COLLEGE OF HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

ECONOMIC COSTS OF OCCUPATIONAL INJURIES IN THE MANUFACTURING SECTOR OF ADDIS ABABA, ETHIOPIA

BY
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JUNE/2016

ADDIS ABABA, ETHIOPIA

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Declaration

I, Hailye Birhane, declare that the contents of this thesis comprises of my own original work, prepared under the guidance of my advisors. All sources and materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any qualification.

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ACRONYMS

BoLSA: Bureau of Labour and Social Affair

CSA: Central Statistical Authority

EISC: Ethiopian Industrial Standard Classification

GDP: Gross Domestic Product

GNP: Gross National Product

GPA: Group Personal Accident

ILO: International Labour Organization

ISIC: International Standard Industrial Classification

MLSs: Medium and Large Scale Industries

MoLSA: Ministry of Labour and Social Affair

OSH: Occupational Safety and Health

PPD: Permanent Partial Disability

PPE: Personal Protective Equipment

PTD Permanent Total Disability

TTD: Temporary Total Disability

WC: Workmen's Compensation Insurance

WHO: World Health Organization

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Abstract

Introduction: The magnitude of economic loss resulted from occupational injuries for all economic agents are known globally and in developed countries. It is estimated to absorb 4-6% of the national income (GDP) and results thousands of death and millions of human suffering. However, this is not yet investigated in Ethiopia. Therefore, the result of this study -helps to contribute in filling this gap.

Objective: To estimate the economic costs of occupational injuries in the manufacturing sector of Addis Ababa, Ethiopia for 2014/15, using company perspective.

Methods: The cost input data was collected from injury compensation claim record of 13(76.5%) insurance companies head office, Addis Ababa city government BoLSA offices injury record reviews and through a survey of 398 injured cases and their companies (establishments). The cost input data were used to estimate the following cost components: direct cost (compensation and medical) and indirect costs (absenteeism and presenteeism), using friction cost estimation method.

Findings: The estimated annual number of injured cases were 28,221; among them 15,166(53.8%) workers were temporarily disabled, 12,368 (43.8%) workers were partially disabled, 629(2.2%) workers were totally disabled and 58 (0.2%) workers were died. Additionally, the estimated total lost workday were 128,431.5 days; an average of 7.5 workday per injury. The estimated economic cost of occupational injuries in the manufacturing sector of Addis Ababa, Ethiopia during 2014/15 varies from Birr 335,810,072.5 (15,990,955.8 US$) up to 1,060,447,498 Birr (50,497,499.9 US$). This is because of the indirect (uninsured) cost varies from 70,698,198 Birr to 795,335,623.5 Birr. Therefore, the estimated average total economic cost was 698,128,785.3 Birr (33,244,228 US$); the indirect cost 433,016,911 Birr (62%) and direct cost 265,111,874.5 Birr (38%). Furthermore, these direct and indirect costs of injury absorb 3% up to 5.7% or an average of 4.35% of the operating cost per employer annually.

Conclusion: The economic loss as a result of injury was very substantial. Strengthening OSH management system at all level and creating a safe and healthy working condition would reduce substantial amount of expenditure and human suffering as well as save 798,774 Birr (38,037 US$) costs-per-year-per-employer.

Key words: Economic costs of injury, direct and indirect costs, manufacturing sector, disability.

1. Introduction

1.1 Background

Occupational injuries pose a major public health and developmental problems, which result disability, reliance on benefits (if they exist), early retirement, exclusion from the labour market, the loss of a breadwinner and poverty [1]. Creating a safe and healthy working environment will help prevent exclusion and poverty, suffering and economic costs to the worker and their families, businesses and governments [1, 2]. However, it is realized that resources for occupational health interventions are limited; less than 5% of the annual budget in Ethiopia [3] and health problems in the working population are paired with significant socioeconomic burden [2].

The economic costs of occupational injuries have long been cause for concern at all levels from the individual workplace to the national and international level. It occurs too frequent and their cost in terms of human suffering and economic burden continues to be significant [1, 4]. The economic burden of occupational injuries is a useful tool to inform workers and employee organizations on the cost-benefit of occupational health and safety intervention measures and also guides employers and policy-makers on how to allocate resources effectively [1].

According to the international labour organization 2012 estimation 317 million peoples suffer from work-related injuries. It is estimated that around 4% of annual worldwide GDP, or $1,250 billion, is absorbed by the direct and indirect costs of work accidents and occupational diseases. This extremely high figure partly explains why the costs of occupational injuries are a focus of current research [2].

The economic costs of these injuries and deaths are extremely large, at the enterprise, national and global levels. Taking into account compensation, lost working time, interruption of production, training and retraining, medical expenses, and so on, estimates of these losses are routinely put at roughly 4% of global GNP every year, and possibly much more [5]. However, the study on economic cost of occupational injuries has got little attention and has not been adequately documented. The aim of this paper is to estimate the direct and indirect costs of occupational injuries for manufacturing industries of Addis Ababa city to provide cost information on occupational injuries for prevention purposes.

1.2 Problem statement

A workplace accident can have "catastrophic effects on the quality of life of the worker and also have a devastating effect on family and friends as a result it continue to be a prominent public health concern. Similarly, the costs associated with workplace injuries can be substantial for the injured workers, employers and the nation [4] Workers suffer economic and noneconomic hardships that often persist for years. Employers must pay medical and indemnity benefits, lose worker productivity, and often bear the costs of replacing the lost worker. In Ethiopia in three year (2011/12 to 2013/14) there were 6554(48%) non fatal and fatal injuries were reported only from less than 7% of the manufacturing industries nationwide [9, 10, 11].

The problem is preventable by allocating appropriate resources on health and safety intervention and improving poor working conditions [19]. However, resources for prevention are scarce, and identifying which industry groups and risk classes are at highest risk and could most benefit from prevention activities for common, high cost of injuries is an important step to characterize the nature of occupational injuries and inform future action. In this regard the economic cost estimation of occupational injuries is a useful tool to inform workers and employee organizations on the cost of occupational injuries occurred due to poor work place conditions and also guides on how to allocate resources effectively [5].

In Ethiopia many studies have been conducted in occupational injury prevalence, determinants and associated factors but no studies focus on work-related injury costs estimation. Therefore, this study is an attempt to fill this gap and to provide insight about the cost and consequences of occupational injuries in manufacturing industries for decision makers to allocate appropriate resources for occupational health and safety intervention and to inform policy makers about the impact of work related injury in order to support efforts to strengthen occupational health and safety in Ethiopia and helps to raise awareness on the cost of occupational injury and also serves as a base for further study.

1.3. Research Question

What are the economic costs and consequences of occupational injuries in the manufacturing sector (including workers incapacity, as well as absenteeism)?

2. Literature Review

2.1. The prevalence of Injuries in the Manufacturing Sector

The prevalence rates of occupational injuries varied among manufacturing industries. The study conducted in large scale metal manufacturing industries of Addis Ababa indicates that the magnitude of occupational injury was 489 per 1000 exposed workers per year [6]. A case control study in textile factory workers in Addis Ababa found that an incidence rate of 200 injuries per 1000 workers per year. The prevalence of injury in two metal factories was 333 per 1000 per year [7].

According to studies multiple factors were involved in the occurrence of injuries, including the length of time worked per shift; working 48 hours or more per week, sleep disorder, job satisfaction, service year in the present job, young age less than 30, gender, safety and health supervision, poor health, job stress, splitting materials, slippery floor, lack of safety training, poor lighting, low education were major determinants of injury in the work place [3, 6, 7].

Study conducted in iron and steel industries found that flying subjects, falling and machinery cause 43% of the injuries [7]. Additionally, the other study conducted in 397 injured patients shows that 57.9% lack or inadequacy and 46.8% the presence and regular use of PPE such as gloves, goggles and gowns in the work environment was indicated as causes of injury [11].

The three year, 2011/12 to 2013/14, national injury report of MoLSA shows that in the manufacturing industry machine, hand tool, fire and explosive, falling and slippery, miss handling, collisions with objects and work mistakes cause 75% of injuries. Among them 29% were caused by machine, 14 % were caused by hand tool, 13% were caused by falling and slippery and 12 % were caused by hand tools. About 75 % of injuries involved upper extreme, lower extreme, eye and central body resulted in 39 % abrasion, 16% cuts, 13% piercing, 4% burns and 6% eye injury. According to the report these injuries has occurred among 75% of the workers whose age group were 15-39 [8-10].

According to work related injury cost studies injuries that involved falls and vehicle incidents were the most expensive; this can be attributed mainly to the high proportion of fractures, multiple injuries, and involvement of lower extremities from such incidents.

The causes of work accidents that resulted in the most expensive work injuries were ‘‘equipment, tools, and machinery’’. The hands were involved in 52% of the injuries caused by ‘‘equipment, tools, and machinery’’ twice the rate from other causes [12].

The study on the impact of serious occupational injury on the health related quality of life of Egyptian workers revealed that some occupationally injured workers still experience significant problems, such as pain or discomfort, functional limitations and anxiety/ depression even 6 months after the injury. The injured workers (with a median age of 40 years) reported much higher levels of problems across all dimensions of quality of life [13].

2.2. Economic Costs of Occupational Injuries in the Manufacturing Sector

The study conducted in Lebanon on the cost of work-related injuries in insured workplaces indicates that the median cost per injury was US$ 83. Extrapolated to all injuries within insured workplaces, the overall cost was estimated 10 up to 13 million when pain and suffering was accounted for. Fatal injuries and those that caused permanent disabilities accounted for 10.4% of the overall costs and hospitalized injuries for 45%. Cost per injury was highest among older workers and for injuries that involved falls and vehicle incidents. Medical, but not compensation, costs were higher among female workers [12].

Several studies indicated that costs of injuries sharply increased with the severity of the injury, which determine the lost workday. Three (0.1%) fatal injuries consumed 3.8% of the overall costs, and injuries with disabilities plus severe non-fatal injuries 2.9% accounted for 27%. Injuries that resulted in hospitalization cost 12 times as much per injury as those that did not [12, 13].

Work-related injuries and deaths impose costs on employers, workers and the community. However, the level of costs borne by each of the three economic agents; employers, workers and the community varies with the severity of the injury [15]. When a worker is injured, it means they cannot work either permanently or until recovered as well as the accidents that cause the injury have damaging effect on the company. The company must then find a replacement worker and train them in the job. This costs the company time as well as money. The overall costs of the company include both direct and indirect costs.

Direct costs include items such as workers compensation payments to injured or incapacitated workers and healthcare costs. Indirect costs include items such as lost productivity and lost potential output [14, 15].

The study conducted to measure the economic cost of work related injuries reveals that the total cost of work-related injuries and ill health to workers, their employers and the community is estimated to be equivalent to 3.2% of the nation's GDP for 2011. The costs borne by different economic agents were estimated to be: 22.1% by employers; 50.5% by workers and 27.4% by the community. The bulk of the cost was borne by the workers [16]. However, the total cost of a workplace injury is often underestimated because some costs may be indirect, are not immediately felt, or simply difficult to quantify but a study by the Stanford University estimated that the indirect costs could be 4 times higher than the direct costs [15].

The 2003/4 occupational safety and health profile of Ethiopia indicate that from the estimated 4600 establishments employing 10 and above workers only 2% of the employer reported that due to 2,448 non fatal accidents around 11,263, days were lost without work. The severity rate was around 1 hour or 60 minutes lost out of 1000 worked hours and the frequency rate was around 25 hours out of 1000,000 worked hours. The manufacturing is the most hazardous industrial sector accounting for 91.04 percent of all accidents reported [17]. Similarly, the 2011/12 to 2013/14 employer reported national compilation data shows that for medical purpose only Birr 1, 33 7,180 were paid for injured workers [8-10].

2.2.1. The Economic Impact of Injuries in the Manufacturing sector

The economic cost was defined as the sum of financial costs and opportunity costs (i.e., the value of the best alternative forgone by the sector due to injury). The goal of any business is to maximize profit and minimize loss. This being the case, the financial and economic effects of injury should be approximated with reference to the appropriate industry/ employer objective. Injury related unplanned workers absence, incapacity and pre mature death leads to economic losses that can reduce the productivity and efficiency of an employer, which may negatively affect its earnings and profits, its ability to invest profits into new capital accumulation and thereby reduce the wealth or consumption possibilities [18].

These negative effects on productivity resulting from injury, employers may choose to protect the health and safety of their workers through investments in physical and human capital [18].Thus, injury-related out-of-pocket expenditures of employers can be an important component of the overall financial and economic costs of injury that reflects the maximum amount of money that could potentially be saved or gained if an injury were to be eradicated [18, 19].

