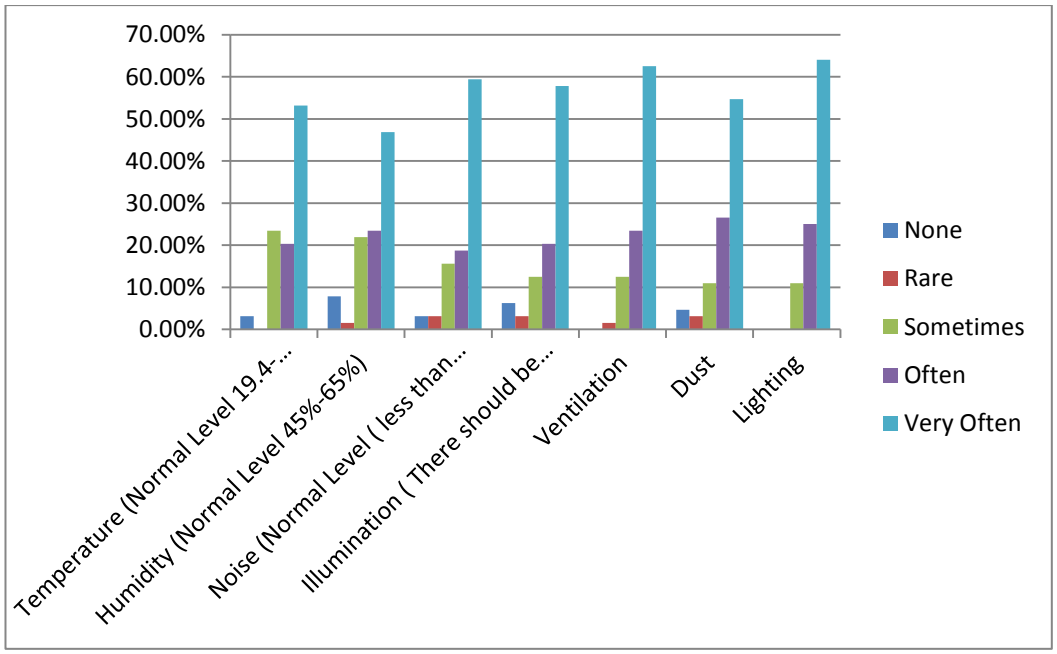

Figure 4.12 Frequency of work activities in wood working industry

For woodworking industry ten different combinations are made. Table 4.2 shows the Minitab results for aluminum industry.

Table 4.2 Minitab Results for wood working industry

#	Response	Model	Analysis	Odds Ratio and 95% Confidence Interval Value	p- Value	p < 0.05
1	Occupational Diseases	Age	Regression	X	0.033	Yes
		Weight			0.046	Yes
		Education			0.708	No
		Work Experience			0.246	No
2	Trainings about the Load Carried	Backaches	Binary Logistic Regression	(OR : 1.15, CI : 0.53, 2.49)	0.718	No
		Neck and shoulder ache		(OR : 1.28, CI : 0.60, 2.71)	0.527	No
		Muscle pain		(OR : 0.86, CI : 0.40, 1.87)	0.709	No
3	PPE's of employees maintenance carried	Visual Problem	Binary Logistic	(OR : 2.74, CI : 0.62, 12.18)	0.185	No
		Skin Problem		(OR : 0.16, CI : 0.03, 0.79)	0.024	Yes
4	Employees protect themselves from harmful level of external factors	Visual Problem	Binary Logistic Regression	(OR : 7.92, CI : 1.06, 59.07)	0.043	Yes
		Skin Problem		(OR : 0.08, CI : 0.01, 0.62)	0.016	Yes
5	Employees have any accident in the workplace	Falls because of the greasy ground	Logistic Regression	(OR : 0.72, CI : 0.21, 2.51)	0.609	No
6	Employee confronted with overload	Backaches	Ordinal Logistic Regression	(OR : 0.73, CI : 0.37, 1.45)	0.367	No
		Neck and shoulder ache		(OR : 0.93, CI : 0.49, 1.77)	0.836	No
		Muscle pain		(OR : 0.94, CI : 0.49, 1.81)	0.849	No
7	Employer provides ear protectors	Level of noise	Logistic Regression	(OR : 1.10, CI : 0.68, 1.80)	0.693	No
8	Employers provide written instructions	Confronted with vibration	Binary Logistic Regression	(OR : 0.56, CI : 0.25, 1.27)	0.165	No
		Confronted with tighten your hands and arms		(OR : 1.05, CI : 0.52, 2.10)	0.900	No
9	Trainings about the risk of incorrect handling	Confronted with overload	Binary Logistic Regression	(OR : 0.94, CI : 0.49, 1.80)	0.864	No
		Neck and shoulder ache		(OR : 1.10, CI : 0.54, 2.25)	0.794	No
		Backaches		(OR : 1.22, CI : 0.61, 2.44)	0.582	No
10	Employers provide written instructions	Provide written instruction	Regression Analysis	X	0.866	No
		Aware of danger of machines and equipmets			0.797	No
		Appropriate warning signs on the equipments			0.592	No

For woodworking industry ten different combinations were made. The combinations were made to see if there is a significant relation between;

1. Occupational diseases and employees' age, weight, education, and experience

It shows that there is sufficient evidence for age and weight that the coefficients are not zero using alpha level of 0.05. It means that age and weight of the employee is related with the occupational diseases. Because of the lack of OSH training at the workplace, employees are under risk.

Table 4.3 Minitab output for combination 1 for woodworking industry

```
The regression equation is
q7 = 0,535 + 0,0132 age(yr) - 0,0124 weight(kg) - 0,0109 education(yr)
     + 0,00454 experience(yr)


Predictor            Coef   SE Coef      T      P
Constant           0,5353    0,3486   1,54  0,130
age(yr)          0,013155  0,006042   2,18  0,033
weight(kg)      -0,012438  0,006097  -2,04  0,046
education(yr)    -0,01090   0,02892  -0,38  0,708
experience(yr)   0,004543  0,003874   1,17  0,246
```

2. Trainings about the load carried by employees and back, neck, shoulder aches and muscle pain (Question(Q) 14 and Q30, Q31, Q32)
3. PPE's of employees maintenance carried by employer and visual and skin problems (Question(Q) 16 and Q33, Q34)

Q34 p: 0.024 (OR: 0.03, CI: 0.03, 0.79) It shows that there is sufficient evidence for Q34 that the coefficients are not zero using alpha level of 0.05.

Table 4.4 Minitab output for combination 3 for woodworking industry

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	2,24200	0,816704	2,75	0,006			
q33	1,00926	0,760643	1,33	0,185	2,74	0,62	12,18
q34	-1,83726	0,814029	-2,26	0,024	0,16	0,03	0,79

It means that Skin problem is correlated with the PPE's of employee maintenance carried by employer.

4. Employees protect themselves from harmful level of external factors and visual and skin problems (Question(Q) 23 and Q33, Q34)

Q33 p: 0.043 (OR: 7.92, CI: 1.06, 59.07) It is shows that there is sufficient evidence for Q33 that the coefficients are not zero using alpha level of 0.05.

Q34 p: 0.016 (OR: 0.08, CI: 0.01, 0.62) It is shows that there is sufficient evidence for Q34 that the coefficients are not zero using alpha level of 0.05.

Table 4.5 Minitab output for combination 4 for woodworking industry

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	1,18724	0,743172	1,60	0,110			
q33	2,06957	1,02508	2,02	0,043	7,92	1,06	59,07
q34	-2,56746	1,06842	-2,40	0,016	0,08	0,01	0,62

It shows that visual and skin problems are correlated with use of PPE at the workplace.

5. Employees have any accident in the workplace and employer protect the employees from falls at the greasy ground in the workplace (Question(Q) 5 and Q24)
6. Employee confronted with overload and back, neck, shoulder aches and muscle pain (Question(Q) 27 and Q30, Q31, Q32)
7. Employer provides ear protectors when the noise exposure exceeds the minimum exposure action values and level of the noise (Question(Q) 20 and Q38)
8. Employers provide written instructions about the equipment that is used and confronted with vibration and confronted with tighten your hands and arms (Question(Q) 10 and Q28, Q29)
9. Training given by employer about the risks of incorrect handling and confronted with overload and back, neck and shoulder ache. (Question(Q) 14 and Q27, Q30, Q31)
10. Accidents in the workplace and written introduction about the machines and equipments used, aware of danger of machines and equipments used and training about the risk of incorrect handling (Question(Q) 5 and Q10, Q11, Q12)

There are three combinations which has sufficient evidence that the coefficients are not zero using alpha level of 0.05. . These outputs can be seen in Appendix F (on page 83) .

4.3 Construction Industry

In construction industry nine companies visited and surveys are conducted. Seven out of nine companies employer reported that they gave OSH training to their employees and six employers stated that training is periodic. 77.78% of construction workers reported that they have OSH training before they started work. All of the employers reported that they have security colors at the places where there is a risk for obstacles and falls. However, only one employer reported that they have illuminated signs at necessary places in the workplaces. 100% of employees reported that they have security colors but 77.78% of them reported that they do not have illuminated signs in the necessary places. Both employers and employees reported that the employees are aware of the danger of the machines and equipments whether they use or not. Also 100% employees reported that their employers give them written instruction about the machines and equipments used in the workplace. Employers inform their workers about the danger of the machines and on the machines and equipments have necessary warnings and signs. All employers reported that they inform and give trainings to their employer about the maximum load they can carry. And 91.11% of employees agree on their employers. As it shown the below figure, all employers supply the PPE and all of them check if the employees used them properly or not. However, only one company does not pay the repair and maintenance cost of the PPE. And does not give any practical training how the employee should use the PPE.

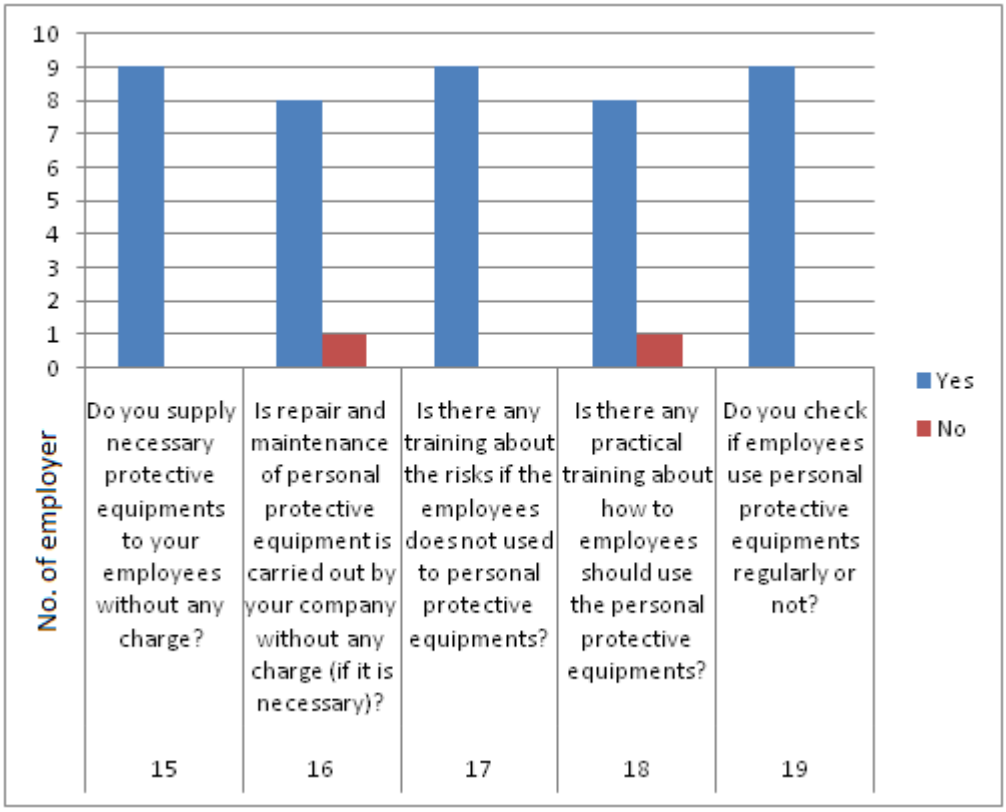

Figure 4.9 Charts related with the use of PPE in construction industry as reported by employers

According to the 8 employers, employees protect their self's from the harmful level of external factors such as noise and dust. And all companies take same measures to protect the employees from slippery surfaces at the workplace.

As it shown in the below figure age frequency is high between 31 years old to 35 years old.

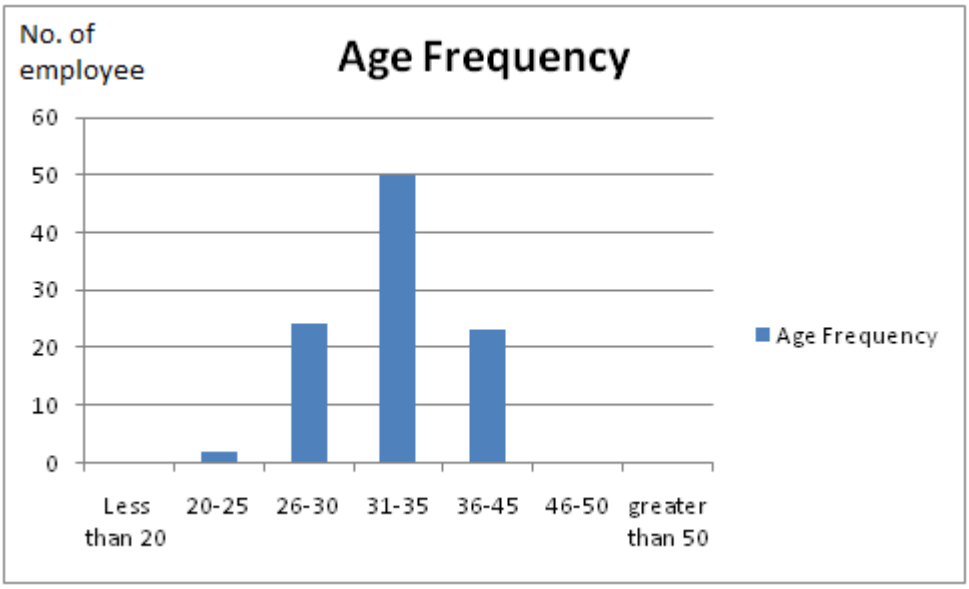

Figure 4.10 Age frequency in construction industry

According to the survey result; 74% of employees have primary level education and 26% of them have secondary level education. Personal habits of the workers are collected to see if the working conditions affect their habits or not. As it seems from the figure 4.11, 48 employees out of 90 have no personal habits. The main reason being economic situation and lack of time.

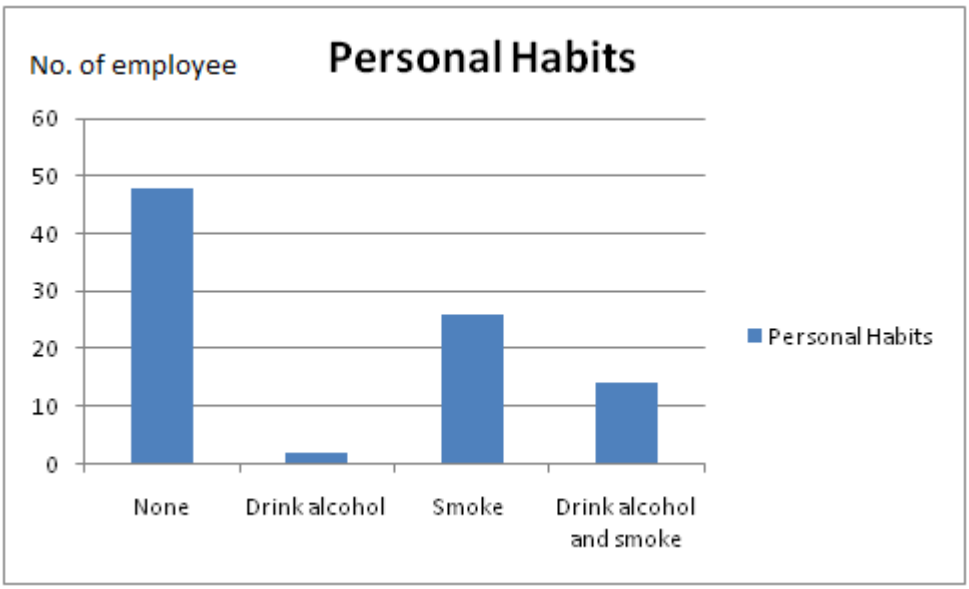

Figure 4.11 Personal habits of employees in the construction sector

Eleven employees out of ninety had serious accident during their working life. The accident types which are reported by employees are; neck incision, finger cuts, fall from scaffold, pressed nail, tighten finger to the machines and stifle because of the dust. Just like an employer's all of the employees also reported that employers provide PPE and they control whether it they use them properly or not.

From the data collected from surveys it is observed that, employees are suffering from repetitive movements, vibration and carrying load. Between 65% and 75% of employees reported that they have medium level back, neck, shoulder ache and muscle pain. According to the employees work place temperature is not at normal level. They generally work under cold and hot weather. Also they feel humidity too much, illumination and ventilation is acceptable. However, level of the noise and the dust at the work place is too much.

From figure 4.16 and 4.17 you can see frequency of symptoms and work activities that might put employees at risk for occupational injuries or disease.

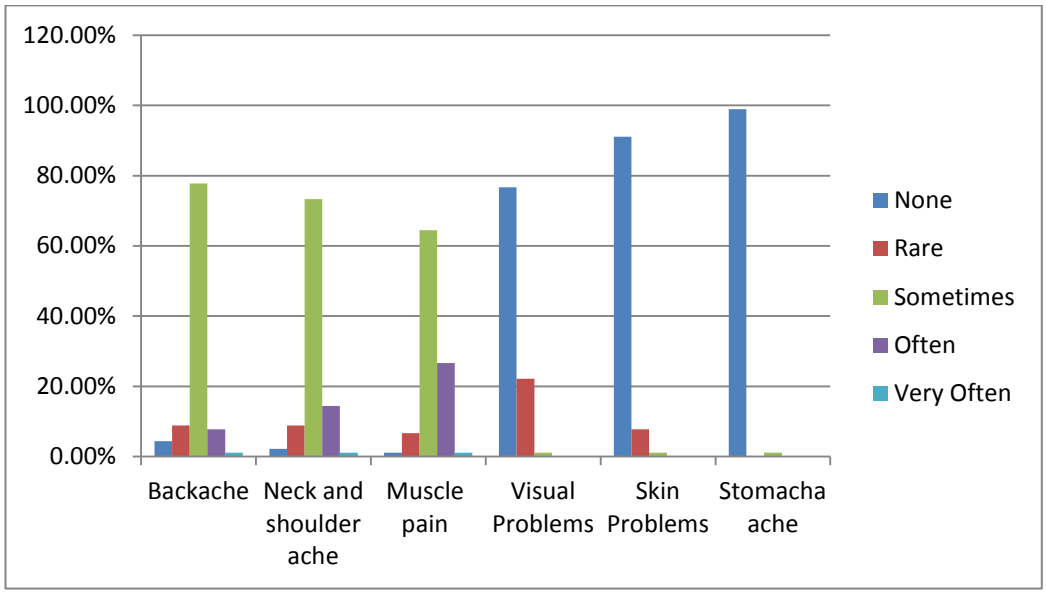

Figure 4.16 Frequency of symptoms in wood working industry

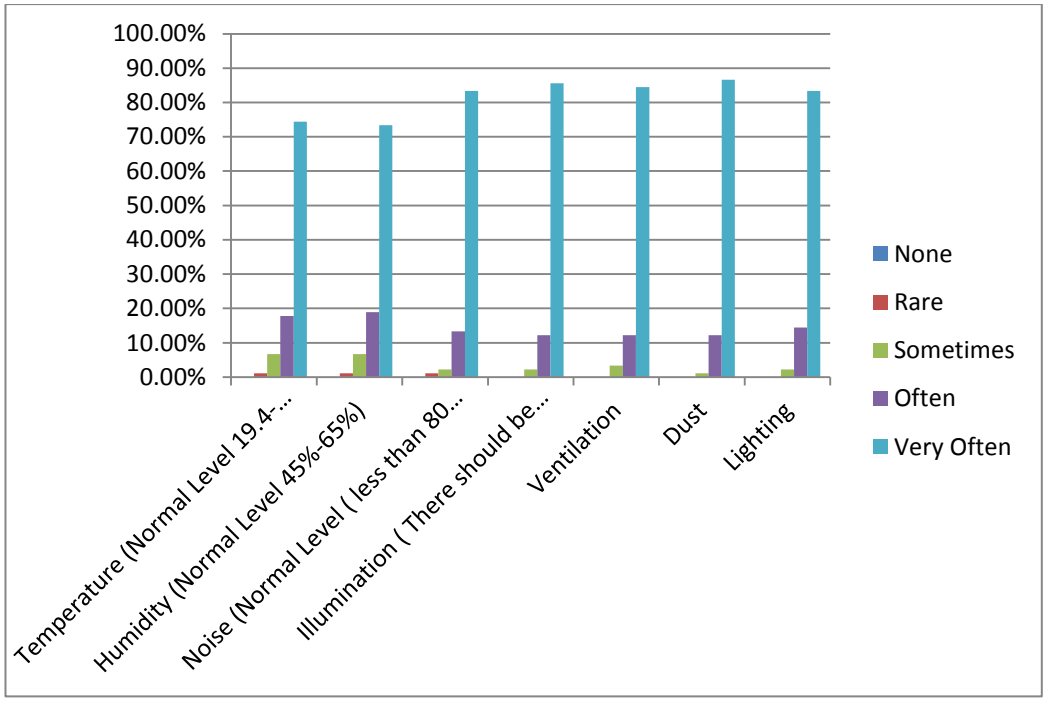

Figure 4.17 Frequency of work activities

For woodworking industry ten different combinations are made. Table 4.6 and 4.7 show the Minitab results for aluminum industry.

Table 4.6 Minitab results for construction industry part 1

#	Response	Model	Analysis	Odds Ratio and 95% Confidence Interval Value	p- Value	p < 0.05
1	Trainings about the Load Carried	Backaches	Binary Logistic Regression	(OR : 1.35, CI : 0.24, 7.68)	0.734	No
		Neck and shoulder ache		(OR : 0.22, CI : 0.05, 0.94)	0.042	Yes
		Muscle pain		(OR : 1.12, CI : 0.21, 6.01)	0.891	No
2	PPE's of employees maintenance carried	Visual Problem	Binary Logistic	(OR : $5x10^{-8}$, CI : 0.00, *)	0.998	No
		Skin Problem		(OR : 0.33, CI : 0.03, 3.58)	0.364	No
3	Employees protect themselves from harmful level of external factors	Visual Problem	Binary Logistic Regression	(OR : 1.61, CI : 0.32, 8.09)	0.565	No
		Skin Problem		(OR : 0.39, CI : 0.07, 2.07)	0.267	No
4	Employees have any accident in the workplace	Falls because of the greasy ground	Logistic Regression	(OR : 01.79, CI : 0.21, 15.31)	0.594	No
5	Employee confronted with overload	Backaches	Ordinal Logistic Regression	(OR : 0.98, CI : 0.36, 2.64)	0.962	No
		Neck and shoulder ache		(OR : 0.68, CI : 0.26, 1.78)	0.431	No
		Muscle pain		(OR : 0.57, CI : 0.23, 1.38)	0.212	No
6	Employer provides ear protectors	Level of noise	Logistic Regression	(OR : 0.29, CI : 0.04, 2.18)	0.226	No
7	Employers provide written instructions	Confronted with vibration	Binary Logistic Regression	(OR : 0.97, CI : 0.33, 2.87)	0.950	No
		Confronted with tighten your hands and arms		(OR : 2.06, CI : 0.64, 6.28)	0.223	No
8	Trainings about the risk of incorrect handling	Confronted with overload	Binary Logistic Regression	(OR : 0.45, CI : 0.08, 2.64)	0.378	No
		Neck and shoulder ache		(OR : 1.37, CI : 0.31, 6.10)	0.680	No
		Muscle pain		(OR : 0.21, CI : 0.05, 0.82)	0.024	Yes
9	PPE provide by employers	Suitables seats	Binary Logistic Regression	(OR : 0.68, CI : 0.22, 2.14)	0.509	No
		Falls protector		(OR : 0.87, CI : 0.17, 4.41)	0.863	No
		Head protector		(OR : 0.41, CI : 0.05, 3.46)	0.409	No
10	Use of stairs	How often employees use stairs?	Logistic Regression	(OR : 0.10, CI : 0.04, 0.28)	0.00	Yes

Table 4.7 Minitab results for construction industry part 1

#	Response	Model	Analysis	Odds Ratio and 95% Confidence Interval Value	p- Value	p < 0.05
11	Use of positioning rope	How often employees use positioning rope?	Logistic Regression	(OR : 1.72, CI : 0.67, 4.41)	0.260	No
12	Fall protectors	Head protector	Binary	(OR : 1.07, CI : 0.32, 3.52)	0.913	No
13	Use of seat belts	Apply specific rules for scaffolds	Binary Logistic Regression	(OR : 3.07, CI : 0.46, 20.25)	0.245	No
		Calculate strength and durability of scaffold		(OR : 0.00, CI : 0.00, *)	0.999	No
		Put an appropriate sign		(OR : 1.61, CI : 0.14, 18.58)	0.702	No
		Head protector		(OR : 1.14, CI : 0.20, 6.44)	0.884	No
14	Rules for scaffolds	Use seatbelts	Binary Logistic Regression	(OR : 1.89, CI : 0.38, 9.36)	0.437	No
15	PPE provide by employers without any charge	Foot protectors while working with concrete	Binary Logistic Regression	(OR : $2x10^{-17}$, CI : 0.00, *)	0.999	No
		Foot protectors while working with prefabricated parts,site		(OR : 0.00, CI : 0.00, *)	0.999	No
		Foot protectors while working in repository and roof		(OR : 0.00, CI : 0.00, *)	0.999	No
16	PPE provide by employers without any charge	Seatbelts while working on scaffolds	Binary Logistic Regression	(OR : 2.52, CI : 0.34, 18.90)	0.369	No
		Seatbelts while assembling the prefabricated parts		(OR : 2.01, CI : 0.42, 9.61)	0.382	No
		Seatbelts while working on columns		(OR : 1.71, CI : 0.37, 7.94)	0.493	No
17	Use of safety rope	Work in high crane cabins	Binary Logistic Regression	(OR : 0.39, CI : 0.12, 1.23)	0.107	No
		Work in high cabins		(OR : 1.68, CI : 0.52, 5.43)	0.384	No
		Work in high drilling towers		(OR : 1.68, CI : 0.52, 5.42)	0.389	No
		Work in wellhole and canalization		(OR : 0.59, CI : 0.05, 7.76)	0.691	No
18	Use of positioning rope	Work in high crane cabins	Binary Logistic Regression	(OR : 0.84, CI : 0.30, 2.33)	0.738	No
		Work in high cabins		(OR : 0.97, CI : 0.30, 3.15)	0.964	No
		Work in high drilling towers		(OR : 1.62, CI : 0.52, 5.10)	0.409	No
		Work in wellhole and canalization		(OR : 0.83, CI : 0.07, 10.11)	0.886	No

For construction industry eighteen different combinations are made. The combinations were made to see if there is a significant relation between;

1. Trainings about the load carried by employees and back, neck, shoulder aches and muscle pain (Question(Q) 14 and Q57, Q58, Q59)

Q58 p: 0.042 (OR: 0.22, CI: 0.05, 0.94) It is shows that there is sufficient evidence for Q58 that the coefficients are not zero using alpha level of 0.05.