2.2.2. The cost and consequence of injuries

According to the Ethiopian labour proclamation employers were generally obliged to provide insurance coverage for all wages and wage workers injured at work with full medical care, 75% of their daily salary starting from the day of the injury, compensation for permanent disabilities, funeral expenses and dependent compensation for death [20]. However, some employers purchase work-accident insurance policies from private insurance companies, but most employers choose to pay out-of-pocket at the time of injury. Insurance policies are issued for the worksite as a whole, not always in the name of individual workers.

However, according to the proclamation employers are liable for employment injury cases. In economic terms, when an employer is held liable, it is to oblige the employer to prevent preventable risks at two levels; through the provision of safe and health workplace and through taking remedy actions. If it fails to prevent; the employer is obliged to taking compensatory measures after the damage has already been sustained. At this stage, in actual effect, is pin pointing the modalities for loss distribution. Once employment injury has occurred the employer is liable to cover the cost. This liability is closely related to the degree of injury [21].

The liability of employers are distinguished between “direct” and “indirect” costs borne by employers as a result of work-related injuries. The direct costs of employers includes all those costs of occupational injuries for which monetary payments are made as stated by labour proclamation law, these costs are employer payments into employment injury insurance funds, workers compensation payments to injured or incapacitated workers, wage paid to workers during an injury- induced absence (sick pay) and medical expenses for which the employer is held responsible, the latter three costs are net of reimbursement by insurances [20, 21].

Table 1: Cost of injury according to Ethiopian labour proclamation law [20]

Cost of injury	Definition	Type of costs
Emergency services and transport costs	All emergency services that may be used during a work accident	Provision of first aid service; Transporting the injured employee to the nearest medical facility.
Medical benefits	Expenses incurred to treat the injury It is payable in addition to disability or death scale of benefits	General and specialized medical and surgical care; Hospital and pharmaceutical care;
Temporary disability compensation	Reduction of worker's capacity for a limited period of work time partially or totally	Monthly wage for 12 month
Permanent total disablement compensation	Prevents the injured worker from engaging in any kind of remunerated work	Sum equal to five times his annual wages to the injured
Permanent partial disablement compensation	1) Injury results in decreasing the injured worker's capacity. 2)Injury that cause serious mutilation or disfigurement	Percentage of five years' wage (proportion to the degree of the disability)
Funeral expenses	All costs incurred to bury a deceased worker	not less than two month wage of the worker
Death benefit	All costs incurred to compensate the dependant's of a deceased worker	Sum equal to five times the annual wage

The insurance companies' provides two types of insurance coverage WC and GPA; WC covers for events occurred at workplace during the time of work, whereas GPA provides cover on job or off the job hours or both (24 hour coverage). For insurance companies to cover medical and compensation costs the employer would pay certain amount of premium annually [22]. The premium paid depends on factors related to risk in the employer's and occupation, number of workers and wage rates. This insurance costs or premium can be seen as a general cost of injury in the sense that if there were no injury, there would be no need to pay for insurance [18].

In addition, premiums paid by employers are experience rated, which may encourage them to reduce work-related injuries and disabilities [23]. Payments for workers' compensation claims are record for the insurance company administrative purposes yet the record may contain useful information on gender, age, payments, part-of-body injured, industry sector, occupation, and disability status (partial and temporary disability).

As a result, workers' compensation data can be used to estimate the (1) magnitude (2) severity, (3) cost, and (4) frequency of many injuries, and to look at trends over time. However, if information from multiple sources could be combined, WC insurance records would permit informative analyses of costs [23, 24].

Indirect costs are lost opportunities. In contrast to direct costs, indirect costs do not usually involve out-of-pocket expenses and are not usually insured. In most cases, however, it is not possible to actually measure the productivity losses. To overcome this problem, most researchers use the human capital method. However, it was claimed that the human capital method overestimates productivity losses because it evaluates the "potential" productivity loss instead of the "actual" loss [24].

Therefore, the friction cost method produces estimates that are more tangible for employers and in economies where there is no full employment [18, 24]. However, the main indirect costs of employers/establishments are: Production disturbance; the production process may be halted due to an injury.

- Absence of the insured worker; employers may lose productivity when workers are away from their jobs. Note that reduced productivity due to this and other causes may appear not only in the form of reduced output, but also deterioration in quality or timeliness.
- Negative effects on co-workers; co-workers may be distracted or suffer a loss of morale as a result of an injury or illness episode
- Compensatory overstaffing; employers may employ extra workers in anticipation of future absences due to work-related injury; and
- Reduced productivity when workers' health is impaired; this referred as "presenteeism".

Additionally, administrative costs and recruitment indirect costs are potentially significant in their impact, are difficult to observe and quantify.

Increased operating expenses: Absenteeism increases operational costs of a company. If an employee doesn't go to work, his/her work will be assigned to other colleagues that have already workload. Work overload can lead to delays in the delivery times of projects and management will have to pay for overtime to other employees. Thus, operating costs will be increased. The collapse of employee morale: Work of the absent employee overloads another employee and this additional workload definitely affects the morale of these employees negatively.

This situation not only decreases efficiencies of employees, but also increases stress. Even if employees get payment for extra work hours, this will result in the lack of communication in the workplace and extra cost for the company. Moreover fail of management to cope with absenteeism will decrease in employees 'motivation. Delays on the project: If an employee doesn't come to work in a regular basis, there will be inevitable delays on the projects and thus, this situation would increase operational costs and therefore decrease customer's satisfaction [21, 23-25]. This study aimed to estimate the economic costs of occupational injuries in the manufacturing sector of Addis Ababa and examine factors affecting cost of injury.

3. Objectives

3.1. General Objective

- The general objective of this study is to estimate the economic costs of occupational injuries for manufacturing sector in Addis Ababa during 2014/15, using company perspective.

3.2. Specific Objectives

- To identify the number and characteristics of occupational injury cases that involved absence from work during the study period 2014/15;

- To estimate the economic costs (direct and indirect costs) of occupational injuries and its budget impact for the manufacturing sector during the study period; and

- To identify factors affecting cost of injuries in the manufacturing sector during the study period.

4. Methodology

4.1. Study Area

This study was conducted in the manufacturing sector of Addis Ababa city. In the city there are seventeen; one public and sixteen private insurance companies were available that provides work related injury insurance coverage. Addis Ababa is the largest as well as the dominant political, economic, cultural and historical city located in the heart land of the country in an area of 540 square kilometres. It is situated between 9 degrees latitude and 38 degrees east longitude in the plateau that stretches at the range of 2,200-2,800 meters of latitude above sea level.

The city is structured in to 10 Sub-Cities and 116 Woredas with a total projected population of 3,194,999 for the year 2014/15 of which 1,522,379 (47.6%) are males and 1,672,620 (52.4%) are females. The rate of natural increase of the population is estimated to be 2.1 while considering the net migration the total population growth rate is 2.8%. According to the information from BoFED the dependency ratio is calculated to be 37.4% for the year 2011/12. In terms of literacy the CSA 2014/15 data shows about 85.3 percent of the population of which 91.3% are males and 79.9% are females.

The CSA 2014/15 data indicates that Addis Ababa is the main economic centre of the country. About 63% of the population aged 10 and above years that are economically active groups can be engaged in some kind of employment. According to the socio-economic profile of Addis Ababa, the peak employment age is represented by 20-29 age groups (34%). Employment to population ratio of the city during 2010, 2011 and 2012 was 44.89%, 47.17% and 45.86 % respectively.

The total unemployment rate at city level in the year 2000 were 31.4% thus, declines to 25.1% in 2012. When compared with unemployment status at country level which were 24.1%, in Addis Ababa the situation was more serious. The investment sector is a major source of revenue and employment opportunity of Addis Ababa city. About more than 100 large scales and 2,209 small and medium scale including cottage factories and handicrafts registered in the city. The manufacturing sector absorbs a total of about 114,000 workers (18% of the total employment) and registered 695,717,529 Birr capitals by 2012 [26, 27].

However, according to the 2011/12 Central Statistical Agency (CSA) Large and Medium Scale Manufacturing and Electricity Industries Survey report in Addis Ababa there are approximately 874 manufacturing industries employing 10 and above workers operating in the city, which constitute 48% of the manufacturing industries of the country until mid of July/2015 [28].

4.2. Study design

The study was a cross sectional survey design conducted from December 2015 to June 2016. The cost estimation was based on company perspective to consider cost components for analysis and the prevalence based model as a time frame [29].

4.3.Source population

- Workers employed in manufacturing sector of Addis Ababa employing 10 and above workers during 2014/15.

4.4.Study population

- Fatal and non fatal injured cases of manufacturing industry workers during 2014/15.

4.5.Inclusion criteria

- Any injured workers with lost workday during 2014/15.
- Any injured cases with insurance compensation payment through WC insurance policy coverage during 2014/15.

4.6. Study variables

Dependent variable: the dependant variables will be direct and indirect costs incurred by manufacturing industries.

Independent variable: the independent variables includes age, sex, education, occupation/job title, use of PPE, work experience, shift work schedule (accident time), status in employment, type of injury, injured body parts, type of establishment, absence from work due to injury, level of disability and cause of injury [6-10].

Disability measurement: temporary disability, permanent partial disability, permanent total disability and death [22].

4.7. Operational definition

Occupational injury: injuries resulting in an absence from work of at least one day [36].

Perspective: perspective refers to the "point of view" taken to identify relevant cost components included in the study [29].

Prevalence approach: this approach assesses the costs associated with the number of people who have any occupational injury in a year, with the incident potentially occurring in the current or past years [29].

Lost workday: lost days counted from the day of the accident, measured in calendar days and working days lost to measure severity of the injury as well as the economic impact for both the worker and the employer respectively [36].

Average days lost: average number of days lost per case of temporary incapacity [36].

The company or employer direct costs: are those costs that are directly associated with the accident such as payments made by firms or insurance company including compensation, medical expense, sick pay or payment made according to the labour proclamation employment injury benefit [29].

The employer indirect costs: are also costs that are indirectly linked to the accident such as production losses and other intangible costs [29].

4.8. Method of Sampling

4.8.1. Sampling frame

The study sampling frame includes both public and private manufacturing establishments identified from 13 insurance compensation payments in Addis Ababa in 2014/15. At the beginning of the study a fresh list of 118 manufacturing establishments was prepared using the available data collected from administrative records. Therefore, to select sample establishment's for primary data collection the identified 118 manufacturing establishments was stratified in to 9(nine) stratum according to EISC [30].

4.8.2. **Sample size and sampling procedure**

The study uses business establishment as the unit for data collection, since it is the basic unit within the enterprise which carries out a single type of economic activity, it would mean that the data can be classified adequately according to each industries economic activity, which facilitates the collection of data by industry. The source population of the study consists of 118 establishments stratified in to 9 industrial groups based on their economic activity were used to estimate the sample for the study [31]. When stratified sampling is used, we must know how big the total sample and how the sample must be distributed across the strata.

This can be done by determining the total sample size and distributing it across the strata to minimize the variability determined based on the following formula [32].

.4.8.*2.1. Stage 1: Selected establishments stratified based on economic activity*

Calculate the total estimated sample size, ($n_{1)}$:

Where n_1 is the sample size, N is the total population of MLSs and margin of error (e) was considered 0.1(10%). This margin of error was considered 0.1 by considering the stratification almost always increases the precision of sample size estimation [32] and the supplementary data collected from insurance companies;

$$n1 = \frac{N}{1 + N(e)2}$$

$$n1 = \frac{118}{(1 + 118(0.1)2}$$

$$n1 = \frac{118}{2.18} = 54(\text{Sample size})$$

The calculated total sample size is n=54. This total sample size was distributed into nine (9) stratums using sampling fraction $(f) = \frac{n2}{n1}$. This allocation method is the proportional allocation method, $\text{i. e}\frac{54}{118} = 0.4576$.

Table 2 Showing the distribution of establishments by industrial group and samples taken

No	Industrial group/stratum	Study population	Sample size (0.4576)	Final SS (0.3333)
1	Food products, bev. and tobacco	20	9	3
2	Textiles and Wearing apparel	6	3	1
3	Leather; products of leather	9	4	2
4	Paper, paper products; prit & publ	9	4	1
5	Chemicals and chemical products	11	5	2
6	Rubber and plastic products	11	5	2
7	Other Non-metallic minerals	11	5	2
8	Basic products, M&E	39	18	5
9	Furniture	6	3	1
Total		**118**	**54**	**18**

However, the study decided to selects only 1/3 of the calculated total sample size n=54 to be included in the study. This gives raise the final total sample size of 18.