Table 4.8 Minitab Output for combination 1 in construction industry

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	6,00208	2,97825	2,02	0,044			
q57	0,301386	0,886508	0,34	0,734	1,35	0,24	7,68
q58	-1,52802	0,749658	-2,04	0,042	0,22	0,05	0,94
q59	0,117392	0,855344	0,14	0,891	1,12	0,21	6,01

It shows that shoulder aches are correlated with the load carried by employees. If employees do not have adequate OSH trainings then they can have more shoulder aches that the ones who had.

2. PPE's of employees maintenance carried by employer and visual and skin problems (Question(Q) 16 and Q60, Q61)
3. Employees protect their self' from harmful level of external factors and visual and skin problems (Question(Q) 23 and Q60, Q61)
4. Employees have any accident in the workplace and employer protect the employees from falls at the greasy ground in the workplace (Question(Q) 5 and Q24)

5. Confronted with overload and back, neck and shoulder ache and muscle pain (Question(Q) 27 and Q57, Q58, Q59)
6. Employer provides ear protectors when the noise exposure exceeds the minimum exposure action values and noise problem (Question(Q) 20 and Q65)
7. Accidents in the workplace and written introduction about the machines and equipments used, vibration and tighten your hands (Question(Q) 10 and Q55, Q56)
8. Training about the risk of incorrect handling and confronted with overload, shoulder ache and muscle pain (Question(Q) 14 and Q54, Q57, Q58)

Q58 p: 0.042 (OR: 0.21, CI: 0.05, 0.82) It is shows that there is sufficient evidence for Q58 that the coefficients are not zero using alpha level of 0.05.

Table 4.9 Minitab output for combination 8 in construction industry

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	8,75703	4,21256	2,08	0,038			
q54	-0,793207	0,899399	-0,88	0,378	0,45	0,08	2,64
q57	0,314420	0,762371	0,41	0,680	1,37	0,31	6,10
q58	-1,55032	0,688869	-2,25	0,024	0,21	0,05	0,82

It means muscle pain is correlated with incorrect handling.

9. PPE provide by employers and suitable seats, protectors for protect the falls and head protectors while working scaffolds (Question(Q) 15 and Q29, Q30, Q36)

10. They use stairs and how often they use stairs in the construction site (Question(Q) 26 and Q37)

Q37 p: 0.00 (OR: 0.10, CI: 0.04, 0.28) It is shows that there is sufficient evidence for Q58 that the coefficients are not zero using alpha level of 0.05.

Table 4.10 Minitab output for combination 10 in construction industry

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	6,34007	1,32045	4,80	0,000			
q37	-2,31264	0,521551	-4,43	0,000	0,10	0,04	0,28

11. They use positioning rope and how often they use positioning rope (Question(Q) 27 and Q38)
12. Protectors to protect you from possible falls and use of head protectors (Question(Q) 30, Q39)
13. Use of seat belts and apply special rules for scaffolds, calculate strength and durability of scaffold, put an appropriate sign and use head protectors (Question(Q) 40 and Q33, Q34, Q35, Q36)
14. Apply specific rules for scaffold and use seatbelts while working with scaffolds (Question(Q) 33 and Q41)
15. Employer supplies necessary protective equipments to you without any charge and use foot protectors while working with concrete & prefabricated parts, site & repository and roof(Question(Q) 15 and Q42, Q43, Q44)

16. Employer supplies necessary protective equipments to you without any charge and use seat belts while working with on scaffold, assembling the prefabricated parts and on columns (Question(Q) 15 and Q45, Q46, Q47)
17. Use safety rope and high cranes cabins, high cabins which are used in warehouses for stowing and unloading the equipments , high drilling towers , well hole and canalization (Question(Q) 38 and Q48, Q49, Q50, Q51)
18. Use of positioning rope and high cranes cabins, high cabins which are used in warehouses for stowing and unloading the equipments , high drilling towers , well hole and canalization (Question(Q) 27 and Q48, Q49, Q50, Q51)

There is one combination which has sufficient evidence that the coefficients are not zero using alpha level of 0.05. . These outputs can be seen in Appendix G (on page 93).

Chapter 5

CONCLUSIONS AND DISCUSSIONS

This study shows that OSH training is not regularly applied by all companies resulting in several types of occupational illnesses and injuries. In order to protect employees from those illnesses and injuries, employer should train their employees well and those trainings should be offered periodically. Repetitive activities can lead to repetitive strain injuries. Employees working at the same job for a long time got used to their aches and pains and do not consider them as a problem anymore. From face to face interviews it is observed that working environments are not as good as that reported by employers. From on site observations the temperature was noted to be extremely high and lighting was inadequate at most workplaces. In the woodworking industry employees were confronted with too much dust, and did not use any PPE. As a result, some employees are suffering from visual and skin problems. Training regarding with load carried by employees is inadequate resulting in employees with back, shoulder, neck and muscle pains. Furthermore, machines and other equipments used in the work places have no warning signs. Also, some employers do not provide written instruction about the machines and equipment used. As a result, employees are confronted vibration; getting their hand or finger to the machines, finger cuts and other more serious occupational injuries or diseases. Especially at construction sites, it is observed that approximately all of the employees did not use any PPE even though they reported that they did. Employees

also reported the presence of a workplace first aid room and emergency exit doors. On site observations did not confirm this. Most companies did not have a first aid room; some companies had a first aid bag; there were no specific emergency exit doors. Employees felt that their work environment was such that they could easily go out in the case of emergency. Observations during construction sites also revealed the lack of appropriate signage and warnings, lack of protective gear for fall prevention, foot protectors, seat belts or safety ropes. In addition, employees fail to protect themselves from harmful levels of noise and dust.

Chapter 6

RECOMMENDATIONS

In order to address the above mentioned OSH issues and improve the working conditions for employees decreasing the number of workers suffering from occupational disease we make the following recommendations.

1) There should be specific trainings offered to those industries. This would include pre- employment OSH training and training of employers. There should be an OSH expert assigned to give ongoing employer seminars in those industries. Trained employers should assign expert people to conduct periodic training of their employees.
2) Companies of all industries should conduct on site risk analysis and try to improve their working conditions by applying the OSH rules and regulations.
3) The ministry of labor and social insurance labor office should do some site visits evaluating the extent to which OSH standards are being met by each industry and making suggesting for improvement.

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APPENDICES

Appendix A: Aluminum and Woodworking Employer Survey

This study aims to determine the general state of health and safety and make contribution for improvement. Your participation in this survey is voluntary and is within the scope of graduate studies. In the case of publication of survey results, company name and identity will be kept strictly confidential.

...../..../2010

General Information

1. What is the sector of your company?
- Aluminum
- Wood working
- Construction
2. What is your firm's name?

3. Please indicates your firm's
- Telephone number
- fax
- e-mail
- web address
- address

4. How many people work in your company?

5. What is your position in the firm?

		Yes	No
6	Do you give occupational health and safety training to your employees before starting work?		
7	Does the occupational health and safety training periodic?		
8	Is there any sign or security color in the workplace which has a risk for obstacles and falls?		
9	Is there any illuminated sign in places that require voice signal and verbal communication?		
10	Are there any written instructions given to employees about the equipment they use and guidelines for operation?		
11	Are the employees aware of the danger of all equipments and machines that affect them (even if they do not use)?		
12	Are there any warnings or signs on the equipments which is necessary for employees' protection?		
13	Do you give any general information to the employees about the load carried at the workplace?		
14	Do you give any training to your employees about the risks of incorrect handling?		
15	Do you provide necessary protective equipments to your employees without any charge?		
16	Is the repair and maintenance of personal protective equipment carried out by your company without any charge (whenever necessary)?		
17	Is there any training about the risks if the employees does not use personal protective equipments?		
18	Is there any practical training about how employees should use the personal protective equipments?		
19	Do you check if employees use personal protective equipments regularly or not?		
20	Dou you provide ear protectors when the noise exposure exceeds the minimum exposure action values?		
21	Is the lighting adequate at the workplace?		
22	Is there first aid room at the workplace?		

		Yes	No
23	Did you consider the disabled employees situation while designing the entrance, crossing points, stairs, showers, sinks and toilets?		
24	Are there a sufficient number of escape routes and emergency exit doors at the workplace?		
25	Can the employees can protect their self's from harmful level of external factors such as noise and dust?		
26	Do you take any measures for protecting the employees from falling due to the slippery surfaces workplace?		
27	Do you inform the related department as an employer about the occupational diseases, illness, injuries or dangerous event latest in two days after you founf out?		
28	Do you cover medical examination expenses of your employees?		

Appendix B: Aluminum and Woodworking Employee Survey

This study aims to determine the general state of health and safety and make contribution for improvement. Your participation in this survey is voluntary and is within the scope of graduate studies. In the case of publication of survey results, company name and identity will be kept strictly confidential.

...../..../2010

General Information

1. What is the sector of your company?

a) Aluminum
b) Wood working
c) Construction

2. What is your position in the company?

Personal Information		
Age		Less than 20
		20-25
		26-30
		31-35
		36-45
		46-50
		greater than 50
Gender	☐ Female ☐ Male	
Weight		51-60
		61-70
		71-80
		81-90
		91-100
		greater than 100
Education		Primary Level
		Secondary Level
		High Level
How long have you been doing this job?		
Personal Habits (such as sports, nutrition, smoking)		

		Yes	No
3	Did you attend any occupational health and safety training before starting the work?		
4	Is the occupational health and safety training repeated periodically?		
5	Did you have any accidents during work?		
6	a) If it is yes; (was it in this company or not)		
	b) Please give brief information about the accident.		
7	Do you have any occupational disease?		
8	Is there any sign or security color in the workplace at places with risk for obstacles and falls?		
9	Is there any illuminated sign in places that require voice signal and verbal communication?		
10	Are there any written instructions about the equipment that is used?		
11	Are you aware of the danger of all equipments and machines that affect you (even if you do not use)?		

		Yes	No
12	Are there any warnings or signs on the equipments which is necessary for your protection?		
13	Does your employer give any general information to you about the load carried at the workplace?		
14	Do you have any training given by employer about the risks of incorrect handling?		
15	Does your employer supplies necessary protective equipments to you without any charge?		
16	Is the repair and maintenance of personal protective equipment carried out by your employer without any charge (whenever necessary)?		
17	Is there any training about the risks if you do not used the personal protective equipments?		
18	Is there any practical training about how you should use the personal protective equipments?		
19	Does your employer checks if you use personal protective equipments regularly or not?		
20	Does your employer provide ear protectors when the noise exposure exceeds the minimum exposure action values?		
21	Is the lighting adequate at the workplace?		
22	Are there a sufficient number of escape routes and emergency exit doors at the workplace?		
23	Can you protect your self's from harmful level of external factors such as noise and dust?		
24	Does your employer take any measures for protecting you from falling due to slippery surfaces at the workplace?		

		None	Rare	Sometimes	Often	Very Often
		I	II	III	IV	V
25	How often are you confronted with repetitive movements?					
26	How often are you confronted with static exposure?					
27	How often are you confronted with overload?					
28	How often are you confronted with vibration?					
29	How often are you confronted with tighten your hands and arms?					
30	How often do you face the health problems which are listed below?					
	Backache					
	Neck and shoulder ache					
	Muscle pain					
	Visual Problems					
	Skin Problems					
	Stomacha ache					
31	What do you think about the following work enviornment levels?					
	Temperature (Normal Level 19.4-22.8 ^{0}C)					
	Humidity (Normal Level 45%-65%)					
	Noise (Normal Level (less than 80 decibel)					
	Illumination (There should be enough lighting. There should not be any shade and reflection)					
	Ventilation					
	Dust					
	Lighting					

Appendix C: Construction Employer Survey

This study aims to determine the general state of health and safety and make contribution for improvement. Your participation in this survey is voluntary and is within the scope of graduate studies. In the case of publication of survey results, company name and identity will be kept strictly confidential.

...../..../2010

General Information

1. What is the sector of your company?
- Aluminum
- Wood working
- Construction

2. What is your firm's name?

3. Please indicates your firm's
- Telephone number
- fax
- e-mail
- web address
- address

4. How many people work in your company?

5. What is your position in the firm?

		Yes	No
6	Do you give occupational health and safety training to your employees before starting work?		
7	Does the occupational health and safety training periodic?		
8	Is there any sign or security color in the workplace which has a risk for obstacles and falls?		
9	Is there any illuminated sign in places that require voice signal and verbal communication?		
10	Are there any written instructions given to employees about the equipment they use and guidelines for operation?		
11	Are the employees aware of the danger of all equipments and machines that affect them (even if they do not use)?		
12	Are there any warnings or signs on the equipments which is necessary for employees' protection?		
13	Do you give any general information to the employees about the load carried at the workplace?		
14	Do you give any training to your employees about the risks of incorrect handling?		
15	Do you provide necessary protective equipments to your employees without any charge?		
16	Is the repair and maintenance of personal protective equipment carried out by your company without any charge (whenever necessary)?		
17	Is there any training about the risks if the employees does not use personal protective equipments?		
18	Is there any practical training about how employees should use the personal protective equipments?		
19	Do you check if employees use personal protective equipments regularly or not?		
20	Dou you provide ear protectors when the noise exposure exceeds the minimum exposure action values?		
21	Is the lighting adequate at the workplace?		
22	Is there first aid room at the workplace?		

		Yes	No
23	Did you consider the disabled employees situation while designing the entrance, crossing points, stairs, showers, sinks and toilets?		
24	Are there a sufficient number of escape routes and emergency exit doors at the workplace?		
25	Can the employees can protect their self's from harmful level of external factors such as noise and dust?		
26	Do you take any measures for protecting the employees from falling due to the slippery surfaces workplace?		
27	Do you inform the related department as an employer about the occupational diseases, illness, injuries or dangerous event latest in two days after you founf out?		
28	Do you cover medical examination expenses of your employees?		

29	Do you inform related department as an employer about the occupational diseases, illness, injuries or dangerous event latest in two days afer you found out?		
30	Do you cover medical examination expenses of your employees?		
31	Do you use stairs in the construction area?		
32	Do you use stairs in the construction area?		
33	Do you use any positioning rope in the construction area?		
34	Do you follow special rules while you are using the positioning rope and access techniques?		
35	Do you have suitable seat in the construction area?		

		Yes	No
35	Do you have appropriate protectors to protect you from possible falls?		
36	Does your employer provide same security protection after you removed the special fall prevention protectors?		
37	How much your employer pay an attention to special rules about the use of stairs?		
38	How much your employer pay an attention to special rules about the scaffold?		
39	Do you calculate strength and durabiliry of the scaffold?		
40	Do you pay an attention to marked the uncompleted scaffold with appropriate signs based on the OHS regulations?		
41	Do you use head protector while you are working on the scaffold, high platforms, assembly lines and demolition works?		

		None	Rare	Sometimes	Often	Very Often
		I	II	III	IV	V
42	How often do you use scaffold?					
43	How often do you use rope?					
44	How much attention do you pay to special fall prevention protectors?					
45	Are the scaffolds constructed based on special rules?					
46	Are the scaffolds constructed by experts?					

Appendix D: Construction Employee Survey

This study aims to determine the general state of health and safety and make contribution for improvement. Your participation in this survey is voluntary and is within the scope of graduate studies. In the case of publication of survey results, company name and identity will be kept strictly confidential.

...../..../2010

General Information

1. What is the sector of your company?

a) Aluminum

b) Wood working

c) Construction

2. What is your position in the company?

Personal Information		
Age		Less than 20
		20-25
		26-30
		31-35
		36-45
		46-50
		greater than 50
Gender	☐ Female ☐ Male	
Weight		51-60
		61-70
		71-80
		81-90
		91-100
		greater than 100
Education		Primary Level
		Secondary Level
		High Level
How long have you been doing this job?		
Personal Habits (such as sports, nutrition, smoking)		

		Yes	No
3	Do you have occupational health and safety training before starting the work?		
4	Does the occupational health and safety training repeated periodically?		
5	Do you have any accident during your working time?		
6	a) If it is yes; (was it in this company or not)		
	b) Please give brief information about the accident.		
7	Dou you have any occupational disease?		
8	Is there any sign or security color in the workplace which has a risk for obstacles and falls?		
9	Is there any illuminated sign in places that require voice signal and verbal communication?		
10	Are there any written instructions about the equipment that is used?		
11	Are you aware of the danger of all equipments and machines that affect you (even if you do not use)?		

		Yes	No
12	Are there any warnings or signs on the equipments which is necessary for your protection?		
13	Does your employer give any general information to you about the load carried at the workplace?		
14	Do you have any training given by employer about the risks of incorrect handling?		
15	Does your employer supplies necessary protective equipments to you without any charge?		
16	Is the repair and maintenance of personal protective equipment carried out by your employer without any charge (whenever necessary)?		
17	Is there any training about the risks if you do not used the personal protective equipments?		
18	Is there any practical training about how you should use the personal protective equipments?		
19	Does your employer checks if you use personal protective equipments regularly or not?		
20	Does your employer provide ear protectors when the noise exposure exceeds the minimum exposure action values?		
21	Is the lighting adequate at the workplace?		
22	Are there a sufficient number of escape routes and emergency exit doors at the workplace?		
23	Can you protect your self's from harmful level of external factors such as noise and dust?		
24	Does your employer take any measures for protecting you from falling due to slippery surfaces at the workplace?		

		Yes	No
25	Are the work equipments dimension appropriate for the work done, safely crossing and prescribed loads?		
26	Do you use portable ladders in the construction area?		
27	Do you use any positioning rope in the construction area?		
28	Do you follow special rules while you are using the positioning rope and access techniques?		
29	Do you have suitable seat in the construction area?		
30	Do you have appropriate protectors to protect you from possible falls?		
31	Does your employer provide other types of protection after the protectors preventing falls are removed for special purposes?		
32	Is the employer paying attention to the special rules on buildig scaffolds?		
33	Does your employer paying attention to the special rules on buildig scaffolds?		
34	Do you calculate strength and durabiliry of the scaffold?		
35	Do you pay attention to marking the uncomplete scaffold with appropriate signs based on the OSH regulations?		
36	Do you use head protector while you are working on or arround the scaffold, high platforms, assembly lines and demolition works?		

		None	Rare	Sometimes	Often	Very Often
		I	II	III	IV	V
37	How often do you use a scaffold?					
38	How often do you use a rope?					
39	Are the fall prevention protectors appropriate and strong enough?					
40	Are the scaffolds constructed based on special rules?					
41	Are the scaffolds constructed by an experts?					

		Yes	No
	Do you use foot protection while you are working;		
42	with concrete and prefabricated parts		
43	on site and repository		
44	on roof		
	Do you use seat belts while you are working;		
45	on scaffold		
46	assembling the prefabricated parts		
47	on columns		
	Do you use safety rope while you are work in		
48	high crane cabins		
49	high cabins which are used in warehouses for stowing and unloading the equipments		
50	high drilllig towers		
51	wellhole and canalization		

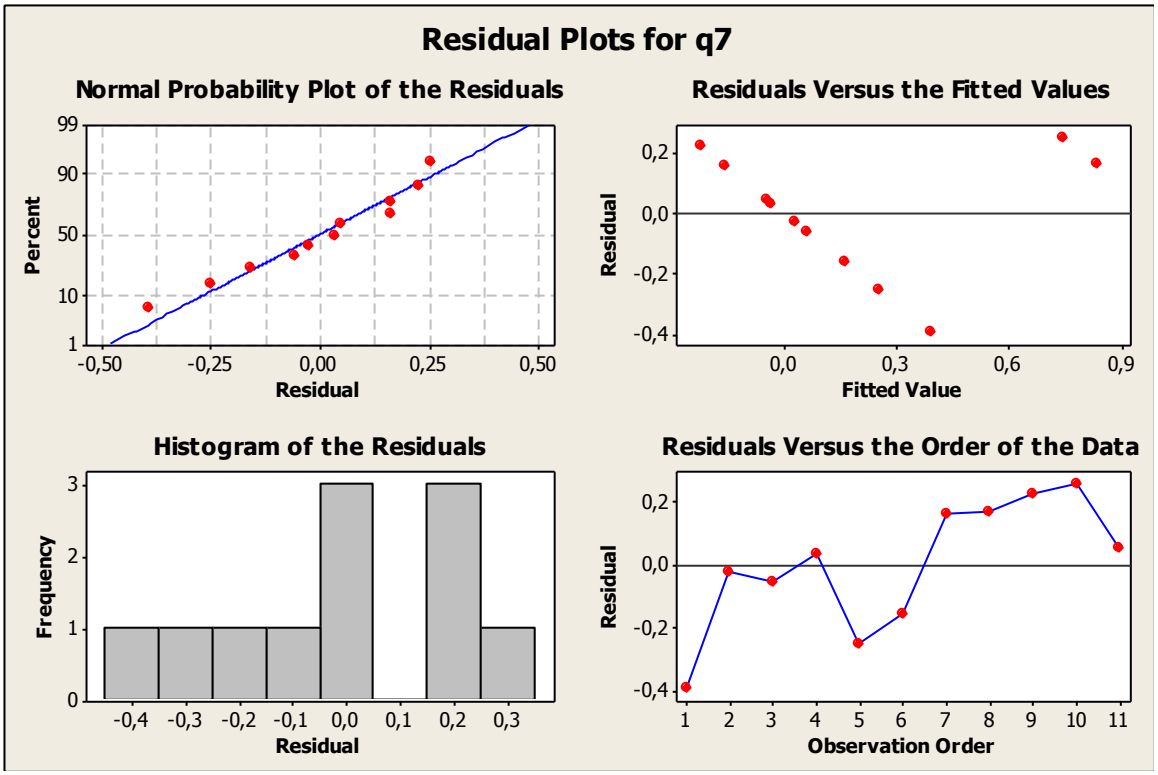
		None	Rare	Sometimes	Often	Very Often
52	How often are you confronted with repetitive movements?					
53	How often are you confronted with static exposure?					
54	How often are you confronted with overload?					
55	How often are you confronted with vibration?					
56	How often are you confronted with tighten your hands and arms?					
57	How often do you face the health problems which are listed below?					
	Backache					
	Neck and shoulder ache					
	Muscle pain					
	Visual Problems					
	Skin Problems					
	Stomacha ache					
58	What do you think about the following work enviornment levels?					
	Temperature (Normal Level 19.4-22.8 ^{0}C)					
	Humidity (Normal Level 45%-65%)					
	Noise (Normal Level (less than 80 decibel)					
	Illumination (There should be enough lighting. There should not be any shaded and reflection)					
	Ventilation					
	Dust					
	Lighting					

Appendix E: Minitab Result for Aluminum Industry

Regression Analysis: q7 versus age(yr); weight(kg); ...

```
The regression equation is
q7 = 2,09 + 0,0171 age(yr) - 0,0233 weight(kg) - 0,0722 education(yr)
     - 0,0220 experience(yr)


Predictor           Coef  SE Coef      T      P
Constant          2,0919   0,9715   2,15  0,075
age(yr)          0,01709  0,02462   0,69  0,514
weight(kg)       -0,0232  0,01090  -2,13  0,077
education(yr)    -0,0722  0,07480  -0,97  0,371
experience(yr)   -0,0220  0,01974  -1,12  0,307


S = 0,264291   R-Sq = 74,4%   R-Sq(adj) = 57,3%


Analysis of Variance

Source           DF       SS       MS     F      P
Regression        4  1,21727  0,30432  4,36  0,054
Residual Error    6  0,41910  0,06985
Total            10  1,63636


Source           DF   Seq SS
age(yr)           1  0,05268
weight(kg)        1  0,96587
education(yr)     1  0,11187
experience(yr)    1  0,08684
```

Residual Plots for q7



Binary Logistic Regression: q14 versus q30; q31; q32

Link Function: Logit

Response Information

Variable	Value	Count	
q14	1	6	(Event)
	0	5	
	Total	11	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	0,764291	1,77115	0,43	0,666			
q30	0,113515	0,909880	0,12	0,901	1,12	0,19	6,67
q31	-0,0559362	0,861460	-0,06	0,948	0,95	0,17	5,12
q32	-0,338044	0,629731	-0,54	0,591	0,71	0,21	2,45

Log-Likelihood = -7,394
Test that all slopes are zero: G = 0,370, DF = 3, P-Value = 0,946

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	11,0392	6	0,087
Deviance	14,7881	6	0,022
Hosmer-Lemeshow	11,0392	8	0,199

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group										
Value	1	2	3	4	5	6	7	8	9	10	Total
1											
Obs	0	1	0	0	2	1	0	1	1	0	6
Exp	0,4	0,4	0,5	0,5	1,1	0,6	0,6	0,6	0,7	0,7	
0											
Obs	1	0	1	1	0	0	1	0	0	1	5
Exp	0,6	0,6	0,5	0,5	0,9	0,4	0,4	0,4	0,3	0,3	
Total	1	1	1	1	2	1	1	1	1	1	11

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	18	60,0	Somers' D	0,20
Discordant	12	40,0	Goodman-Kruskal Gamma	0,20
Ties	0	0,0	Kendall's Tau-a	0,11
Total	30	100,0		

Binary Logistic Regression: q16 versus q33; q34

Link Function: Logit

Response Information

Variable	Value	Count	
q16	1	7	(Event)
	0	4	
	Total	11	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	1,63611	1,56066	1,05	0,294			
q33	-0,689259	0,629062	-1,10	0,273	0,50	0,15	1,72
q34	0,0437684	0,784719	0,06	0,956	1,04	0,22	4,86

Log-Likelihood = -6,424
Test that all slopes are zero: G = 1,572, DF = 2, P-Value = 0,456

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	3,39819	2	0,183
Deviance	4,47289	2	0,107
Hosmer-Lemeshow	3,39819	3	0,334

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group					
Value	1	2	3	4	5	Total
1						
Obs	0	1	0	5	1	7
Exp	0,2	0,4	0,6	5,1	0,8	
0						
Obs	1	0	1	2	0	4
Exp	0,8	0,6	0,4	1,9	0,2	
Total	1	1	1	7	1	11

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	15	53,6	Somers' D	0,43
Discordant	3	10,7	Goodman-Kruskal Gamma	0,67
Ties	10	35,7	Kendall's Tau-a	0,22
Total	28	100,0		

Binary Logistic Regression: q23 versus q33; q34

Link Function: Logit

Response Information

Variable	Value	Count	
q23	1	8	(Event)
	0	3	
	Total	11	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	3,00674	1,92668	1,56	0,119			
q33	-0,950627	0,724664	-1,31	0,190	0,39	0,09	1,60
q34	-0,239120	0,811455	-0,29	0,768	0,79	0,16	3,86

Log-Likelihood = -5,052
Test that all slopes are zero: G = 2,786, DF = 2, P-Value = 0,248

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	3,40201	2	0,183
Deviance	4,36336	2	0,113
Hosmer-Lemeshow	3,40201	3	0,334

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group					
Value	1	2	3	4	5	Total
1						
Obs	0	1	0	1	6	8
Exp	0,1	0,5	0,7	0,8	6,0	
0						
Obs	1	0	1	0	1	3
Exp	0,9	0,5	0,3	0,2	1,0	
Total	1	1	1	1	7	11

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	15	62,5	Somers' D	0,50
Discordant	3	12,5	Goodman-Kruskal Gamma	0,67
Ties	6	25,0	Kendall's Tau-a	0,22
Total	24	100,0		