This final sample size were allocated, across nine strata proportionally using estimation ratio, i,e. $\frac{18}{54} = 0.3333$. Finally, a total of 18 representative sample of establishments were selected from the sampling frame each stratum, using simple random sampling procedure.

4.8.2.2. *Stage 2. The first stage sampling units were establishments. Injured workers were selected at the second stage.*

The sample size was calculated using a single population proportion formula. By assuming P=prevalence of injury among manufacturing workers= 36.9%=0.369 from the study (2013) conducted in textile factory [33]$\frac{Z\alpha}{2}$ =the critical value at 95% confidence level of certainty (1.96) d=the margin of error between the sample and the population 5%. The actual sample size:

$$\underline{(Z\alpha\backslash 2)2}\frac{p(1-p)}{(d)2}$$

$$\underline{(1.96)2} * \frac{0.369(1-0.369)}{(0.05)2}$$

$$3.8416 * \frac{0.233}{0.0025} = \underline{\mathbf{358}}$$

The study considers non response rate of 10%. Thus, the required sample size calculated to be **398** to collect primary data from injured workers of 18 selected establishments from each 9 stratum through interview to support the cost analysis.

The data collected from administrative records of injury indicate that in the randomly selected 18 establishments the total number of injuries that occurred during 2014/15 was 916. The allocation ratio were $\frac{398}{916} = 0.4345$, at the same time the allocated sample size for each stratum was distributed to each establishments in the stratum proportional to number of injuries of 18 establishments. Finally, data were collected from injured workers per establishment selected using simple random sampling technique and interview using questionnaire.

Table 3 Allocated sample size of respondent workers per establishment per stratum

No	Industrial group/stratum	Sampled establishments	No of injury	Allocated sample size (0.4345)
1	Food products, bev. and tobacco	3	139	60
2	Textiles and Wearing apparel	1	130	57
3	Leather; products of leather	2	19	8
4	Paper, paper products; prit & publ	1	44	19
5	Chemicals and chemical products	2	37	16
6	Rubber and plastic products	2	248	108
7	Other Non-metallic minerals	1	21	9
8	Basic products, M&E	5	245	107
9	Furniture	1	33	14
	TOTAL	**18**	**916**	**398**

4.9. Method of Data Collection

The data collection process were organized in to two stages; at the first stage data was collected from administrative records of insurance companies and BoLSA aimed to identify manufacturing establishments and injured cases for the reference period. The administrative data also served as to build sampling frame in order to select establishments and injured workers in it for primary data collection. Because of high injury undercounting/underreporting no single source of data can completely enumerate all cases [34]. It is important to combines data collected by a questionnaire with administrative data. Therefore, the study was conducted by combining data collected from primary sources and administrative records.

As a result, multisource data collection approach has been applied for data collection purpose. The data was collected from nine different type of sector within manufacturing industry. Which includes manufacture of food, beverage and tobacco; textile and wearing apparel industries; manufacture of leather and products of leather; wood and paper products, printing and publishing; chemical and chemical products; rubber and plastics; other non-metallic minerals; basic metals, machinery and equipment; and furniture or recycling.

Insurance company's 2014/15 compensation and BoLSA record were reviewed in order to get all injured cases. Only injured cases occurred in 2014/15 are taken into consideration and it is limited to lost workday. Besides, first aid cases (which have no lost work day) were excluded from the study. Finally, there are 3,769 cases from 118 establishments were available in total after data verification process is completed. And, 398 randomly selected injured cases from randomly selected 18 establishments were interviewed.

For 18 establishments and 398 sampled occupational injured cases, the OSH officers, account department officers, production managers and injured cases were interviewed in order to estimate the actual cost for each cost component and to identify factors affecting costs. The cost components taken into account are medical cost and compensation cost. In contrast, indirect cost comprise of: (a) productivity loss including (a_1) absenteeism considering worker replacement cost using multiplier (a_2) presenteeism considering decreased work performance cost using multiplier.

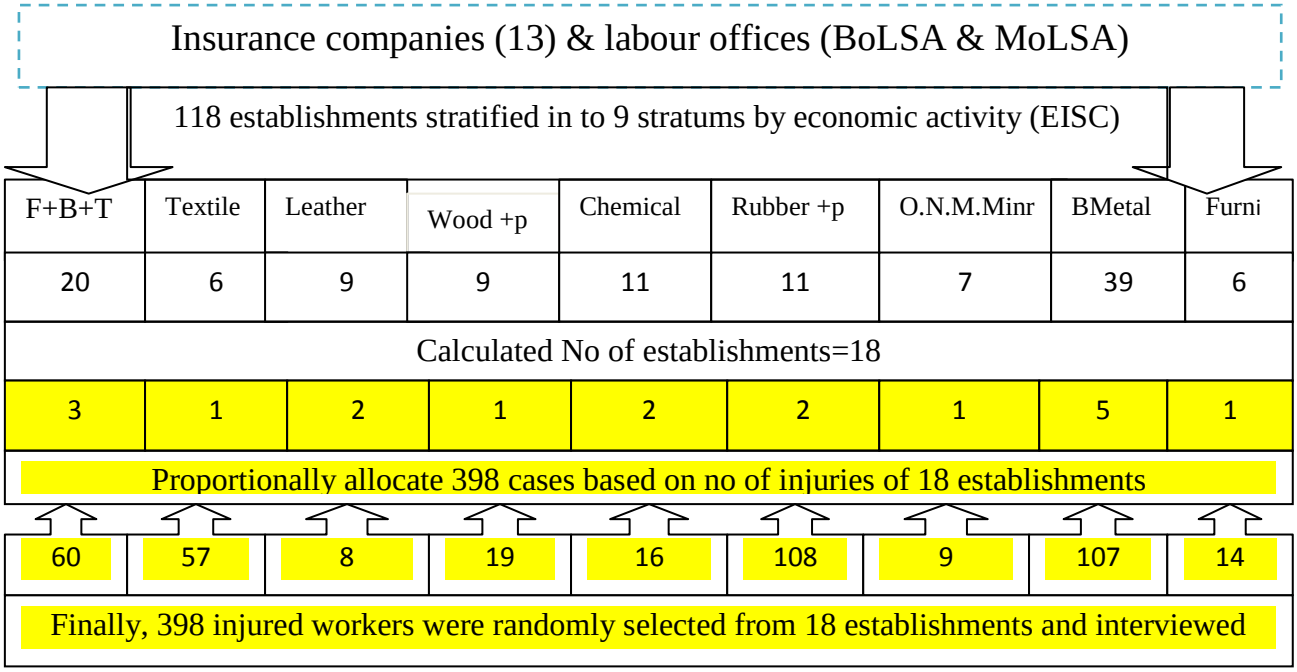

Figure 1: diagrammatic presentation of sampling procedure (2 stage sampling

4.9.1. Data from secondary sources (administrative data)

The administrative data was collected from administrative records of 10 sub cities BoLSA OHS departments, MoLSA, 13 insurance companies head office, and 18 manufacturing industries. A total of 118 manufacturing industries work-related injury data was collected. The study targets 17 insurance companies to review injury compensation payment for 2014/15. At the time of data collection only 13(76.5%) of them were willing to provide the information based on their interest, the other 4 companies were not participated in the study. Among the 13 participated insurance companies 10 of them constitute 96.81% of the total insurance market share in Ethiopia [35].

The data collected from insurance companies was undertaken after discussion and understanding of how the insurance claim information was recorded and generated from insurance companies accounting system, and how consistent across insurance companies were examined to determine the reliability and validity of the data and then the data collection format was developed accordingly. The common variables extracted from all insurance companies using administrative approach includes like name of manufacturing industries, premium payment, number of injured workers (nonfatal and fatal), compensation payment by number and amount paid for each type of disability (temporary total disability (TTD), permanent total disability (PTD), medical or sick leave and other) and lost work day.

The data collected from insurance companies was enough to estimate the cost by level of disability. However, the study has an objective of identifying factors that affect costs of injuries in order to recommend OSH intervention measures. Therefore, the primary data was collected from sampled 398 injured workers among selected 18 establishments using stratified simple random sampling. The sampling method was as follows.

4.9.2. Content and organization of the survey questionnaire

The primary data collection tools were covered detailed socio-demographic background variables such as age, sex, educational level, experience, employment status, absence workday, injury characteristics and work environment factors. The survey has used a structured questionnaire to produce the required data in the study, which mainly adapted from ILO statistics of occupational injuries [36]. The data from injured workers was collected using structured pre tested questionnaire through interview of respondents. The draft questionnaire was pre-tested in 39 workers from different manufacturing industries in Sebeta industrial areas and finally the questionnaire was amended.

The questionnaire used to collect data from injured workers was translated in to Amharic language. The data collection begins with by explaining the purpose of the study and obtaining informed consent. The interview and discussion with key informants was managed by the principal investigator with one assistant note taker. The data was collected by eight data collectors that were recruited from level two TVET students. Those data collectors were supervised by two occupational health degree graduates. A three day training complemented with practical exercise was given to data collectors and supervisors regarding the aim of the study, data collection tool and procedures through reviewing the questionnaires page by page.

4.9.3 Data from establishments and injured workers

4.9.3.1. Data from establishments

An official permission was taken by the investigator from establishment authority. Workers who were included and willing to participate were informed about the purpose and the nature of the study; data were collected through structured interviewing questionnaire with the assistance of OHS officer, clinic staffs, production manager's administration managers, safety officers and insurance dealers of establishments. The data from establishments were collected in two forms through interview of 18 establishments and 36 establishment data also collected through self-administered questionnaire to collect additional data on the total number of injury and total absent workday. The data from establishments were collected using formats organized as follows.

Section - 1: Number of workers (sex, job category, number of workers);

Section - 2: Injury and sick leave (Number of injured workers, death, Total number of days lost, sick leave pay)

Section - 3: Insurance premiums payment and annual operating budget

4.9.3.2. Data from injured workers

These data was collected with respect to individual cases of occupational injury, collection of more detailed information. A total of 398 injured workers data were collected to obtain detailed data from injured workers who has at least one day lost work day during 2014/15 in order to examine factors influencing costs of injury. However, 91 injured workers were not at work and the data was collected from the administrative record of the companies. The Questionnaire was organized in to six sections;

Section - 1: Informed consent: The data collection were begin with by explaining the purpose of the study and obtaining informed consent

Section - 2: Socio- demographic characteristics of individuals: it consisted of the general socio-demographic characteristics of the population such as age, sex, education, job status, job category, service year, monthly wage and benefit.

Section – 3: Injury characteristic: this section dealt with a range of questions (type, cause, body part, agent, date, time) which helps to see the cause and severity of injury

Section – 4: **Injured worker replacement costs**, incapacity/job change and decrease in wage, medical expense, injury compensation payment

Section – 5: **Working environment** (working day/week and Hr/day and use of PPE)

Section – 6: Workers behaviour (sleeping disturbance)

4.10. Data triangulation, editing and cleaning

The data were collected from multiple sources including both primary and secondary data sources using different approaches; interview, discussion and record/report review and self-administered questionnaire. To ensure the quality of those data collected from multiple sources, the collected data were triangulated, edited, standardized and complemented. The triangulation strengthens the study by making the data more valid and credible [37]. Then the data collected from primary source were entered in to SPSS and the analysis results were aligned or combined together to provide descriptive analysis of findings; socio demographic background, magnitude, characteristics, severity and cost of work related injuries.

4.11. Data Analysis

This study estimates employers cost of occupational injury based on ILO recommendation for estimating the economic cost of occupational injuries in developing countries. The cost estimation was analyzed based on objective (tools used by OSH economic consultants) and subjective measures (absenteeism and presenteeism multipliers) [5]. The data collected from primary sources were coded, cleaned and entered in to Epi-data; all data were analyzed using SPSS V20.

The relationship between independent variables, including age, gender, education, job title, use of PPE, work experience, shift work schedule, type of employment, absent work day, injured body parts, type and cause of injury, on the magnitude of cost incurred by employers (direct and indirect) due to injuries was evaluated using multiple linear regression analysis; P-value (<0.05) and 95% confidence interval (CI), correlation coefficient (R^2) was used in judging significance of the association between costs and causes of work related injury.

The method used is stepwise. It means that the independent variables entered are removed based on their association into model and finally, only few variables that have significant association with the outcome variable were reported. Additionally, the qualitative data were also be cleaned, edited and analyzed thematically and then interpreted to each of the research objectives manually. Then the result will be presented in narration with quantitative findings to describe the variables.

4.12. Estimation of direct and indirect costs

The study was conducted using prevalence approach, in order to identify injured cases for the study and company perspective to consider cost components for analysis of the study reference period of 20014/15 (2007 EEY), this case identification method was chosen because it is more suitable to find out the total economic burden of injury during the reference period [29]. The identified number of annual cases of workplace injury is important drivers of the total cost estimation.