Binary Logistic Regression: q5 versus q24

```
Link Function: Logit


Response Information

Variable  Value  Count
q5        1          3  (Event)
          0          8
          Total     11


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant   -0,693147  0,866025  -0,80  0,423
q24        -0,693147   1,41421  -0,49  0,624   0,50   0,03   7,99


Log-Likelihood = -6,321
Test that all slopes are zero: G = 0,249, DF = 1, P-Value = 0,618

* NOTE * No goodness of fit test performed.
* NOTE * The model uses all degrees of freedom.

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant       8     33,3  Somers' D              0,17
Discordant       4     16,7  Goodman-Kruskal Gamma  0,33
Ties            12     50,0  Kendall's Tau-a        0,07
Total           24    100,0
```

Ordinal Logistic Regression: q27 versus q30; q31; q32

```
Link Function: Logit


Response Information

Variable  Value  Count
q27       1          3
          2          1
          3          2
          4          4
          5          1
          Total     11


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Const(1)    0,216601   1,60539   0,13  0,893
Const(2)    0,714511   1,61038   0,44  0,657
Const(3)     1,60107   1,67587   0,96  0,339
Const(4)     4,08196   2,10310   1,94  0,052
q30          0,201655  0,814646   0,25  0,804   1,22   0,25   6,04
q31         -0,984615  0,837928  -1,18  0,240   0,37   0,07   1,93
```

```
q32        0,0148483  0,560192   0,03  0,979   1,01   0,34   3,04


Log-Likelihood = -14,831
Test that all slopes are zero: G = 2,637, DF = 3, P-Value = 0,451


Goodness-of-Fit Tests

Method    Chi-Square  DF      P
Pearson      30,1099  33  0,612
Deviance     26,8895  33  0,764


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant      31     68,9  Somers' D              0,40
Discordant      13     28,9  Goodman-Kruskal Gamma  0,41
Ties             1      2,2  Kendall's Tau-a        0,33
Total           45    100,0
```

Binary Logistic Regression: q20 versus q38

```
Link Function: Logit


Response Information

Variable  Value  Count
q20       1          6  (Event)
          0          5
          Total     11


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant     1,16149   1,84061   0,63  0,528
q38        -0,259981  0,454240  -0,57  0,567   0,77   0,32   1,88


Log-Likelihood = -7,406
Test that all slopes are zero: G = 0,347, DF = 1, P-Value = 0,556


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             4,84039   2  0,089
Deviance            5,81376   2  0,055
Hosmer-Lemeshow     4,84039   2  0,089


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

             Group
Value    1    2    3    4  Total
1
  Obs    3    1    0    2      6
  Exp  1,9  2,1  0,6  1,4
0
  Obs    1    3    1    0      5
```

```
  Exp  2,1  1,9  0,4  0,6
Total    4    4    1    2     11


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant      11     36,7  Somers' D              -0,07
Discordant      13     43,3  Goodman-Kruskal Gamma  -0,08
Ties             6     20,0  Kendall's Tau-a        -0,04
Total           30    100,0
```

Binary Logistic Regression: q10 versus q28; q29

```
Link Function: Logit


Response Information

Variable  Value  Count
q10       1          7  (Event)
          0          4
          Total     11


Logistic Regression Table

                                                    Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant     3,90742   2,28475   1,71  0,087
q28        -0,804837  0,711873  -1,13  0,258   0,45   0,11   1,80
q29        -0,726059  0,771891  -0,94  0,347   0,48   0,11   2,20


Log-Likelihood = -5,284
Test that all slopes are zero: G = 3,852, DF = 2, P-Value = 0,146


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             6,39653   4  0,171
Deviance            7,79551   4  0,099
Hosmer-Lemeshow     6,39653   5  0,270


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

                    Group
Value    1    2    3    4    5    6    7  Total
1
  Obs    0    0    1    1    0    1    4      7
  Exp  0,2  0,2  0,3  0,5  0,7  1,4  3,7
0
  Obs    1    1    0    0    1    1    0      4
  Exp  0,8  0,8  0,7  0,5  0,3  0,6  0,3
Total    1    1    1    1    1    2    4     11


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant      23     82,1  Somers' D              0,68
```

```
Discordant       4     14,3  Goodman-Kruskal Gamma  0,70
Ties             1      3,6  Kendall's Tau-a        0,35
Total           28    100,0
```

Binary Logistic Regression: q14 versus q27; q30; q31

```
Link Function: Logit


Response Information

Variable  Value  Count
q14       1          6  (Event)
          0          5
          Total     11


Logistic Regression Table

                                                    Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant     2,22767   2,16598   1,03  0,304
q27        -0,948885  0,649083  -1,46  0,144   0,39   0,11   1,38
q30        0,0282204  0,978176   0,03  0,977   1,03   0,15   7,00
q31         0,381498  0,948120   0,40  0,687   1,46   0,23   9,39


Log-Likelihood = -6,166
Test that all slopes are zero: G = 2,826, DF = 3, P-Value = 0,419


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             7,57566   6  0,271
Deviance            9,55954   6  0,144
Hosmer-Lemeshow     7,57566   8  0,476


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

                          Group
Value    1    2    3    4    5    6    7    8    9   10  Total
1
  Obs    0    0    0    1    1    0    1    1    1    1      6
  Exp  0,2  0,2  0,2  0,4  0,4  0,5  0,6  0,7  1,7  0,9
0
  Obs    1    1    1    0    0    1    0    0    1    0      5
  Exp  0,8  0,8  0,8  0,6  0,6  0,5  0,4  0,3  0,3  0,1
Total    1    1    1    1    1    1    1    1    2    1     11


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant      23     76,7  Somers' D              0,57
Discordant       6     20,0  Goodman-Kruskal Gamma  0,59
Ties             1      3,3  Kendall's Tau-a        0,31
Total           30    100,0
```

Regression Analysis: q5 versus q10; q11; q12

The regression equation is
q5 = - 0,500 + 0,500 q10 + 0,000 q11 + 0,500 q12

Predictor	Coef	SE Coef	T	P
Constant	-0,5000	0,6814	-0,73	0,487
q10	0,5000	0,3273	1,53	0,170
q11	0,0000	0,5345	0,00	1,000
q12	0,5000	0,5000	1,00	0,351

S = 0,462910 R-Sq = 31,2% R-Sq(adj) = 1,8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	3	0,6818	0,2273	1,06	0,424
Residual Error	7	1,5000	0,2143		
Total	10	2,1818			

Source	DF	Seq SS
q10	1	0,4675
q11	1	0,0000
q12	1	0,2143

Unusual Observations

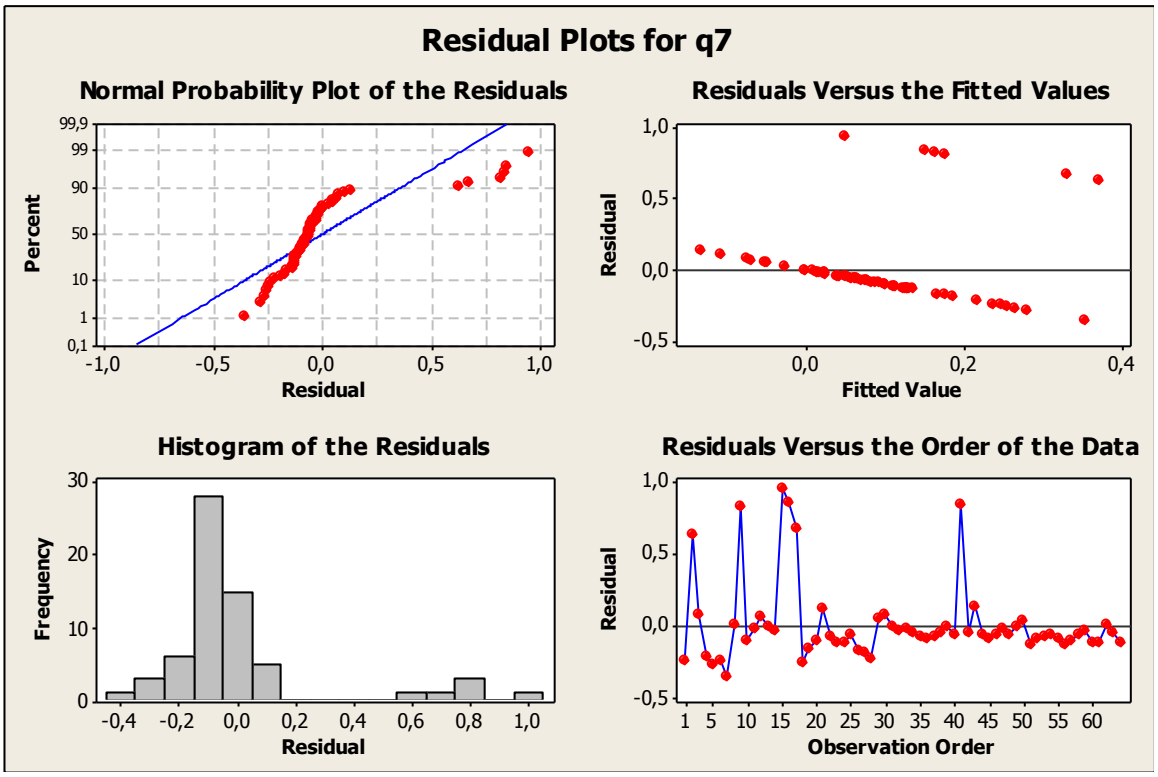
Obs	q10	q5	Fit	SE Fit	Residual	St Resid	
5	0,00	0,000	-0,000	0,463	0,000	*	X
7	1,00	0,000	-0,000	0,463	0,000	*	X

X denotes an observation whose X value gives it large influence.

Appendix F: Minitab Result for Wood Working Industry

Regression Analysis: q7 versus age(yr); weight(kg); ...

```
The regression equation is
q7 = 0,535 + 0,0132 age(yr) - 0,0124 weight(kg) - 0,0109 education(yr)
     + 0,00454 experience(yr)


Predictor            Coef   SE Coef      T      P
Constant           0,5353    0,3486   1,54  0,130
age(yr)          0,013155  0,006042   2,18  0,033
weight(kg)      -0,012438  0,006097  -2,04  0,046
education(yr)    -0,01090   0,02892  -0,38  0,708
experience(yr)   0,004543  0,003874   1,17  0,246


S = 0,283938   R-Sq = 12,5%   R-Sq(adj) = 6,6%


Analysis of Variance

Source          DF       SS       MS     F      P
Regression       4  0,68087  0,17022  2,11  0,091
Residual Error  59  4,75663  0,08062
Total           63  5,43750


Source          DF   Seq SS
age(yr)          1  0,16699
weight(kg)       1  0,38112
education(yr)    1  0,02190
experience(yr)   1  0,11087


Unusual Observations

Obs  age(yr)      q7      Fit  SE Fit  Residual  St Resid
  2     52,0  1,0000   0,3722  0,1114    0,6278      2,40R
  4     28,0  0,0000   0,2174  0,1746   -0,2174     -0,97 X
  9     40,0  1,0000   0,1768  0,0571    0,8232      2,96R
 15     28,0  1,0000   0,0493  0,0591    0,9507      3,42R
 16     33,0  1,0000   0,1500  0,0542    0,8500      3,05R
 17     44,0  1,0000   0,3311  0,0939    0,6689      2,50R
 41     46,0  1,0000   0,1640  0,0861    0,8360      3,09R
 43     52,0  0,0000  -0,1334  0,1776    0,1334      0,60 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.


Residual Plots for q7
```



Binary Logistic Regression: q14 versus q30; q31; q32

```
Link Function: Logit


Response Information

Variable  Value   Count
q14       1          46  (Event)
          0          18
          Total      64


Logistic Regression Table

                                                    Odds      95% CI
Predictor        Coef    SE Coef       Z      P  Ratio  Lower  Upper
Constant    0,355313  0,732903    0,48  0,628
q30         0,142145  0,393409    0,36  0,718   1,15   0,53   2,49
q31         0,243073  0,384445    0,63  0,527   1,28   0,60   2,71
q32        -0,147480  0,395521   -0,37  0,709   0,86   0,40   1,87


Log-Likelihood = -37,386
Test that all slopes are zero: G = 1,277, DF = 3, P-Value = 0,735


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             17,5135  17  0,420
Deviance            20,4246  17  0,253
Hosmer-Lemeshow      3,6743   4  0,452
```

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

			Group				
Value	1	2	3	4	5	6	Total
1							
Obs	11	5	17	5	6	2	46
Exp	11,4	4,1	18,6	4,6	4,7	2,5	
0							
Obs	7	1	8	1	0	1	18
Exp	6,6	1,9	6,4	1,4	1,3	0,5	
Total	18	6	25	6	6	3	64

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	412	49,8	Somers' D	0,21
Discordant	240	29,0	Goodman-Kruskal Gamma	0,26
Ties	176	21,3	Kendall's Tau-a	0,09
Total	828	100,0		

Binary Logistic Regression: q16 versus q33; q34

Link Function: Logit

Response Information

Variable	Value	Count	
q16	1	51	(Event)
	0	13	
	Total	64	

Logistic Regression Table

					Odds	95% CI	
Predictor	Coef	SE Coef	Z	P	Ratio	Lower	Upper
Constant	2,24200	0,816704	2,75	0,006			
q33	1,00926	0,760643	1,33	0,185	2,74	0,62	12,18
q34	-1,83726	0,814029	-2,26	0,024	0,16	0,03	0,79

Log-Likelihood = -29,084
Test that all slopes are zero: G = 6,434, DF = 2, P-Value = 0,040

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	9,6882	3	0,021
Deviance	13,7655	3	0,003
Hosmer-Lemeshow	2,8278	2	0,243

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

		Group			
Value	1	2	3	4	Total
1					
Obs	6	29	11	5	51
Exp	4,7	31,4	10,1	4,8	
0					

```
  Obs    3    10     0    0     13
  Exp  4,3   7,6   0,9  0,2
Total    9    39    11    5     64


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     307     46,3  Somers' D              0,36
Discordant      66     10,0  Goodman-Kruskal Gamma  0,65
Ties           290     43,7  Kendall's Tau-a        0,12
Total          663    100,0
```

Binary Logistic Regression: q23 versus q33; q34

```
Link Function: Logit


Response Information

Variable  Value  Count
q23       1         45  (Event)
          0         19
          Total     64


Logistic Regression Table

                                                  Odds     95% CI
Predictor      Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant    1,18724  0,743172   1,60  0,110
q33         2,06957   1,02508   2,02  0,043   7,92   1,06  59,07
q34        -2,56746   1,06842  -2,40  0,016   0,08   0,01   0,62


Log-Likelihood = -33,144
Test that all slopes are zero: G = 11,561, DF = 2, P-Value = 0,003


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson              9,0411   3  0,029
Deviance            11,5455   3  0,009
Hosmer-Lemeshow      1,9237   2  0,382


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

              Group
Value    1     2     3    4  Total
1
  Obs    5    24    11    5     45
  Exp  3,7  26,0  10,3  5,0
0
  Obs    4    15     0    0     19
  Exp  5,3  13,0   0,7  0,0
Total    9    39    11    5     64


Measures of Association:
```

(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	416	48,7	Somers' D	0,40
Discordant	78	9,1	Goodman-Kruskal Gamma	0,68
Ties	361	42,2	Kendall's Tau-a	0,17
Total	855	100,0		

Binary Logistic Regression: q5 versus q24

Link Function: Logit

Response Information

Variable	Value	Count	
q5	1	15	(Event)
	0	49	
	Total	64	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	Upper
Constant	-0,955511	0,526235	-1,82	0,069			
q24	-0,325422	0,636161	-0,51	0,609	0,72	0,21	2,51

Log-Likelihood = -34,720
Test that all slopes are zero: G = 0,257, DF = 1, P-Value = 0,612

* NOTE * No goodness of fit test performed.
* NOTE * The model uses all degrees of freedom.

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	180	24,5	Somers' D	0,07
Discordant	130	17,7	Goodman-Kruskal Gamma	0,16
Ties	425	57,8	Kendall's Tau-a	0,02
Total	735	100,0		

* NOTE * 1 time(s) the standardized Pearson residuals, delta chi-square, delta
deviance, delta beta (standardized) and delta beta could not be computed because leverage (Hi) is equal to 1.

Ordinal Logistic Regression: q27 versus q30; q31; q32

Link Function: Logit

Response Information

Variable	Value	Count
q27	1	4
	2	3
	3	39

```
          4         13
          5          5
          Total     64


Logistic Regression Table

                                                    Odds     95% CI
Predictor        Coef   SE Coef      Z      P  Ratio  Lower  Upper
Const(1)     -1,66602  0,768955  -2,17  0,030
Const(2)     -1,03250  0,703264  -1,47  0,142
Const(3)      2,10388  0,749986   2,81  0,005
Const(4)      3,65315  0,857921   4,26  0,000
q30         -0,317533  0,352068  -0,90  0,367   0,73   0,37   1,45
q31        -0,0675476  0,326713  -0,21  0,836   0,93   0,49   1,77
q32        -0,0639427  0,336015  -0,19  0,849   0,94   0,49   1,81


Log-Likelihood = -71,394
Test that all slopes are zero: G = 3,326, DF = 3, P-Value = 0,344


Goodness-of-Fit Tests

Method    Chi-Square  DF      P
Pearson      78,3964  77  0,434
Deviance     56,7439  77  0,960


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     578     49,1  Somers' D              0,19
Discordant     355     30,1  Goodman-Kruskal Gamma  0,24
Ties           245     20,8  Kendall's Tau-a        0,11
Total         1178    100,0
```

Binary Logistic Regression: q20 versus q38

```
Link Function: Logit


Response Information

Variable  Value  Count
q20       1         44  (Event)
          0         20
          Total     64


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef     Z      P  Ratio  Lower  Upper
Constant    0,388872   1,04228  0,37  0,709
q38        0,0984732  0,249295  0,40  0,693   1,10   0,68   1,80


Log-Likelihood = -39,672
Test that all slopes are zero: G = 0,155, DF = 1, P-Value = 0,694
```

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	6,28888	3	0,098
Deviance	7,33299	3	0,062
Hosmer-Lemeshow	3,68741	1	0,055

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group			
Value	1	2	3	Total
1				
Obs	10	14	20	44
Exp	11,8	11,0	21,2	
0				
Obs	8	2	10	20
Exp	6,2	5,0	8,8	
Total	18	16	30	64

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	326	37,0	Somers' D	0,05
Discordant	282	32,0	Goodman-Kruskal Gamma	0,07
Ties	272	30,9	Kendall's Tau-a	0,02
Total	880	100,0		

Binary Logistic Regression: q10 versus q28; q29

Link Function: Logit

Response Information

Variable	Value	Count	
q10	1	54	(Event)
	0	10	
	Total	64	

Logistic Regression Table

					Odds	95% CI	
Predictor	Coef	SE Coef	Z	P	Ratio	Lower	Upper
Constant	3,07885	1,16760	2,64	0,008			
q28	-0,581734	0,419352	-1,39	0,165	0,56	0,25	1,27
q29	0,0447711	0,355255	0,13	0,900	1,05	0,52	2,10

Log-Likelihood = -26,634
Test that all slopes are zero: G = 2,206, DF = 2, P-Value = 0,332

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	15,6126	12	0,210
Deviance	18,1728	12	0,111
Hosmer-Lemeshow	8,7812	4	0,067

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

			Group				
Value	1	2	3	4	5	6	Total
1							
Obs	5	6	10	18	11	4	54
Exp	4,1	4,8	13,8	16,7	10,9	3,7	
0							
Obs	1	0	7	1	1	0	10
Exp	1,9	1,2	3,2	2,3	1,1	0,3	
Total	6	6	17	19	12	4	64

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	325	60,2	Somers' D	0,31
Discordant	157	29,1	Goodman-Kruskal Gamma	0,35
Ties	58	10,7	Kendall's Tau-a	0,08
Total	540	100,0		

Binary Logistic Regression: q14 versus q27; q30; q31

Link Function: Logit

Response Information

Variable	Value	Count	
q14	1	46	(Event)
	0	18	
	Total	64	

Logistic Regression Table

					Odds	95% CI	
Predictor	Coef	SE Coef	Z	P	Ratio	Lower	Upper
Constant	0,410553	1,10176	0,37	0,709			
q27	-0,0565855	0,329936	-0,17	0,864	0,94	0,49	1,80
q30	0,0949992	0,364673	0,26	0,794	1,10	0,54	2,25
q31	0,195411	0,354680	0,55	0,582	1,22	0,61	2,44

Log-Likelihood = -37,442
Test that all slopes are zero: G = 1,165, DF = 3, P-Value = 0,762

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	19,3424	16	0,251
Deviance	23,0229	16	0,113
Hosmer-Lemeshow	7,4115	6	0,284

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

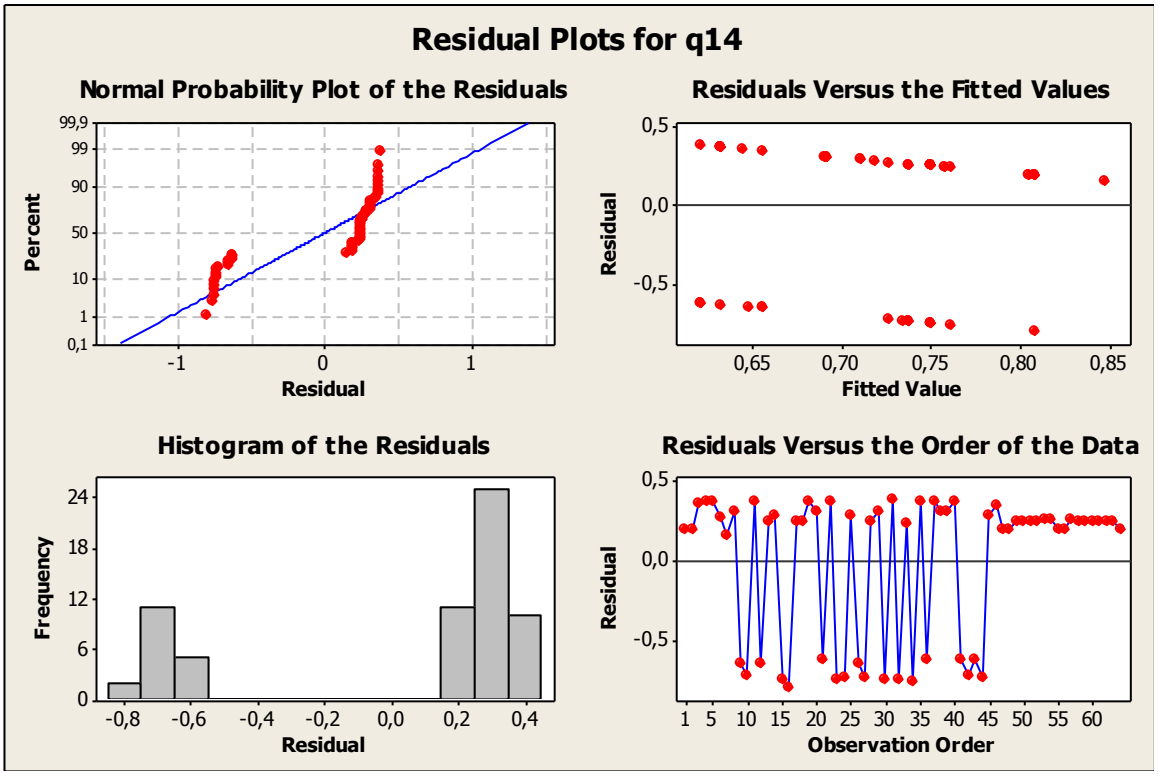
				Group					
Value	1	2	3	4	5	6	7	8	Total
1									
Obs	9	4	6	4	12	5	5	1	46
Exp	8,1	4,6	4,2	6,7	12,0	4,6	4,8	0,8	

```
0
  Obs    4    3    0    5     4    1    1    0     18
  Exp  4,9  2,4  1,8  2,3   4,0  1,4  1,2  0,2
Total   13    7    6    9    16    6    6    1     64


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     452     54,6  Somers' D              0,18
Discordant     299     36,1  Goodman-Kruskal Gamma  0,20
Ties            77      9,3  Kendall's Tau-a        0,08
Total          828    100,0
```

Regression Analysis: q14 versus q27; q30; q31

```
The regression equation is
q14 = 0,609 - 0,0116 q27 + 0,0194 q30 + 0,0391 q31


Predictor      Coef  SE Coef      T      P
Constant     0,6090   0,2308   2,64  0,011
q27         -0,0116   0,0684  -0,17  0,866
q30          0,0194   0,0751   0,26  0,797
q31          0,0391   0,0727   0,54  0,592


S = 0,460109   R-Sq = 1,8%   R-Sq(adj) = 0,0%


Analysis of Variance

Source          DF       SS      MS     F      P
Regression       3   0,2355  0,0785  0,37  0,774
Residual Error  60  12,7020  0,2117
Total           63  12,9375


Source  DF  Seq SS
q27      1  0,0028
q30      1  0,1713
q31      1  0,0614


Unusual Observations

Obs   q27     q14     Fit  SE Fit  Residual  St Resid
  1  5,00  1,0000  0,8050  0,2006    0,1950      0,47 X
  8  3,00  1,0000  0,6910  0,2163    0,3090      0,76 X
 29  3,00  1,0000  0,6910  0,2163    0,3090      0,76 X

X denotes an observation whose X value gives it large influence.
```

Residual Plots for q14



Appendix G: Minitab Result for Construction Industry

Binary Logistic Regression: q14 versus q57; q58; q59

```
Link Function: Logit


Response Information

Variable  Value  Count
q14       1         82  (Event)
          0          8
          Total     90


Logistic Regression Table

                                                    Odds      95% CI
Predictor      Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant    6,00208   2,97825   2,02  0,044
q57        0,301386  0,886508   0,34  0,734   1,35   0,24   7,68
q58        -1,52802  0,749658  -2,04  0,042   0,22   0,05   0,94
q59        0,117392  0,855344   0,14  0,891   1,12   0,21   6,01


Log-Likelihood = -24,446
Test that all slopes are zero: G = 5,101, DF = 3, P-Value = 0,165


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             6,24283  15  0,975
Deviance            9,39823  15  0,856
Hosmer-Lemeshow     1,34743   3  0,718


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

                Group
Value    1     2    3    4    5  Total
1
  Obs    9    49   10   10    4     82
  Exp  8,9  50,1  9,4  9,6  4,0
0
  Obs    3     5    0    0    0      8
  Exp  3,1   3,9  0,6  0,4  0,0
Total   12    54   10   10    4     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     348     53,0  Somers' D              0,39
Discordant      90     13,7  Goodman-Kruskal Gamma  0,59
Ties           218     33,2  Kendall's Tau-a        0,06
Total          656    100,0
```

Binary Logistic Regression: q16 versus q60; q61

```
* WARNING * Algorithm has not converged after 20 iterations.
* WARNING * Convergence has not been reached for the parameter estimates
            criterion.
* WARNING * The results may not be reliable.
* WARNING * Try increasing the maximum number of iterations.

Link Function: Logit


Response Information

Variable  Value  Count
q16       1         84  (Event)
          0          6
          Total     90


Logistic Regression Table

                                                                    95% CI
Predictor      Coef  SE Coef      Z      P   Odds Ratio  Lower  Upper
Constant   -16,5882  10513,9  -0,00  0,999
q60         20,1717  10513,9   0,00  0,998  5,76051E+08   0,00      *
q61        -1,09861  1,21106  -0,91  0,364         0,33   0,03   3,58


Log-Likelihood = -20,129
Test that all slopes are zero: G = 3,829, DF = 2, P-Value = 0,147


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson           0,0000000   2  1,000
Deviance          0,0000000   2  1,000
Hosmer-Lemeshow   0,0000000   1  1,000


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

            Group
Value     1     2    3  Total
1
  Obs    64    19    1     84
  Exp  64,0  19,0  1,0
0
  Obs     6     0    0      6
  Exp   6,0   0,0  0,0
Total    70    19    1     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     180     35,7  Somers' D              0,32
Discordant      20      4,0  Goodman-Kruskal Gamma  0,80
Ties           304     60,3  Kendall's Tau-a        0,04
Total          504    100,0
```