In addition to this, the associated absence work day from these cases is important in determining costs. Some direct costs, such as lost income and production are directly related to absent working day. Other costs, such as healthcare costs and non-financial human costs, use absence workday to infer severity [38]. The costs of occupational injuries for the employer include both direct and indirect costs. However, researchers recommended a change in terminology from direct and indirect to insured and uninsured costs.

The indirect costs include lost production and productivity because of absence from work as a result of injury and the direct costs are compensation and medical payments. The direct cost of injuries was estimated using a ‘top down’ approach to allocate compensation expenditures across disability groups. Finally, the estimated costs of injury using local currency (Birr) were converted to May 2016 exchange rate of 1 USD =21.7167 Birr.

4.12.1. Estimation of indirect costs

The indirect costs is a productivity loss costs composed of two kind of costs; absenteeism lost productivity cost due to absence of the worker and presenteeism lost productivity cost due to decreased work performance of the worker. The indirect costs are proportional to wages. The higher wage in the estimation, the productivity costs becomes higher.

The study objectively measure health related lost productivity based on lost work day due to injury. Sick leave was used as a proxy measure, whether the sick leave was compensated or not [39]. The estimation includes: (1) lost work time due to the worker being absent from work (2) lost work day time due to workers being present in the workplace but still unable to perform all their duties because of incomplete recovery; and (3) lost work day time due to workers are at work in their original functions, however, perform their tasks less effectively due to injury. To estimate the loss in monetary terms the following labels are used as proxy measure: (1) absence work day or sick leave and (2) work-presenteeism. This study uses lost work day collected from multiple sources (insurance, company and BoLSA) [29].

4.12.1.1. Absenteeism costs

This study costs loss of production output for employers, from absent workers, using the friction cost method. This method assumes, most economies do contain structural unemployment. This means the employer can replace workers who have been absent for long periods of time. Based on this assumption short-term cost until production is restored to pre-incident levels (production disturbance costs) was considered in the cost calculation. In this approach the total number of sick day absences is multiplied by the average daily wage and the fractional value of the absence lost productivity multiplier to produce the lost productivity costs of absences [29, 40].The multiplier used is defined as the cost to the employer of an absence as a proportion (often greater than one) of the absent worker's daily wage.

It considers that losses may be partially compensated by greater effort, paid overtime work or unpaid overtime of the worker or other team members, as well as by new hires. The median multiplier is 1.28, which supports the view that the cost to the employer of missed work is often greater than the wage [41]. Therefore, the assumption realized that the loss of revenue results the employers to spend extra efforts to replace absent workers. The formula for absenteeism is:

Absenteeism costs=Av lost workdays × No of injured cases ×Av daily wage ×1.28 [39, 41]

The estimation was based on the principle that the work performed by injured workers was done by another worker in the company but there is production disturbance for short period of time until the injured worker is replaced by other

4.12.1.2. Presenteeism costs

This denotes ‘inefficiency against normal job performance without sickness absence’' because of injury related illness. This underperformance on the job considered as equivalent to absence work days with full payment. This episode of presenteeism increases the per-unit costs of labour inputs. Therefore, the amounts by which each episode of presenteeism shortens a work day are summed to estimate equivalent absence work days [42]. However, as opposed to absenteeism presenteeism is not immediately visible to an employer and may not provoke a conscious response [42].

When a person comes to work with a temporary acute condition [or a chronic condition] for one day, compared to the situation when the person is not injured. Employers must pay the costs. These costs include the value of the lost productivity, covering for the sick worker; any negative impact the injury has on the productivity of other worker, any sales lost due to reduced productivity, and any expenses to accommodate the worker’s condition. 'The answer for this question could be given as a percentage of the worker’s daily wage or a specific dollar amount [41, 42].

The study that generated the iceberg diagram (right) demonstrated that the overwhelming proportion, 70%, of the full cost of poor employee health is caused by absenteeism and presenteeism. The other studies quoted in this Productivity Insight lead us to the conclusion that the majority of that 70% productivity loss is caused by presenteeism. Generally, research has shown that “presenteeism” i.e. sick workers coming to work, costs employers more than “absenteeism” because sick workers put their co-workers at risk and are less productive [38]. The formula used to estimate cost of presenteeism is;

Presenteeism costs= Av lost workdays × No of injured cases ×Av daily wage × 1.5 [42]

4.12.2. Estimation of direct costs

The study considered direct costs such as employer premium payments, compensation payments to injured, incapacitated or deceased workers, salaries paid to workers absent due to injury and medical expenses. The employers were responsible to pay employment injury insurance premiums regularly, but the latter three costs were reimbursed or paid on behalf of the employer by insurances.

The study calculates the fatal and nonfatal cases direct costs of injury using data from 13 out of 17, which is 76.5% of the insurance companies because the Ethiopian labour law enforce employee to pay wage costs and other benefits since the day of injury [20, 22]. The total direct costs were estimated by taking the average cost of 3,769 injured cases medical costs and disability payments for TTD, PPD and PTD cases by each economic activity and multiply by total number of injuries. Finally, the costs were aggregated at employer level, to estimate the total cost of injury [29].

4.13. Ethical Considerations

Interviewers informed each interviewee of the study objectives and explained that information would be kept confidential; participants would not be identified by name when data were analyzed. Participation was voluntary and oral informed consent was obtained for participates of the study. The study was approved by Addis Ababa University College of Health Sciences School of Public Health Institutional Review Board.

5. Results

5.1. Number and Characteristics of Occupational Injuries

A total of 3,769, fatal 7(0.2%) and non-fatal 3,762(99.8%), injury data was collected from 118 employee injury compensation claim record. The mean (±SD) age of the injured cases was 34.74±12.64. Among them 75% (2,805) were male and 86.7% (3,268) was permanent employee's.

Table 4 Socio demographic characteristics of injured workers, Addis Ababa, 2016 (n=3,796)

Variables	Variable sub-group	Frequency	%
Injured cases	Food, beverage and tobacco	699	18.5
	Textile and wearing apparel	362	9.6
	Leather and leather products	256	7
	Wood and paper pro; print and pub	128	3.4
	Chemicals and chemical products	276	7.3
	Rubber and plastic products	664	17.7
	Other non-metallic minerals	78	2.1
	Basic metals, Machinery & Equipm.	1,216	32
	Furniture	90	2.4
Sex	Male	2,805	75.9
	Female	964	24.1
Age	14-24	1,079	28.6
	25-34	1,004	26.6
	35-44	645	17.1
	45-54	720	19.1
	55+	321	8.5
Level of education	Read and write	283	7.5
	Primary education(1-8)	889	23.6
	Secondary education(9-12)	1,353	35.9
	TVTC/ diploma	1,195	31.7
	Degree	49	1.3
Salary	500-1500	1,564	41.5
	15001-3000	976	25.9
	3001-5000	984	26.1
	5000+	245	6.5
Occupation	Machine and related operators	946	25.1
	Welders and metal related workers	682	18.1
	Factory production and related worker	1,137	30.2
	Mechanics and technicians	813	21.6
	Tools keepers and related workers	105	2.8
	Elementary occupations	86	2.3
Employment status	Permanent	3,268	86.7
	Temporary	501	13.3
Work experience	<1 years	863	22.9
	1-5 years	1,172	31.1
	5+ years	1,734	46.0

Source: Administrative data complemented with primary data

The data in the table indicate that in one year period more than 75% of injuries occurred in four manufacturing subsectors; basic metals, 1,216 (32%), food, beverage and tobacco industries 699(18.5%), rubber and plastic products 664(17.7%) and textile and wearing apparel 362(9.6%). Among the injured cases, 67.1% were below grade 12. At the same time, the job title for 50 % of the injured workers were, factory production and related worker 1,137(30.2%) and machine and related operators 946(25.1%).

Table 5: characteristics of injury

Variables	Variable sub-group	Frequency	%
Types of disability	Temporary total disability	2026	53.7
	Permanent partial disability	1652	43.8
	Permanent total disability	84	2.3
	Death	7	0.02
Cause of injury	Acid and hot substance	283	7.5
	Collision	539	14.3
	Electricity, fire and explosion	75	2.0
	Falls(Person and material)	645	17.1
	Conveyors	57	1.5
	Foreign body	68	1.8
	Hit by objects	369	9.8
	Lifting heavy material	113	3.0
	Machine	720	19.1
	Splinters	124	3.3
	Hand tools	482	12.8
	Miss handling	294	7.8
Type of injury	Abrasion	645	17.1
	Burn	256	6.8
	Cut and mutilation	520	13.8
	Dislocation and sprains	264	7.0
	Ear injury	19	.5
	Electrocution	11	.3
	Eye injury	207	5.5
	Fracture and crush	245	6.5
	Puncture	1602	42.5
Injured body parts	Head ,face and neck	245	6.5
	Hand and finger	1836	48.7
	Eye injury	275	7.3
	Ear injury	19	.5
	Leg and foot	814	21.6
	Back; spine and vertebra	283	7.5
	Chest and shoulder	94	2.5
	Multiple location	132	3.5
	Teeth	72	1.8

Source: Administrative data complemented with primary data

The 3,769 injured cases disability status indicate that temporary total disability 2,026(53.7%), permanent partial disability 1,652 (43.8%), permanent total disability 84(2.3%) and 7 death (0.02%). The disability status by industrial group (See Table 6).The injured employee affected body part, types and causes of injury from the available data indicate that more than 75% of the affected body parts were hand and finger 1836 (48.7%), leg and foot 814(21.6%) and back; spine and vertebra 283(7.5%).

Regarding types of injury, puncture 1,602(42.5%), abrasion 645 (17.1%), cut and mutilation 520 (13.8%) and dislocation and sprains 264 (7%) accounted for 80% type of injuries. Similarly, 80% of the injuries are caused by six causative agents; machine 720(19.1%), falls (person and material) 645(17.1%), collision 539(14.3%), hand tools 482(12.8%), hit by objects 369(9.8%) and miss handling 294 (7.8%) respectively.

Table 6 Disability category by industrial group, Addis Ababa, 2014/15 (n=3,769)

Industrial group	Injury	TTD(%)	PPD(%)	PTD(%)	death
Food, bev.&tobacco	699	275(13.6)	416(25.2)	8(9.5)	--
Textile and W. apparel	362	68(3.4)	293(17.7)	--	1
Leather products	256	219(10.8)	36(2.2)	--	1
Wood and paper p., p&p	128	91(4.5)	33(2)	4(4.8)	--
Chemicals products	276	183(9)	92(5.6)		1
Rubber & plastic produc	664	271(13.4)	368(22.3)	25(29.8)	--
Other N-metallic miner	78	--	78(4.7)	--	--
Basic metals, M & E	1216	902(44.5)	276(16.7)	34(40.5)	4
Furniture	90	17(0.008)	60(3.6)	13(15.5)	

Source: insurance compensation payment data during 2014/15

5.1.1. Length of absence work day

Table 7 Short, medium and long absence workday due to injury, Addis Ababa, 2014/15 (n=3,769)

Industrial group	Injury	<3 days	4-30 days	>30 days(%)	Total absence day	average
Food , bev. & tobac.	699	232	435	32	5,592(20)	8
Textile & W. apparel	362	245	102	15	2,896(10)	8
Leather products	256	142	104	10	1,920(7)	7.5
Wood & paper p., p.p.	128	79	43	6	896(3)	7
Chemicals products	276	110	157	9	1,656(6)	6
Rubber & plastic pro	664	453	182	29	3,984(14)	6
Other N-metallic miner	78	0	74	4	780(3)	10
Basic metal pr, M& E	1,216	506	653	57	9,120(32)	7.5
Furniture	90	44	32	14	1,350(5)	15
Total	**3,769**	**1,811(48)**	**1,782(47)**	**176(5)**	**28,194**	**7.5**

Source: data from administrative sources during 2014/15

Table 7 shows injured cases absence work day because of injury, 28,194 days are lost because of injury among them 48% absent for <3 days , 47% cases absent from work from 4-30 days and 5% for > 30 days in the year 2014/15. The average absence workday in the manufacturing sector was 7.5 days. Additionally, more than 75% of days are lost in 4 manufacturing subsectors; basic metal products, 9,120(32%), beverage and tobacco industries 5,592(20%), rubber and plastic products 3,984(14%) and textile and wearing apparel 2,896(10%).

As the data in table 7 indicates, as a result of injury more than 50 % of injured works are absent from work for more than 4 days. The highest average absence work day was 15 day in furniture subsector and the lowest absence work day was 6 day, recorded in two industrial groups; chemicals and chemical products and rubber and plastic products. The range of absent workday was higher in three industrial groups; furniture, basic metal and leather products industrial group. However, basic metals and food, beverage and tobacco industrial groups were the top two industrial groups in all three absence workday divisions; short, medium and long absent workdays.

5.2. Calculating Direct and Indirect Costs of Occupational Injuries

5.2.1. Direct cost of injuries

Table 8 injury compensation claim payment by level of disability Addis Ababa, 2014/15 (n=3,769)

I.G	Nonfatal(NF) cases					NF +F cases		
	Medical	TTD	PPD	PTD	Fatal(F)	Total cost	%	Average
Food,B&T	1,005,212	237,600.00	2,347,696	49,160	--	3,638,668.00	27.5	5,205.50
Textile&WA	79,420	59,622.40	156,137	--	49,944	345,103.40	2.6	953.30
Leather Pro	71,859	247,853.30	333,288	--	126,000	779,000.30	6	3,043.00
Wood&P,pp	153,561.6	105,105.00	159,604.5	40,708	--	458,979.10	3.5	3,586.00
Chemical Pr	178,475	177,876.00	723,611.2	--	113,740	1,193,542.20	9	4,324.00
Rubber&plas	347,803.2	291,102.80	154,302.4	12,945	--	806,153.40	6	1,214.00
ONMetallic	40,716	--	1,310,560	--	--	1,351,116.00	10	17,322.00
Basic metal	1,851,330	766,609.80	785,082	356,932	233,191	3,993,144.80	30.3	3,284.00
Furniture	128,502	64,614.50	344,496	91,943.8	--	629,556.30	5	6,995.00
Total	3,856,879	**1,950,384**	**6,314,777**	**551,689**	**522,875**	13,195,263.5		
Average	**1,023.3**	**962.7**	**3,822.5**	**6,567.8**	**74,697**	**3,501**		

Source: Insurance companies injury compensation record (2014/15)

The table presented that the medical and compensation payment for 3,769 fatal and non-fatal cases during 2014/15 was 13,195,263.5 Birr and the average payment was 3,501 Birr per injured employee.

The medical payment was 3,856,879 Birr, which consists 29% of the total cost, TTD compensation payment was 1,950,384 Birr, which consists 14.8% of the total costs. PPD compensation payment was 6,314,777 Birr, which consists 47.8% of the total cost and PTD payment was 551,689 Birr, which consists 4.2% of the total cost. Death compensation payment was 522,875 Birr, which consists 4% of the total cost. Additionally, the average payment for medical, TTD, PPD, PTD and death compensation was 1,023.3 Birr, 962.7 Birr, 3,822.5 Birr, 6,567.8 Birr and 74,697 Birr respectively.

The TTD cases accounted for 53.8 %(2,026) of all injury cases; their contribution to the total costs were 14.8%. On the other hand, PPD cases accounted for 43.8 %(1,652) of all injury cases but their contribution to the total costs was 47.9%: the PTD cases accounted for 2.2 %(84) of all injury cases but their contribution to the total costs was 4.2% and also fatal cases accounted for 7 (0.2%) of all injury cases but their contribution to the total costs was 4%. Furthermore, more than 50% of the compensation was absorbed by 2 industrial groups; food, beverage and tobacco products (27%) and basic metal products (29.7%). Additionally, a total of 19,271,196.1 Birr premiums were paid for the year 2014/15 by 118 establishments. The average premium payment was 163,315 Birr. The higher insurance premiums can be a result of poor safety and health condition within a company.

5.2.2. Indirect costs of injuries

The absenteeism and presenteeism costs were estimated using formula (1) and (2).To estimate productivity costs, the mean wage of the injured employee in an industrial group was taken to estimate the daily average wage. The productivity cost; presenteeism and absenteeism combined are 10,444,401 Birr (497,352 US$). The absenteeism cost constitutes 4,665,551 Birr (45%) and presenteeism 5,778,850 Birr (55%) of the total productivity cost.

Table 9 indirect cost of injury during 2014/15, Addis Ababa, 2014/15 (n=3,769)

Industrial group		Injury	Mean wage	Absenteeism	Presenteeism	Total	Av/case
Food,B&T	20	699	108	737,649.00	905,904.00	1,643,553.00	2,351
Textile&WA	6	362	109.6	389,440.00	476,103.00	865,543.00	2,391
Leather Pro	9	256	150.9	356,366.00	434,592.00	790,958.00	3,090
Wood&P,pp	9	128	165	180,365.00	221,760.00	402,125.00	3,142
Chemical Pr	11	275	162	332,191.00	402,408.00	734,599.00	2,671
Rubber&plas	11	664	179.03	873,094.00	1,069,883.00	1,942,977.00	2,926
ONMetallic	7	78	175.1	165,855.00	204,867.00	370,722.00	4,753
Basic metal	39	1216	113.32	1,260,844.00	1,550,218.00	2,811,062.00	2,312
Furniture	6	90	253.39	369,747	513,115.00	882,862	9,810
Total	**118**	**3,769**	**157.4**	**4,665,551**	**5,778,850**	**10,444,401**	**2,771**

(1)Absenteeism costs=Av lost workdays × No of injured cases ×Av daily wage × 1.28

(2) Presenteeism costs= Av lost workdays × No of injured cases ×Av daily wage × 1.5

The indirect cost calculation was made for 3,593(95%) short term absent nonfatal cases for less than 30 day (4 weeks). This estimation was based on the principle of frictional approach using the absenteeism multiplier 1.28 as reasonable estimation for the friction period from previous study. This multiplier was applied considering the costs of the employer was greater than one because key informants including production managers were asked about overtime payment to replace the injured worker and production disturbance resulted from injury and 100% of the respondents say yes but it depends on the job and the time when there is high customers order to deliver on a specific time.

Table 10 Summery of direct and indirect costs, Addis Ababa, 2016 (n=3,769)

Industrial group	Indirect costs	Direct costs				Grand total
	Abse+Prese cost	Med+Comp. cost	Premium payment	Total	Premium Utilization	
Food,B&T	1,643,553.00	3,638,668.00	6,618,540	10,257,208.00	55%	11,900,761
Textile&WA	865,543.00	345,103.40	818,463	1,163,566.40	42.2%	2,029,109.4
Leather Pro	790,958.00	779,000.30	746,996	1,525,997.00	104%	2,316,955
Wood&P,pp	402,125.00	458,979.10	790,583	1,249,561.60	58.1%	1,651,686.6
Chemical Pr	734,599.00	1,193,542.20	1,115,618	2,309,160.00	107%	3,043,759
Rubber&plas	1,942,977.00	806,153.40	1,015,687	1,821,841.00	79%	3,764,818
ONMetallic	370,722.00	1,351,116.00	1,382,085	2,733,201.00	97.8%	3,103,923
Basic metal	2,811,062.00	3,993,144.80	6,080,654	10,073,798.90	65.7%	12,884,861
Furniture	882,862	629,556.30	702,570	1,332,126.30	89.6%	2,214,988
Total	**10,444,401**	**13,195,263.5**	**19,271,196**	**32,466,460**	**69.8%**	**42,910,861**

Source: summery (table 7 and 8) including premium paid by employer for injury compensation

The table illustrated that the total direct and indirect costs of 3,769 injured workers of 118 establishments were 42,910,861 Birr. The direct cost accounted for 75 %(32,466,460 Birr) and indirect costs 25 %(10,444,401 Birr).

5.2.3. Estimated economic costs of occupational injuries

Assumptions used to extrapolate the cost to all 874 industries: the costs of occupational injuries for 3,769 injured workers of 118 establishments were known. However, in Addis Ababa there are 874 manufacturing industries that employee 200,628 workers. Similarly, the data was collected from more than 95% of the data sources of the study. Therefore, the cost of occupational injuries of 3,769 injured workers of 118 establishments was extrapolated to all manufacturing industries in Addis Ababa but in order to extrapolate to all manufacturing industries; (in economic terms) we need to have realistic assumptions. These assumptions were as follows.

First, assumed all medium and large manufacturing industries have insurance coverage for their workers. Second, assumed that the reviewed workmen's compensation insurance policy coverage accounted for 14% of all manufacturing industries in 2014/15 (118 out of 874). Third, assumed that the remaining 76% prefer another insurance policy called Group Personal Accident (GPA), employers prefer this because this policy provides 24 hour coverage.

Fourth, assumed the characteristics of collected and un-collected data were similar both in injury characteristics and payment. Fifth, assumed work injuries with missing financial data were as costly as those with available financial data. Six, assumed there is a serious level of under reporting and recording. Seven, all injured cases are not compensated by insurance companies due to workers 'lack of awareness, and absence workday payment covered by employers. Therefore, the cost of injury was assumed to be at least seven times the cost of the reviewed 3,769 sampled injured fatal and non-fatal injured cases.

Table 11 The number of injured cases and absence workday Addis Ababa, 2014/15

Industrial group		Employee (2014/15)	Proportional Estimation Ratio		Estimated injury			Avera absence work day	Absence work day
			injury	death	Nonfatal	fatal	Total		
Food,B&T	276	41,738	0.186		7763		7763	8	62,104
Textile&WA	45	48,758	0.096	0.00276	4681	12	4693	8	37,544
Leather Pro	87	18,293	0.068	0.0039	1244	5	1249	7.5	9,367.5
Wood&P,pp	124	16,453	0.034		559		559	7	3,913
Chemical Pr	41	5,798	0.073	0.0036	423	2	425	6	2,550
Rubber&plas	68	5,355	0.177		948		948	6	5,688
ONMetallic	98	18,333	0.021		385		385	10	4,190
Basic metal	79	37,111	0.322	0.00329	11949	39	11,988	7.5	89,910
Furniture	56	8,789	0.024		211		211	15	3,165
Total	**874**	**200,628**			**28,163**	**58**	**28,221**	**7.5**	**218,431.5**

Source: estimated from data's collected from insurance companies, BoLSA and employers (2014/15)

The table indicates that the extrapolated number of cases was 28,221 among them fatal and non fatal injured cases were 58 and 28,163 respectively. Furthermore, the number of day's that these injured workers absence from work were 218,431.5 work days. Additionally, the prevalence rate of occupational injury was $\frac{28,222}{200,628}$28,221/200,628=14.1%

Table 12 Total direct and indirect cost of injury during 2014/15, Addis Ababa, 2016 (n=28,221)

Industrial group		Indirect cost	Direct cost		Grand total
		Abse+ pres cost	Med + comp	Premium pay	
Food,B&T	7,763	18,264,919.00	40,410,296.50	91,335,852.00	150,011,067.50
Textile&WA	4,693	11,220,963.00	4,473,837.00	6,138,472.50	21,833,272.50
Leather Pro	1,249	3,859,410.00	3,800,707.00	7,220,965.20	14,881,082.20
Wood&P,pp	559	1,756,378.00	2,004,574.00	10,892,482.40	14,653,434.40
Chemical Pr	425	1,135,175.00	1,837,700.00	4,158,211.80	7,131,086.80
Rubber&plas	948	2,773,848.00	1,150,872.00	6,278,793.60	10,203,513.60
ONMetallic	385	1,991,507.00	7,257,918.00	15,597,839.00	24,847,264.00
Basic metal	11,988	27,718,568.00	39,240,516.00	15,279,572.00	82,238,656.00
Furniture	211	2,069,910.00	1,475,945.00	6,557,320.00	10,103,175.00
Total	**28,221**	**70,790,678**	**101,652,365.5**	**163,459,509**	**335,902,552**

The table shows that in one year period the total cost of injury for 874 establishments was 335,902,552 Birr (15,995,360 US$). The direct cost 265,111,874.5 Birr (79%) and indirect cost 70,790,678 Birr (21%). Thus, the unit cost of injury was 11,902 Birr (566.7 US$)

5.2.4. The budget impact of occupational injuries

Table 13 Cost of injury Vs annual operating budget of establishments, Addis Ababa, 2014/15

Annual budget		Cost of injury	Percentage share
1	16,000,000	912,000	5.7%(Max)
2	50,063,000	1,501,890	3%(Min)

Cost of injury= Av cost per injury× Total number of injury

The budget share of injury was calculated by taking the case of two establishments from different industrial group that have high number of injury in the data collected for the study. The table indicates that direct and indirect costs of injury absorb 3 to 5.7% or an average of 4.35% of the annual operating cost of the manufacturing sector. The analysis indicate that the budget size of the company determine the percentage share of the cost of injury. The analysis in terms of budget impact shows as the percentage share of cost of injury decrease as the budget increases. This also depends on the size of the company. This means injury has high impact in organizations that have small size because their operating budget is low.