Binary Logistic Regression: q23 versus q60; q61

Link Function: Logit

Response Information

Variable	Value	Count	
q23	1	80	(Event)
	0	10	
	Total	90	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	2,58226	1,13804	2,27	0,023			
q60	0,474635	0,824691	0,58	0,565	1,61	0,32	8,09
q61	-0,949383	0,855776	-1,11	0,267	0,39	0,07	2,07

Log-Likelihood = -30,816
Test that all slopes are zero: G = 1,157, DF = 2, P-Value = 0,561

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	2,04718	2	0,359
Deviance	1,83312	2	0,400
Hosmer-Lemeshow	0,03915	0	*

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group		
Value	1	2	Total
1			
Obs	64	16	80
Exp	64,2	15,8	
0			
Obs	9	1	10
Exp	8,8	1,2	
Total	73	17	90

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	261	32,6	Somers' D	0,19
Discordant	111	13,9	Goodman-Kruskal Gamma	0,40
Ties	428	53,5	Kendall's Tau-a	0,04
Total	800	100,0		

Binary Logistic Regression: q24 versus q5

```
Link Function: Logit


Response Information

Variable  Value  Count
q24       1         77  (Event)
          0         13
          Total     90


Logistic Regression Table

                                                 Odds     95% CI
Predictor      Coef   SE Coef     Z      P  Ratio  Lower  Upper
Constant    1,71979  0,313462  5,49  0,000
q5         0,582799   1,09465  0,53  0,594   1,79   0,21  15,31


Log-Likelihood = -37,004
Test that all slopes are zero: G = 0,323, DF = 1, P-Value = 0,570

* NOTE * No goodness of fit test performed.
* NOTE * The model uses all degrees of freedom.

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     120     12,0  Somers' D              0,05
Discordant      67      6,7  Goodman-Kruskal Gamma  0,28
Ties           814     81,3  Kendall's Tau-a        0,01
Total         1001    100,0

* NOTE * 1 time(s) the standardized Pearson residuals, delta chi-square,
delta
         deviance, delta beta (standardized) and delta beta could not be
         computed because leverage (Hi) is equal to 1.
```

Binary Logistic Regression: q27 versus q57; q58; q59

```
Link Function: Logit


Response Information

Variable  Value  Count
q27       1         61  (Event)
          0         29
          Total     90


Logistic Regression Table

                                                    Odds     95% CI
Predictor        Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant      3,86789   1,73010   2,24  0,025
q57        -0,0245313  0,508392  -0,05  0,962   0,98   0,36   2,64
q58         -0,388353  0,493033  -0,79  0,431   0,68   0,26   1,78
q59         -0,568442  0,455162  -1,25  0,212   0,57   0,23   1,38


Log-Likelihood = -54,331
Test that all slopes are zero: G = 4,475, DF = 3, P-Value = 0,215
```

```
Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             16,7399  15  0,335
Deviance            20,1596  15  0,166
Hosmer-Lemeshow      2,4400   4  0,655


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

                  Group
Value    1    2    3     4    5    6  Total
1
  Obs    5    6    7    35    6    2     61
  Exp  5,3  7,0  5,9  33,6  7,3  1,9
0
  Obs    6    6    2    12    3    0     29
  Exp  5,7  5,0  3,1  13,4  1,7  0,1
Total   11   12    9    47    9    2     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     851     48,1  Somers' D              0,22
Discordant     456     25,8  Goodman-Kruskal Gamma  0,30
Ties           462     26,1  Kendall's Tau-a        0,10
Total         1769    100,0
```

Binary Logistic Regression: q20 versus q65

```
Link Function: Logit


Response Information

Variable  Value  Count
q20       1         76  (Event)
          0         14
          Total     90


Logistic Regression Table

                                                 Odds     95% CI
Predictor      Coef  SE Coef      Z      P  Ratio  Lower  Upper
Constant    7,77752  5,10459   1,52  0,128
q65        -1,25351  1,03609  -1,21  0,226   0,29   0,04   2,18


Log-Likelihood = -37,766
Test that all slopes are zero: G = 2,269, DF = 1, P-Value = 0,132


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson           0,0261023   2  0,987
Deviance          0,0488569   2  0,976
Hosmer-Lemeshow   0,0260204   1  0,872


Table of Observed and Expected Frequencies:
```

(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group			
Value	1	2	3	Total
1				
Obs	59	15	2	76
Exp	59,0	15,1	2,0	
0				
Obs	13	1	0	14
Exp	13,0	0,9	0,0	
Total	72	16	2	90

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	223	21,0	Somers' D	0,15
Discordant	59	5,5	Goodman-Kruskal Gamma	0,58
Ties	782	73,5	Kendall's Tau-a	0,04
Total	1064	100,0		

Binary Logistic Regression: q10 versus q55; q56

Link Function: Logit

Response Information

Variable	Value	Count	
q10	1	77	(Event)
	0	13	
	Total	90	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	0,783422	1,48768	0,53	0,598			
q55	-0,0351131	0,555382	-0,06	0,950	0,97	0,33	2,87
q56	0,722520	0,592672	1,22	0,223	2,06	0,64	6,58

Log-Likelihood = -36,378
Test that all slopes are zero: G = 1,575, DF = 2, P-Value = 0,455

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	2,28393	5	0,809
Deviance	3,48847	5	0,625
Hosmer-Lemeshow	1,74556	3	0,627

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group					
Value	1	2	3	4	5	Total
1						
Obs	8	23	12	28	6	77
Exp	7,2	24,2	11,4	28,7	5,5	
0						
Obs	1	7	1	4	0	13

```
  Exp  1,8   5,8   1,6   3,3  0,5
Total    9    30    13    32    6     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     449     44,9  Somers' D              0,19
Discordant     263     26,3  Goodman-Kruskal Gamma  0,26
Ties           289     28,9  Kendall's Tau-a        0,05
Total         1001    100,0
```

Binary Logistic Regression: q14 versus q54; q57; q58

```
Link Function: Logit


Response Information

Variable  Value  Count
q14       1         82  (Event)
          0          8
          Total     90


Logistic Regression Table

                                                    Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant     8,75703   4,21256   2,08  0,038
q54        -0,793207  0,899399  -0,88  0,378   0,45   0,08   2,64
q57         0,314420  0,762371   0,41  0,680   1,37   0,31   6,10
q58         -1,55032  0,688869  -2,25  0,024   0,21   0,05   0,82


Log-Likelihood = -24,048
Test that all slopes are zero: G = 5,897, DF = 3, P-Value = 0,117


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             4,38003  14  0,993
Deviance            6,80298  14  0,942
Hosmer-Lemeshow     3,29883   3  0,348


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

                Group
Value    1    2     3     4    5  Total
1
  Obs    6    9    46    12    9     82
  Exp  6,4  7,5  47,6  11,6  8,9
0
  Obs    3    0     5     0    0      8
  Exp  2,6  1,5   3,4   0,4  0,1
Total    9    9    51    12    9     90


Measures of Association:
```

(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	339	51,7	Somers' D	0,39
Discordant	85	13,0	Goodman-Kruskal Gamma	0,60
Ties	232	35,4	Kendall's Tau-a	0,06
Total	656	100,0		

* NOTE * All values in column are identical.
* NOTE * All values in column are identical.

Regression Analysis: q5 versus q10; q11; q12

* q11 is (essentially) constant
* q11 has been removed from the equation.

* NOTE * All values in column are identical.

* q12 is (essentially) constant
* q12 has been removed from the equation.

The regression equation is
q5 = 0,231 - 0,127 q10

Predictor	Coef	SE Coef	T	P
Constant	0,23077	0,09101	2,54	0,013
q10	-0,12687	0,09840	-1,29	0,201

S = 0,328158 R-Sq = 1,9% R-Sq(adj) = 0,7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0,1790	0,1790	1,66	0,201
Residual Error	88	9,4765	0,1077		
Total	89	9,6556			

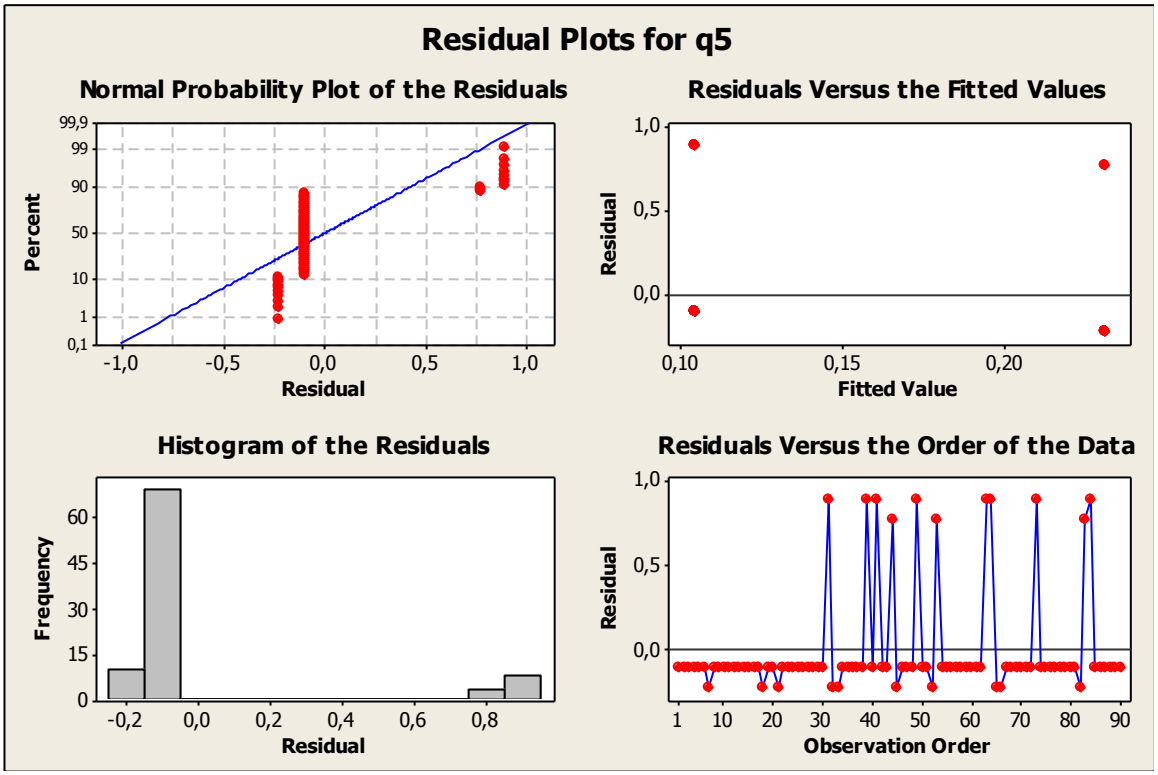
Unusual Observations

Obs	q10	q5	Fit	SE Fit	Residual	St Resid
7	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
18	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
21	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
31	1,00	1,0000	0,1039	0,0374	0,8961	2,75R
32	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
33	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
39	1,00	1,0000	0,1039	0,0374	0,8961	2,75R
41	1,00	1,0000	0,1039	0,0374	0,8961	2,75R
44	0,00	1,0000	0,2308	0,0910	0,7692	2,44RX
45	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
49	1,00	1,0000	0,1039	0,0374	0,8961	2,75R
52	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
53	0,00	1,0000	0,2308	0,0910	0,7692	2,44RX
63	1,00	1,0000	0,1039	0,0374	0,8961	2,75R

64	1,00	1,0000	0,1039	0,0374	0,8961	2,75R
65	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
66	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
73	1,00	1,0000	0,1039	0,0374	0,8961	2,75R
82	0,00	0,0000	0,2308	0,0910	-0,2308	-0,73 X
83	0,00	1,0000	0,2308	0,0910	0,7692	2,44RX
84	1,00	1,0000	0,1039	0,0374	0,8961	2,75R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Residual Plots for q5



Binary Logistic Regression: q15 versus q29; q30; q36

Link Function: Logit

Response Information

Variable	Value	Count	
q15	1	75	(Event)
	0	15	
	Total	90	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	2,68110	1,25047	2,14	0,032			
q29	-0,387016	0,586495	-0,66	0,509	0,68	0,22	2,14

```
q30        -0,143873  0,830809  -0,17  0,863   0,87   0,17   4,41
q36        -0,902087   1,09347  -0,82  0,409   0,41   0,05   3,46


Log-Likelihood = -39,920
Test that all slopes are zero: G = 1,262, DF = 3, P-Value = 0,738


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             3,91741   4  0,417
Deviance            4,54036   4  0,338
Hosmer-Lemeshow     2,72279   2  0,256


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

               Group
Value     1     2    3    4  Total
1
  Obs    17    41    8    9     75
  Exp  17,1  40,1  9,5  8,3
0
  Obs     5     7    3    0     15
  Exp   4,9   7,9  1,5  0,7
Total    22    48   11    9     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     440     39,1  Somers' D              0,11
Discordant     320     28,4  Goodman-Kruskal Gamma  0,16
Ties           365     32,4  Kendall's Tau-a        0,03
Total         1125    100,0
```

Binary Logistic Regression: q26 versus q37

```
Link Function: Logit


Response Information

Variable  Value  Count
q26       1         61  (Event)
          0         29
          Total     90


Logistic Regression Table

                                                 Odds     95% CI
Predictor      Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant    6,34007   1,32045   4,80  0,000
q37        -2,31264  0,521551  -4,43  0,000   0,10   0,04   0,28


Log-Likelihood = -45,361
Test that all slopes are zero: G = 22,415, DF = 1, P-Value = 0,000

* NOTE * No goodness of fit test performed.
* NOTE * The model uses all degrees of freedom.
```

```
Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant    1000     56,5  Somers' D              0,51
Discordant      99      5,6  Goodman-Kruskal Gamma  0,82
Ties           670     37,9  Kendall's Tau-a        0,22
Total         1769    100,0
```