5.3. Factors Affecting Cost of Injuries

Table 14 Personal and work environment factors

Variables	Variable sub-group	Frequency	%	Cumulative %
Shift work day	Morning	1911	50.8	50.8
	Afternoon	1125	29.9	80.7
	Evening	624	16.6	97.3
	Mid night	87	2.3	99.6
	Don't remember	19	.5	100.0
Use of PPE	Yes	1332	35.4	35.4
	No	2299	61.1	96.5
	Unknown	132	3.5	100.0
Sleeping disorder	Yes	474	12.6	12.6
	No	94	2.5	15.1
	Unknown	3194	84.9	100.0

The majority of the injured worker, 50.8% were working at morning followed by afternoon 29.9%, this may have a relationship with sleeping disorder, as indicated in the table 12.9 % of the injured workers were injured because of sleeping problem at the time when they injured and similarly among the injured workers 61.1% explained that they were injured because at the time they were not wearing PPE.

Table 15 Summery of stepwise analysis variable selection, (n=398) [h]

Model	R	R^2	Adj. R^2	S.E.E	Change Statistics				
					R^2Change	F Change	df1	df2	Sig. F Change
1	.830[a]	.690	.689	2594.14803	.690	878.024	1	395[a]	.000
2	.858[b]	.736	.735	2394.63233	.047	69.563	1	394[b]	.000
3	.871[c]	.758	.756	2296.88395	.022	35.248	1	393[c]	.000
4	.874[d]	.763	.761	2275.51437	.005	8.416	1	392[d]	.004
5	.876[e]	.767	.764	2261.81455	.003	5.763	1	391[e]	.017
6	.877[f]	.769	.766	2252.09459	.003	4.382	1	390[f]	.037
7	.879[g]	.772	.768	2239.62412	.003	5.355	1	389[g]	.021

a. Predictors: (Constant), absent work day
b. Predictors: (Constant), absent workday, shift work schedule
c. Predictors: (Constant), absent workday, shift work schedule, experience
d. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury
e. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury, type of injury
f. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury, type of injury, economic activity
g. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury, type of injury, economic activity, no PPE
h. Dependent Variable: cost of injury

As shown in **table 15[h],**. *R2* is multiple correlation coefficients that represent the amount of variance of dependent variable, direct and indirect cost of injury, were explained by seven (7) predictors. These seven variables are the most important variables that have significant association with the dependent variable among 12 variables entered for stepwise analysis but the remaining five variables were excluded from the model because they have insignificant association with cost of injury.

The value of R^2 is 0.69, the first model tell us that absent workday accounts for 69% of the variation in cost of injury. When one predictor included in the model; shift work schedule, the value increased to 73.6% of the variance in cost of injury. When the third predictor included in the model, work experience, the value increased to 75.8% of the variance in cost of injury. When the fourth predictor included in the model, cause of injury, the value increased to 76.3% of the variance in cost of injury. When the fifth predictor included in the model, type of injury, the value increased to 76.7% of the variance in cost of injury. When the sixth predictor included in the model, economic activity, the value increased to 76.9% of the variance in cost of injury. When the seventh predictor included in the model, non use of PPE, the value increased to 77.2% of the variance in cost of injury.

Table 16 Analysis of Variance with cost of injury(n=398) [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5908753690.238	1	5908753690.238	878.024	.000[b]
	Residual	2658193585.057	395	6729604.013		
	Total	8566947275.294	396			
2	Regression	6307647260.442	2	3153823630.221	549.996	.000[c]
	Residual	2259300014.852	394	5734263.997		
	Total	8566947275.294	396			
3	Regression	6493606656.593	3	2164535552.198	410.286	.000[d]
	Residual	2073340618.701	393	5275675.875		
	Total	8566947275.294	396			
4	Regression	6537184747.306	4	1634296186.826	315.625	.000[e]
	Residual	2029762527.988	392	5177965.633		
	Total	8566947275.294	396			
5	Regression	6566667505.782	5	1313333501.156	256.721	.000[f]
	Residual	2000279769.512	391	5115805.037		
	Total	8566947275.294	396			
6	Regression	6588894558.525	6	1098149093.088	216.515	.000[g]
	Residual	1978052716.769	390	5071930.043		
	Total	8566947275.294	396			
7	Regression	6615755879.093	7	945107982.728	188.422	.000[h]
	Residual	1951191396.201	389	5015916.186		
	Total	8566947275.294	396			

a. Predictors: (Constant), absent work day
b. Predictors: (Constant), absent workday, shift work schedule
c. Predictors: (Constant), absent workday, shift work schedule, experience
d. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury
e. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury, type of injury
f. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury, type of injury, economic activity
g. Predictors: (Constant), absent workday, shift work schedule, experience, cause of injury, type of injury, economic activity, PPE
h. Dependent Variable: cost of injury

As shown in Table 16: the regression model with cost of injury(direct and indirect) as outcome variable demonstrated that absent workday, shift work schedule, experience, cause of injury, type of injury, economic activity and non use of PPE were the seven factors that have significant relationships with cost of injury.

The analysis has identified absent work day are the main predictor $P<0.01$ $F(1,395)=878.024$ for high cost injury with other positively associated six risk factors. The analysis also show that shift work schedules have significant relationship with costs, $P<0.01$, $F(2,394)= 549.996$; those working at morning were more injured, shift work schedule. Work experience is also highly associated with cost of injury; $P<0.01$, $F(3,393)= 410.286$. As the analysis shown; the percentage of injury was higher for those with a job experience of more than five year, 46% than those of over five years' experience.

The analysis also identified cause of injury, type of injury, economic activity or type of industry and non use of PPE was positively associated with cost of injury, $P<0.01$, $F(4,392)= 315.625$; $P<0.01$, $F(5,391)= 256.721$; $P<0.01$, $F(6,390)= 216.515$; $P<0.01$, $F(7,389)= 188.422$ respectively.

6. Discussion

6.1. The number and characteristics of occupational injuries

This study is an attempt to estimate the economic (direct and indirect) cost of occupational injuries for industries that have ten and above workers. The data was collected from multiple sources; insurance companies, BoLSA, MoLSA, injured workers and establishments (factories). The study uses data from multiple sources in order to minimize limitation of the study on the utilization of workers compensation data alone for occupational injury research [23].Finally, similar data's were combined and complemented for analysis.

The data collected from multiple sources also identified that many of the work related injuries are not recorded by the company and also not reported for BoLSA. To estimate underreporting, during 2014/15 BoLSA reported 310 injuries from 19(nineteen) manufacturing industries some of them have no lost work day and most cases are minor injuries but the study found 12 times more than what was reported by BoLSA during 2014/15 and all cases that have identified by the study have lost work day and 45% of the cases were severe (disabled).

Therefore, the number of injuries reported by BoLSA during 2014/15 was, 92% lower than the study found during the year in terms of number of injuries. The most severe and death cases weren't reported or unknown by the responsible body. Similarly, comparison in terms of reporting establishments indicates that 84% of the establishments who have injury during the year have no report at BoLSA. This study indicates that an estimated total of 28,221 workplace injuries occurred across medium and large industries, which employed ten and above employees in Addis Ababa during 2014/15. These include injuries resulting at least one day absent from work. The labour force employed in the manufacturing sector was 200,628 in 2014/15. This indicates a prevalence rate of 14.1%.

6.2. Direct and indirect cost estimation

The degree of disability and direct cost: the degree of disability_generally classified as: (a) Temporary disablement (TTD) (b) Permanent partial disablement (PPD) (c) Permanent total disablement (PTD) and (d) Death. Among the estimated 3,769 occupational injuries 53.8 % (15,166) injuries were TTD,43.8%(12,368) were PPD, 2.2 %(629) were PTD and 0.2%(58) were death. For occupational injuries sustained at work the employer is liable to pay compensation, although the extent of liability is related to the degree of disability.

The employer‘s liability includes medical expense and disability benefit to the injured employee. The amount of disability benefit depends on the time taken to return to work normally or duration of disability and degree of disability [20]. According to the labour law the employer liability is to cover emergency services and medical, surgical, pharmaceutical, and any other necessary prosthetic or orthopaedic appliances expenses in addition to providing disability benefit to the injured employee. Additionally, WC insurance policy also states to cover a fixed amount of medical expense. At the time of this study period it was fixed up to 2000 Birr.

If the injury sustained resulted in Temporary Total Disability (TTD), the payment was periodical and the amount was full wage for the first three months; 75% of the employee‘s monthly wage for each of the next three months; and 50% of the monthly wage for each of the remaining six months [20]. Example for TTD case; employee has sustained a severe accident while he works in the machine and he was prevented from providing his employment service for one months due to the accident. Such kind of disability is total and temporary. It is total because the employee was totally prevented from providing service. At the same time, the disability is temporary because the employee was prevented from providing service for limited period of time (one month).

If the injury sustained resulted in Permanent Partial Disability (PPD), the payment was calculated in proportion to the degree of the disability determined by medical board. Assume if the medical evidence verified 40% loss of body part, the calculation for the disability compensation payment was calculated as: monthly wage of the employee × 12(yearly wage) ×5(year) ×30%. Example for PPD cases; an employee has lost his right arm due to an accident associated with his employment. This kind of injury is partial and permanent. It is partial disability because the employee is not lost 100% but some part (25%, 35%, 40%...etc) of his working capacity because of losing his right arm. Nevertheless, it is permanent because it will remain with the injury throughout life. Additionally, in cases of Permanent Partial Disability (PTD), the disability compensation payment was calculated as: monthly wage ×12(yearly wage ×5(years).

Example for PTD cases; an employee has lost his left and right arm due to an accident during at work. Such kind of disability is permanent and total. It is total because the employee has lost 100% of his working capacity as a result of losing his left and right arm. At the same time, the disability is permanent because it prevents the injured worker from engaging in any kind of paid work.

Finally, if an employee dies due to injury, the amount of payment is lump sum of five years wage to compensate the dependant's of a deceased worker; the death compensation payment was calculated as: monthly wage × 12(yearly wage) × 5(years). The calculation is similar to PTD except it includes at least two month wage to cover the funeral expenses of the deceased employee [20].

Generally, the estimated total number of occupational injuries and cost incurred is based on the data on 14%(118) of the total 874 medium and large industries injury claim record and report for that specific year as well as company survey. To estimate direct cost, injuries were classified according to the degree of disability/severity and medical payment based on insurance compensation payment category, and average of each category was assigned to all cases in the category by industrial group to estimate the total direct costs 32,466,460 Birr.

Absence workday and indirect cost: to estimate the indirect cost for 3769, fatal and nonfatal cases identified from 118 establishments; the absence workday were classified in to three categories (<3, 4-30 and >30) by industrial group and the average of each was assigned to determine the total absence workday. The cost per absence was taken on the average daily wage in the establishment in which the injury occurred and absenteeism and presenteeism multipliers were applied considering the theoretical model, the indirect costs was 10,444,401 Birr. Summing up the direct and indirect costs, the total cost was 42,910,861 Birr. The mean cost per injury becomes 11,385 Birr or 547 US$. This finding contradicts with the median cost per injury in Lebanon, US$ 83. Studies indicate that cost of injury sharply increases with severity of injury [15]. Therefore, injuries in Ethiopia were more severe than that of Lebanon.

When this cost from 3,769 injuries of 118 industries/establishments "extrapolated" to all 200,628 manufacturing sector workforce of 874 industries/establishments, the economic cost of occupational injury is estimated at 335,810,072.5 Birr (15,990,955.8 US$) for 2014/15(see Table: 11). The direct cost consists of 265,111,874.5 Birr (79%) and indirect cost 70,698,198 Birr (21%). The overall ratio of direct to indirect costs is estimated as 3.6:1. This finding contradicts with ratios found in other studies, where indirect costs were normally some multiple of direct costs. The range of ratio found by other researchers varies between 1:4 and 1:10. There are factors that explain the difference between the results of this and other studies.

First, the methodology used to estimate the indirect cost is frictional cost method because it produces estimates that are more tangible for employers and in economies where there is no full employment [29]. Second, the cost analysis was prevalence approach measures all cases (whether new or ongoing) in the system for the reference one year. Third, the study excludes some costs from the analysis because of absence of reliable data. For instance, image of the company, emergency/ first aid costs, and ambulance transport cost, investigation costs, legal costs, administrative costs, product damage, replacing or repairing damaged materials and equipment and others were not included.

Fourth, the cost distribution approach considered in this study is "ex-ante" or "top-down estimation process. This approach treat worker compensation premium as a cost to employers for all incidents that will occur in the reference year [29, 38]. This cost distribution approach is chosen because of its association with the time dimension (prevalence approach). However, the approach has increased the proportion of direct cost as premium is treated as direct costs because premium payment alone consists of 48.7% of the total costs.

Fifth, the low wage of the employee in the sector underestimates the indirect cost because indirect as well as direct costs are proportional to wage of employee. Studies conducted in South Africa(SADC) Region by comparing wages to output, estimated that each employee produces 4.7 times the amount they are paid. This means measuring production loss of injury in terms of wage yield a low production loss for the employer due to occupational injury but it signifies huge amounts of potential loss, and it is a clear cost benefit ratio in terms of costs spent on injury prevention [43]. The cost analysis signifies huge potential losses due to injury and a clear economic gain from risk prevention.

Clearly this is more than figures: on the one hand labour surpluses and the high level of unskilled production make injured labour relatively easy to substitute in Africa, and this is often the case, so that the production losses may be lower for the employee. On the other hand, the costs of the loss of a wage earner may spread widely to the larger number of households dependent on wage earner and may lead to unmeasured and even intergenerational health and social costs [43, 44].

Apart from this, researchers found the declining of ratio between direct to indirect costs explains that the reduction is reduced due to increment of direct cost and this condition is reflected to severity of the injury/accident. More severe cases require accident victim to stay longer in hospital. Therefore, it would incur higher medical and hospitalization cost for recovery purposes. In addition, steady increase of medical service and compensation benefit in last few years has reduced the gap of differences between direct and indirect cost.

However, the comparisons and considering possible explanatory factors are appropriate; however, economic cost of occupational injury was born by three economic agents; the employers, workers and the society/ community. This study is employer perspective, exclude indirect costs borne by the employee and society. Researchers agree that the bulk of the cost was borne by the workers. Studies of industries have generally found that the non-insurance costs of work accidents are not more than a third of insurance costs. Therefore, considering this finding related to the study and cost components not included in the estimation. The indirect cost of this study was estimated using the theoretical model of industrial studies finding 1:3; this study estimated economic cost of injury becomes 1,060,447,498 Birr (51,100,313 US$). The direct cost consists of 265,111,874.5 Birr and indirect cost 795,335,623.5 Birr.

Therefore, the estimated economic cost of injury in the manufacturing sector of Addis Ababa, Ethiopia ranges from cost 335,810,072.5 Birr (15,990,955.8 US$) up to 1,060,447,498 Birr (50,497,499.9 US$); the estimated average total cost was 698,128,785.3 Birr (33,244,228 US$); Thus indirect cost becomes 433,016,911 Birr (62%) and direct cost 265,111,874.5 Birr (38%). This is because of the indirect (uninsured) cost varies from 70,698,198 Birr to 795,335,623.5 Birr. Thus, the unit cost of injury was 24,742.3 Birr (1,178 US$). Additionally, it is estimated that the injured workers were absent from work for a total of 128,431.5 days; an average of 7.5 absence workday per injury. The length of sick leave (absence) day determines severity of injury, as well as costs.

The study indicates, direct and indirect costs of injury absorb 3% up to 5.7% or an average 4.35% of the annual operating cost of the manufacturing sector. It is difficult to compare this finding with other similar findings because of absence of similar study on the area but generally this finding is less than the study finding about impact of injury cost on the total budget of the Ministry of Public Health of Lebanon [12]. However, this mayn't fully reflect the real impact.

The difference may be explained as stated as stated above to explain the contradictory finding of direct to indirect costs ratio; the frictional cost method used and the excluded costs from the analysis may reduce the real cost of injury. Additionally, indirect cost, which has the highest share of injury cost, is calculated as at least wage/salary costs. This does not yet cover all productivity aspects, as profitable business activities must exceed costs [44]. Therefore, the budget impact of injury is more than the study findings.

6.3. Factors affecting cost of injuries

The regression model with cost of injury(direct and indirect) as outcome variable demonstrated that 77.2% variance of injury cost is explained by seven variables combined; absent workday, shift work schedule, experience, cause of injury, type of injury, economic activity, non-use of PPE (See Table: 15). It is clear that most costs are the result of absence workday and disability. The finding on the effect of cause and type of injury on cost was related to other manufacturing sector study findings conducted to determine the direct to indirect cost ratio by cause, and type of injury. The ratio of costs for cause of accident is ranged between 1:1.38 and 1:2.52 while for type of injury, direct to indirect cost is recorded between 1:1.11 and 1:2.92 [45].

However, the analysis has identified absent work day are the main predictor (69%) for high cost injury with other positively associated six risk factors resulted in the occurrence of injury. Therefore, the length of absent from work (sick leave) was strongly associated with costs (direct and indirect) of injury. The length of absence was ranged from minor injuries involving no absence from work to fatalities. Generally, it is the case that the more severe the injury, the longer the time taken to recover and return to works. Furthermore, it was also associated with the amount of medical cost, income replacement cost and compensation cost.

The analysis also show that shift work schedules have a relationship with costs and those 50.8 % (1,911) workers working at morning were more injured. This may be linked with some other behavioural factors like over drinking and chat chewing that can disturb normal sleeping at night and can leads to sleeping disorders during working. Work experience is also an important predictor for the occurrence of injury resulting absent from work. As the analysis shown; the percentage of injury was higher for those with a job experience of more than five year, 46% than those of over five years' experience.

The analysis identified the economic activity or type of industry, non-use of PPE, cause, and type of injury was positively associated with the occurrence of injury resulted in long absent or high cost injury, it is the case that the risky the economic activity of the establishment, the more the cause or risk factors for the occurrence of injury either minor or severe type of injury. Furthermore, 57 % of death and 40.5% of permanent disability were occurred in basic metal. The occurrence of injury was more aggravated with non-use of PPE whether the non-use was because of personal or organizational problem. All those interrelated factors resulted in the occurrence of high number or severe type of injury that is positively associated with long absent(individually or collectively) from work or type of injury that require long-time to recover and return to works

7. Strength and limitation of the study

7.1. Strengths of the study

- The use of actual documented compensation data.
- The use of simple calculation method.
- The use of multiple data sources.

7.2. Limitations of the study

- No adjustment for under-reporting
- The exclusion of some indirect cost components
- The use of multipliers from previous study

8. Conclusion and Recommendations

8.1. Conclusion

1. Annually occurred disability and death due to occupational injuries are substantial.
2. The costs incurred by the manufacturing sector due to occupational injuries are huge.
3. The direct and indirect costs absorb substantial amount of annual operating budget
4. Most costs are the result of absence workday and disability/severity of injury

The study also concludes that there is a serious level of under reporting and recording of workplace injuries. However, the little information that is available suggests that the direct and indirect (productivity) costs of occupational injuries within the manufacturing sector are huge. The overall cost of occupational injuries are greater than estimated by this study specially when we consider human costs like pain, suffering, and diminished quality of life of injured workers.

The visible part of cost of occupational injuries consists of the direct costs and the invisible costs are indirect costs. The cost born by occupational injuries usually born by the three economic agents; the worker, the employer, and the society, however, this cost estimation was done for the employer. However, in most cases the employers, depending on the business working environment competitiveness, may not absorb all the costs resulting from occupational injuries, rather they transfer part or all of the costs to other agents; the employee and consumer/society through wage and benefit cut, increasing product and service prices and job loss of employees. These costs of injury can easily be transferred to employees in countries or areas where there is unemployment in the labour market because companies get easily replaceable workers because as studies indicated, most of the injured employee's employment statuses were temporary employee.

This makes easier for the company for "use and through". Similarly, employers who have few or no competitors can also transfer costs to the consumer thorough raising product or service price. However, the society has no option to transfer the cost and absorbs all costs. Therefore, human and financial resources invested in occupational health are not a burden but have a positive and productive impact on the company and national economy. It has also direct spill over effect on poverty reduction

8.2. Recommendations

Recommendation for BoLSA and MoLSA

- A comprehensive web based notification systems including recording, reporting and monitoring of occupational injuries should be strengthened
- The national data system should be established to comprehensively collect WC data in a way that is easily accessible by researchers
- MoLSA/BoLSA should establish occupational injuriese data exchange mechanism with insurance companies and work in partnership to improve injuries record keeping to easily sharing information.
- The national CSA household survey, including; DHS, labour market surveys as well as industries survey should incorporate or added a few basic OSH questionnaires to collect national data on occupational injuries
- To strengthen OSH at workplace minimum safety requirement should be developed
- OSH and insurance should be linked by; experience rating of premium payments,
- OSH Management System should be strengthened at BoLSA/ MoLSA

Recommendation for Researchers

- Research including workmen's compensation (WC) & group personal accident (GPA) insurance policy is recommended. The insurance data is best source data to study on both occupational injury as well as disease

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10.Appendices

a. *Appendix I. Insurance companies compensation payment data collection format*

Name of insurance company*:* _____

Objective of the study: to estimate the direct and indirect costs of occupational injuries incurred by manufacturing industries in Addis Ababa city. Each of the information's obtained from your company is vital for this study in order to analyze and generate relevant evidence to strengthen occupational health and safety (OHS) intervention. The study will not cause any harm to you as information provider rather it benefits your company through suggesting strategies to reduce occupational injuries. The information will be collected from 17 insurance companies, 18 manufacturing industries and 398 injured workers about the causes and consequences of injuries and also payments for compensation.

Information confidentiality: the investigator wants to assure you that in relation to the data collected for this study any individual and organization name will not be described or used for any other purpose and all the information you give will be kept strictly confidential and is to be used only for the purpose of this study to analyze injuries based on individual characteristics and industries classification in relation to injury costs

1. Manufacturing industries workmen's compensation 2007 EC(2014/15) payment

1.1. Manufacturing industry name: _____Economic activity _____

No	Name of organization	Age	Sex	Salary	Injury characteristics		**Payments**			Medical leave issued	Type of disability
					Non fatal	**Fatal**	medical	compensation	Other		

b. Appendix II: data collected from injured workers (Amharic and English)

የአዲስ አበባ ዩኒቨርስቲ ህክምና ፋከልቲየህብረተሰብ ጤና ሳይንስ ትምህርት ክፍል

የሰራ ላይ ጉዳት ከደረሰባቸው ሰራተኞች የሚሰበሰብ መረጃ

ይህ መጠይቅ በአዱስ አበባ ከተማ ውስጥ የሚገኙ ፋብሪካዎች ውስጥ በሚሰሩ ሠራተኞች ላይ ከሚሰሩት ሥራ ጋር በተያያዘ የደረሰባቸውን ጉዳት ላማጥናት የተዘጋጀ መጠይቅ ነው፡፡

የመጠይቁ መለያ ቁጥር _____

የፋብሪካው ስም_____**ባለቤትነትቱ(የግል/የመንግስት)**

Name of establishment..... Year of establishment.....

የፋብሪካው ምርት_____**የተቋቋመበት ዓመት**_____

አድራሻ_____**ዲፓርትመንት**_____

Type of goods/services produced.....

ጤና ይስጥልኝ ስሜ ይባሊሌ፡፡ እኔ የመጣሁት ከአዲስ አበባ ዩኒቨርስቲ ጤና ሳይንስ ኮሌጅ ከህብረተሰብ ጤና ትምህርት ቤት ነው፡፡ አሁን ልጠይቅዎ የምፈልገው ለ20 ደቂቃ የሚያቆይ ከሥራዎት ጋር በተገናኘ ባለፉት 12 ወራት ውስጥ የደረሰብዎትን አደጋ በተመለከተና ተዛማጂ ጉዳዩችን ነው፡፡ የሚሰጡት መረጃ ውሳኔ ሰጭቆችንና ፖሊሲ አውጭዎችን በሥራ ምክንያት የሚደርሱ አደጋዎችን መመከሊከል ቅድሚያ እና ትኩረት እንዱሰጡ ያደርጋል፡፡

<u>ከጥናቱ የሚገኝ ጥቅም</u>፡ አንድ ሠራተኛ ይህን መጠይቅ በመመለስ ስለተሳተፈ ቀጥተኛ የሆነ ጥቅም አያገኝም፡፡ የዚህ ጥናት ውጤት ለሚመለከታቸው አካላት ሁሉ የሚሰራጭ በመሆኑ በቀጣይ በሥራ ላይ የሚደርስ አደጋን ለመከላከል ከፍተኛ ሚና የሚጫወት በመሆኑ በተዘዋዋሪ ተጠቃሚ ይሆናሉ፡፡

<u>በጥናቱ የመሳተፍ ስጋት</u>፡ አንድ ሠራተኛ ይህንን መጠይቅ በመመለሱ ምንም አይነት ጉዳት አይደርስበትም በተጨማሪው የሰራተኛው ስም በጥናቱ ውስጥም ሆነ ለሌለሰ ወገን አይጠቀስም፡፡

በጥናቱ የሚሳተፍ ሠራተኛ መብት በዚህ ጥናት መሳተፍ እና አለመሳተፍ የአንድ ሠራተኛ ሙለ መብት ነው፡፡ ከዚህ ባሻገር መመለስ የማይፈልገውን ጥያቄ እንዲመልስ አይገደድም እንዲሁም ካልፈለገ ጥናቱን በማንኛውም ጊዜ መቋረጥ ይችላል፡፡በተጨማሪ ያሌገባው እና የተጠራተረበት ጥያቄ ካለ የጥናቱን አስተባባሪ መጠየቅ ይችላል፡፡ ምስጢራዊነት በዚህ መጠየቅ የተሰጠው መረጃ መስጥራዊነት የተጠበቀ ሲሆን የሠራተኛ ስም በፍፁም አይገለፅም፡፡

2. ስምምነት

ከላይ የተፃፈውን መረጃ እኔ በሚችለው ቋንቋ ስለተፃፈ ሁለንም በማንበብ ተረድቻለሁ፡ ስለሆነም በጥናቱ ለመሳተፍ ፍቃደኛ ነኝ፡፡

የተሳታፊ ስም ፉርማ _____

የሱፐርቫይዘሩ ስም ፉርማ _____

መጠይቁ የተሞሊበት ቀን _____

የመጠይቁ ውጤት

1. በሙለ ተሞልቷል
2. ተሳታፊው አልተገኘም
3. ለመሙላት ፈቃደኛ አልሆነም
4. በግማሽ ተሞልቷል

መሳሰቢያ፡ያልገባዎት ወይም ጥያቄ የሆነብዎት ሁኔታ ካለ የጥናቱ ዋና ተሳታፊ መጠየቅ ይችላል፡፡

Remark: For any inconvenience and problem related to questionnaire please contact principal investigator.