Binary Logistic Regression: q27 versus q38

```
Link Function: Logit


Response Information

Variable  Value  Count
q27       1         61  (Event)
          0         29
          Total     90


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant   -0,708501   1,30069  -0,54  0,586
q38         0,541597  0,480819   1,13  0,260   1,72   0,67   4,41


Log-Likelihood = -55,940
Test that all slopes are zero: G = 1,255, DF = 1, P-Value = 0,263

* NOTE * No goodness of fit test performed.
* NOTE * The model uses all degrees of freedom.

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     495     28,0  Somers' D              0,12
Discordant     288     16,3  Goodman-Kruskal Gamma  0,26
Ties           986     55,7  Kendall's Tau-a        0,05
Total         1769    100,0
```

Binary Logistic Regression: q30 versus q39

```
Link Function: Logit


Response Information

Variable  Value  Count
q30       1         76  (Event)
          0         14
          Total     90


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef     Z      P  Ratio  Lower  Upper
Constant     1,38410   2,83889  0,49  0,626
q39        0,0661398  0,607925  0,11  0,913   1,07   0,32   3,52
```

```
Log-Likelihood = -38,894
Test that all slopes are zero: G = 0,012, DF = 1, P-Value = 0,914

* NOTE * No goodness of fit test performed.
* NOTE * The model uses all degrees of freedom.

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     250     23,5  Somers' D              0,02
Discordant     234     22,0  Goodman-Kruskal Gamma  0,03
Ties           580     54,5  Kendall's Tau-a        0,00
Total         1064    100,0
```

Binary Logistic Regression: q40 versus q33; q34; q35; q36

```
* WARNING * Algorithm has not converged after 20 iterations.
* WARNING * Convergence has not been reached for the parameter estimates
            criterion.
* WARNING * The results may not be reliable.
* WARNING * Try increasing the maximum number of iterations.

Link Function: Logit


Response Information

Variable  Value  Count
q40       5         78  (Event)
          4         12
          Total     90


Logistic Regression Table

                                                 Odds     95% CI
Predictor      Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant    20,3929   14430,9   0,00  0,999
q33         1,12009  0,963225   1,16  0,245   3,07   0,46  20,25
q34        -20,1794   14430,9  -0,00  0,999   0,00   0,00      *
q35        0,477746   1,24715   0,38  0,702   1,61   0,14  18,58
q36        0,128927  0,884436   0,15  0,884   1,14   0,20   6,44


Log-Likelihood = -33,472
Test that all slopes are zero: G = 3,737, DF = 4, P-Value = 0,443


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             3,95420   4  0,412
Deviance            5,37594   4  0,251
Hosmer-Lemeshow     0,22721   1  0,634


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

            Group
Value    1     2    3  Total
5
  Obs    7    64    7     78
```

```
  Exp  6,4  64,6  7,0
4
  Obs    2    10    0     12
  Exp  2,6   9,4  0,0
Total    9    74    7     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     338     36,1  Somers' D              0,23
Discordant     120     12,8  Goodman-Kruskal Gamma  0,48
Ties           478     51,1  Kendall's Tau-a        0,05
Total          936    100,0
```

Binary Logistic Regression: q33 versus q41

```
Link Function: Logit


Response Information

Variable  Value  Count
q33       1         84  (Event)
          0          6
          Total     90


Logistic Regression Table

                                                  Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant   -0,373512   3,84880  -0,10  0,923
q41         0,635053  0,817023   0,78  0,437   1,89   0,38   9,36


Log-Likelihood = -21,773
Test that all slopes are zero: G = 0,540, DF = 1, P-Value = 0,462


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson            0,309858   1  0,578
Deviance           0,480283   1  0,488
Hosmer-Lemeshow    0,027443   0      *


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

          Group
Value     1     2  Total
1
  Obs    15    69     84
  Exp  15,2  68,8
0
  Obs     2     4      6
  Exp   1,8   4,2
Total    17    73     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)
```

Pairs	Number	Percent	Summary Measures	
Concordant	138	27,4	Somers' D	0,15
Discordant	62	12,3	Goodman-Kruskal Gamma	0,38
Ties	304	60,3	Kendall's Tau-a	0,02
Total	504	100,0		

Binary Logistic Regression: q15 versus q42; q43; q44

```
* WARNING * Algorithm has not converged after 20 iterations.
* WARNING * Convergence has not been reached for the parameter estimates
            criterion.
* WARNING * The results may not be reliable.
* WARNING * Try increasing the maximum number of iterations.
```

Link Function: Logit

Response Information

Variable	Value	Count	
q15	1	75	(Event)
	0	15	
	Total	90	

Logistic Regression Table

						95% CI	
Predictor	Coef	SE Coef	Z	P	Odds Ratio	Lower	Upper
Constant	1,60944	0,632456	2,54	0,011			
q42	40,0170	36267,4	0,00	0,999	2,39416E+17	0,00	*
q43	-19,8213	27812,1	-0,00	0,999	0,00	0,00	*
q44	-20,1600	23294,8	-0,00	0,999	0,00	0,00	*

Log-Likelihood = -38,206
Test that all slopes are zero: G = 4,689, DF = 3, P-Value = 0,196

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	0,0000000	1	1,000
Deviance	0,0000000	1	1,000
Hosmer-Lemeshow	0,0000000	1	1,000

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group			
Value	1	2	3	Total
1				
Obs	15	57	3	75
Exp	15,0	57,0	3,0	
0				
Obs	4	11	0	15
Exp	4,0	11,0	0,0	
Total	19	68	3	90

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	288	25,6	Somers' D	0,11

```
Discordant     165     14,7  Goodman-Kruskal Gamma  0,27
Ties           672     59,7  Kendall's Tau-a        0,03
Total         1125    100,0

* NOTE * 2 time(s) the standardized Pearson residuals, delta chi-square,
delta
         deviance, delta beta (standardized) and delta beta could not be
         computed because leverage (Hi) is equal to 1.
```

Binary Logistic Regression: q15 versus q45; q46; q47

```
Link Function: Logit


Response Information

Variable  Value  Count
q15       1         75  (Event)
          0         15
          Total     90


Logistic Regression Table

                                                 Odds     95% CI
Predictor      Coef   SE Coef     Z      P  Ratio  Lower  Upper
Constant   0,786926  0,764326  1,03  0,303
q45        0,923433   1,02842  0,90  0,369   2,52   0,34  18,90
q46        0,698361  0,798424  0,87  0,382   2,01   0,42   9,61
q47        0,536428  0,783156  0,68  0,493   1,71   0,37   7,94


Log-Likelihood = -39,558
Test that all slopes are zero: G = 1,985, DF = 3, P-Value = 0,575


Goodness-of-Fit Tests

Method           Chi-Square  DF      P
Pearson             12,8747   4  0,012
Deviance            11,8368   4  0,019
Hosmer-Lemeshow      3,2178   2  0,200


Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

               Group
Value     1     2     3    4  Total
1
  Obs    47    12    13    3     75
  Exp  47,3  12,3  11,8  3,7
0
  Obs    12     2     0    1     15
  Exp  11,7   1,7   1,2  0,3
Total    59    14    13    4     90


Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs       Number  Percent  Summary Measures
Concordant     505     44,9  Somers' D              0,25
Discordant     223     19,8  Goodman-Kruskal Gamma  0,39
Ties           397     35,3  Kendall's Tau-a        0,07
Total         1125    100,0
```

Binary Logistic Regression: q38 versus q48; q49; q50; q51

Link Function: Logit

Response Information

Variable	Value	Count	
q38	3	63	(Event)
	2	27	
	Total	90	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	1,04074	0,681298	1,53	0,127			
q48	-0,948309	0,588041	-1,61	0,107	0,39	0,12	1,23
q49	0,520199	0,597403	0,87	0,384	1,68	0,52	5,43
q50	0,516401	0,599019	0,86	0,389	1,68	0,52	5,42
q51	-0,520407	1,31088	-0,40	0,691	0,59	0,05	7,76

Log-Likelihood = -53,115
Test that all slopes are zero: G = 3,726, DF = 4, P-Value = 0,444

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	12,2294	5	0,032
Deviance	10,5417	5	0,061
Hosmer-Lemeshow	4,3432	3	0,227

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group					
Value	1	2	3	4	5	Total
3						
Obs	6	24	17	15	1	63
Exp	5,5	25,9	15,8	14,0	1,8	
2						
Obs	4	16	4	2	1	27
Exp	4,5	14,1	5,2	3,0	0,2	
Total	10	40	21	17	2	90

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	825	48,5	Somers' D	0,27
Discordant	371	21,8	Goodman-Kruskal Gamma	0,38
Ties	505	29,7	Kendall's Tau-a	0,11
Total	1701	100,0		

Binary Logistic Regression: q27 versus q48; q49; q50; q51

Link Function: Logit

Response Information

Variable	Value	Count	
q27	1	61	(Event)
	0	29	
	Total	90	

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	Upper
Constant	0,795804	0,646095	1,23	0,218			
q48	-0,173712	0,519602	-0,33	0,738	0,84	0,30	2,33
q49	-0,0268751	0,599569	-0,04	0,964	0,97	0,30	3,15
q50	0,482594	0,584605	0,83	0,409	1,62	0,52	5,10
q51	-0,183372	1,27410	-0,14	0,886	0,83	0,07	10,11

Log-Likelihood = -56,188
Test that all slopes are zero: G = 0,760, DF = 4, P-Value = 0,944

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	6,00810	5	0,305
Deviance	6,10338	5	0,296
Hosmer-Lemeshow	1,45472	2	0,483

Table of Observed and Expected Frequencies:
(See Hosmer-Lemeshow Test for the Pearson Chi-Square Statistic)

	Group				
Value	1	2	3	4	Total
1					
Obs	26	16	16	3	61
Exp	27,1	15,5	14,6	3,8	
0					
Obs	16	7	4	2	29
Exp	14,9	7,5	5,4	1,2	
Total	42	23	20	5	90

Measures of Association:
(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures	
Concordant	766	43,3	Somers' D	0,14
Discordant	524	29,6	Goodman-Kruskal Gamma	0,19
Ties	479	27,1	Kendall's Tau-a	0,06
Total	1769	100,0		

Appendix H: Industrial Accidents

	2000			2001			2002			2003			2004		
	No. Of Accidents	No. Of Injuries	Fatal Accidents	No. Of Accidents	No. Of Injuries	Fatal Accidents	No. Of Accidents	No. Of Injuries	Fatal Accident	No. Of Accidents	No. Of Injuries	Fatal Accident	No. Of Accidents	No. Of Injuries	Fatal Accident
Construction industry	14	14	0	20	8	4	10	10	0	11	11	0	9	7	2
Production	16	14	2	18	18	0	20	19	1	13	11	2	12	12	0
Wholesale and retail trade, motor vehicle and household furniture repair	7	6	1	8	4	0	15	14	1	7	7	0	13	12	1
Transportation, Warehousing and Communication	9	9	0	12	0	0	18	18	0	13	13	0	15	14	1
Hotels and Restaurants	0	0	0	4	12	0	7	7	0	3	3	0	1	1	0
Agriculture, hunting and Foresting	3	3	0	2	1	1	11	11	0	10	10	0	5	5	0
Puplic Administration, defense and social security	2	2	0	2	0	0	2	2	0	8	8	0	14	14	0
Electiricity, Gas, Steam Water produciton and Distribution	2	2	0	0	16	0	3	3	0	0	0	0	4	4	0
Other Social and Personal Works	1	1	0	0	0	0	4	4	0	1	1	0	1	1	0
Minning and quarrying	6	6	0	7	6	1	3	2	1	5	5	0	4	3	1
Real asset, Renting and Business Acctivity	3	3	0	0	2	0	3	3	0	1	0	1	0	0	0
Education	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0
Acts of accounting systems	2	2	0	0	0	0	1	1	0	0	0	0	1	1	0
Health and Social Works	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0
Fishing	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Work at home	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	2000			2001			2002			2003			2004		
	No. Of Accidents	No. Of Injuries	Fatal Accidents	No. Of Accidents	No. Of Injuries	Fatal Accidents	No. Of Accidents	No. Of Injuries	Fatal Accident	No. Of Accidents	No. Of Injuries	Fatal Accident	No. Of Accidents	No. Of Injuries	Fatal Accident
Construction industry	14	14	0	20	8	4	10	10	0	11	11	0	9	7	2
Production	16	14	2	18	18	0	20	19	1	13	11	2	12	12	0
Wholesale and retail trade, motor vehicle and household furniture repair	7	6	1	8	4	0	15	14	1	7	7	0	13	12	1
Transportation, Warehousing and Communication	9	9	0	12	0	0	18	18	0	13	13	0	15	14	1
Hotels and Restaurants	0	0	0	4	12	0	7	7	0	3	3	0	1	1	0
Agriculture, hunting and Foresting	3	3	0	2	1	1	11	11	0	10	10	0	5	5	0
Puplic Administration, defense and social security	2	2	0	2	0	0	2	2	0	8	8	0	14	14	0
Electiricity, Gas, Steam Water produciton and Distribution	2	2	0	0	16	0	3	3	0	0	0	0	4	4	0
Other Social and Personal Works	1	1	0	0	0	0	4	4	0	1	1	0	1	1	0
Minning and quarrying	6	6	0	7	6	1	3	2	1	5	5	0	4	3	1
Real asset, Renting and Business Acctivity	3	3	0	0	2	0	3	3	0	1	0	1	0	0	0
Education	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0
Acts of accounting systems	2	2	0	0	0	0	1	1	0	0	0	0	1	1	0
Health and Social Works	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0
Fishing	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Work at home	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0