Name of PI – Hailye Birhane

Address: Tell- **0911806562** e-mail bhailye@gmail.com

1.1	**የስራ ላይ ጉዳት የደረሰበት ሰራተኛ ማህበራዊ ሁኔታ**	
101	ፆታ	1. ሴት 2. ወንድ
	Sex?	1. Male 2. Female
102	እድሜ	_____አመት_____ወር
	Age?	_____year
103	የትምህርት ደረጃ? 1.ማንበብና መፃፍ 2.ሌላ ይጠቀስ_____	
	Level of Education?	1. Read and Wright 2. Other
104	የቅጥር ሁኔታ?	1. ቋሚ 2.ጊዜያዊ/ኮንትራት

	Employment status ? 1. Permanent 2. Temporary
105	የስራ መደብና ሙያ? 1.የስራ መደብ_____ 2.የሙያ አይነት_____
	Job title?_____ Qualification?_____
106	የአገልግሎት ዘመን? 1.ከ 1 አመት በታች 2.ሌላ ይጠቀስ_____
	Service year/Experience? 1. >1 year 2. other_____
107	የወር ደመወዝ?_____ወርሃዊ ጥቅማጥቅም_____
	Monthly salary?_____other monthly benefits_____
1.2	**የስራ ላይ ጉዳት** work related injury
108	እርስዎ ከዚህ በፊት የስራ ላይ ጉዳት ደርሶብዎት ያውቃል? 1.አዎ [መቼ(ወር/ቀን/ዓም)ይጠቀስ_____] 2. የለም
	Have you had an incident at job that resulted in an injury to you in the last 12 months?
109	በአደጋው የተጎዳው የሰውነት አካል ክፍል የትኛው ነው? 1. አይን 2. ጥርስ 3. እጂ 4. ጆሮ 5.ጉልበት 6. የእግር ጣት 7. የእጂ ጣት 8. ራስ 9. የላይኛው ክንድ 10.የታችኛው ክንድ 11. ከጉልበት በላይ/ጭን 12. ከጉልበት በታች 13. ጀርባ 14. ደረት 15. እግር 16. ሌላ ይጠቀስ_____
	Part of body injured፡ Eye Tooth Hand Ear Knee Toe Finger Head Upper Arm Lower Arm Upper Leg Lower Leg Back Chest Multiplication
110	የተጎዳው የሰውነት አካል ክፍል የደረሰበት ጉዳት መጠን ምን አይነት ነው? Degree of injury?
1. ጭረት 2. ቃጠሎ 3.መወጋት 4 ወለምታ 5.መታፈን 6.እራስን መሳት 7. መመረዝ 8.ስር መዞ 9.ሌላ _____	
Temporary disability :Abrasion Cut Burn Puncture Fracture Dislocation Eye injury Ear injury Suffocation Electrocutions Amputation Poisoning Other_____	
የአንድ እጂ መቆረጥ2.የአንድ እግር መቆረጥ3.የአንድ አይን ብርሃን መጥፋት4.የአንድ ጆሮ መደንቆር5.የአውራ ጣትና የአመልካች ጣት መቆረጥ6.ሌላ አንድ አካል ላይ የደረሰ ጉዳት_____	
Permanent partial disability: Loss of one hands Loss of one feet Loss of sight of one eye Loss of thumb and Index finger Loss of Any other injury causing Permanent partial disablement	
1.የሁለት እጆች መቆረጥ2.የሁለት እግሮች መቆረጥ 3.የሁለት አይኖች ብርሃን መጥፋት4.የሁለት ጆሮዎች መደንቆር5.የአንድ እጂና አንድ እግር መቆረጥ6.አንድ እጂ መቆረጭና አንድ ዓይን ብርሃን መጥፋት7.የአውራ ጣትና የአመልካች ጣት መቆረጥ 8.ሌላ ሁለት አካል ወይም ከዚያ በላይ የደረሰ ጉዳት _____	
Permanent total disability: Loss of life Loss of both hands Loss of both feet Loss of sight of both eyes Loss of one hand and sight of one eye Loss of one hand and one foot Loss of one foot and sight of one eye Total paralysis Total insanity Any other injury causing total and Permanent disablement	
111	የጉዳቱ ምክንያት?1. ማሽኖች 2. በሚወድቁ እቃዎች በመመታት 3.ኤሌክትሪክ 4.በፍንጣሪ ነገሮች 5.የእጂ መሳሪያዎች 6.እሳትና ፍንዳታ 7.አሲድና ትኩስ ነገሮች 8.መውደቅ 9.ግጭት 10. ከባድ እቃዎች በማንሳት 11. የስራ አሰራር ስህተት 12.ሌላ ይጠቀስ_____

	Cause of the injury? Machinery Hit by Falling objects Electricity Splintering objects Hand tools Fire & Explosion Acids and hot substances Falling & splinter Surface falling Splinter Collision with objects Miss handling Transport Work mistakes Lifting heavy objects Other, specify_____
112	ጉዳቱ የደረሰበት ጊዜ/ሰዓት? 1.ጠዋት 2. ከሰዓት 3.ማታ 4.ለሊት
	Time of injury?
1.3	**የእረፍት ጊዜና የደመወዝ ክፍያን በተመለከተ**
113	ጉዳቱ ስራ መስራት ከልክሎህ/ሽ ነበር? 1.አዎ 2. የለም
	Did the injury keep you away from work? Yes No
114	አዎ ከሆነ ምን ያክል ጊዜ ስራ ሳይሰሩ አረፉ? 1.ጠቅላላ ቀን_____2.የስራ ቀን_____
	If yes, How long work day did you stay away from work? 1.Calendar day..... 2.Work day.....
115	ባልሰሩበት የእረፍት ጊዜ ደመወዝ ይከፈልዎት ነበር? 1.አዎ 2. የለም
	Have your salary paid during leave? Yes No
116	አዎ ከሆነ የሚከፈልዎት ደመወዝ ምን ያክሉ ነበር? 1. ሙሉ 2.ከፊል(%)
	If yes salary paid during leave? Full Partial….in %
1.4	**የእረፍት ጊዜ የስራ ተተኪና ወጭ/ክፍያ**
117	እርስዎ በጉዳት ምክንያት እረፍት ላይ ሆነው የሚሰሩት ስራ በማን ተሸፈነ? 1.አልተሸፈነም/ተቋረጠ 2. ተሸፍኗል [በማን? ሀ. በረዳት ሰራተኛ ለ.በአዲስ ተቀጣሪ(ቋሚ) ሐ.በአዲስ ተቀጣሪ (ጊዜያዊ) ሐ. በነባር ሰራተኛ መ.በሌላ ይጠቀስ_____]
118	Have your job continued or ceased during your leave/absences? 1.Yes, continued (Covered by Assistant New permanent employee New temporary employee or other_____) 2.No, ceased/Not covered
119	ተሸፍኖ ከነበረ ስራውን የሸፈነው ሰራተኛ ተጨማሪ ክፍያ ይከፈለው ነበር? 1. አዎ (ስንት?_____) 2. የለም
	If the job was covered does he paid or not? 1. Yes(How much was paid per day or Hr_____) 2. No
120	የማይከፈል ከነበረ ምክንያቱ ይጠቀስ?_____
	If not paid what is the reasion?
1.5	**ከጉዳቱ ጋር በተያያዘ የመስራት አቅም መቀነስ/ስራ የመቀየር ሁኔታን በተመለከተ**
121	ከጉዳት አገግመው ከተመለሱ በኋላ ስራዎን ቀይረዋል? 1.አዎ 2. የለም
	Have your job changed after injury?
122	አዎ ከሆነ ምክንያቱ? If yes, what was the reason for job change?
123	አዎ ከሆነ ደመዎዝዎስ ቀንሷል? 1.አዎ 2. የለም If yes, have your salary declined after job change? Yes No
124	ደመዎዝዎ ከቀነሰ ምን ያክል? ደመወዝ፡ ከአደጋው በፊት?_____በኋላ?_____ If yes, what is the difference? Salary before injury_____after injury_____
125	**የህክምና ካሳ ክፍያ**
1.6	ለደረሰብዎት ጉዳት ህክምና ተደርጎልዎት ነበር? 1.አዎ 2. የለም
	Have you got treatment to the hospital? Yes No

126	አዎ ከሆነ የህክምና ክፍያው ምን ያክል ነበር? 1. ይጠቀስ_____
	What was the total medical cost of the injury?
127	የለም ከሆነ ምክንያቱ?
128	የህክምናውን ወጭ ማን ሸፈነ? 1.ሰራተኛው 2. ድርጂቱ/አሰሪዎ 3. መድን ድርጂት
	Who paid the medical bills?
129	በግልዎ ያወጡት ያልተሸፈነ የህክምና ወጭ ካለ ይጠቀስ?_____
	Do you have expenses not covered?
130	**የጉዳት ካሳ ክፍያ**
1.7	እርስዎ ለደረሰብዎት የስራ ላይ ጉዳት ካሳ ክፍያ አግኝተዋል? 1.አዎ 2. የለም
	Have you compensated? Yes No
131	አዎ ከሆነ በግምት ምን ያክል የካሳ ክፍያ ገንዘብ አገኙ? ይጠቀስ _____
	If yes, How much compensation has you-received? No of compensated days and amount of Birr?
132	የካሳ ክፍያውን ማነው የከፈለዎት? 1. ድርጂቱ/አሰሪዎ 2. መድን ድርጂት
	Who pay the compensation?
133	የለም ከሆነ ምክንያቱ ?_____
134	**የስራ አካባቢ**
1.8	በሳምንት ስንት ቀን ይሰራሉ? 1. 5 ቀን 2. 6 ቀን 3. 7 ቀን 4.ሌላ ይጠቀስ_____
	Number of days worked per week?
135	ምን ያክል ሰዓት ይሰራሉ? በቀን_____ሰዓት በሳ ምንት_____ሰዓት
	Hours worked per day?
136	ጉዳቱ በደረሰብዎት ወቅት በቂ የጉዳት መከላከያዎችን ይጠቀሙ ነበር? 1.አዎ 2. የለም
	Do you have enough personal protective equipment? Yes No
137	የለም ከሆነ ምክንያቱ ምንድነው? What are your reasons for not using personal protective equipment? 1. የመከላከያ መሣሪያዎች ባለመኖራቸው 2. የደህንነትና ጤንነት ትምህርት ስለማይሰጥ 3. ለአጠቃቀም ምቹ ስላልሆነ 4. የስራ አፈፃፀምን ስለሚቀንስ 5. የደህንነትና የጤና ጠንቅ ሊያስከትል ስለሚችል 6. ሌላ ካለ ይጠቀስ----------
1.9	**የሰራተኛው የግል ባህርይ**
138	የእንቅልፍ ማጣት ችግር አለብዎት? 1.አዎ 2. የለም
	Do you have any sleeping disorders? Yes No
139	አዎ ከሆነ ምክንያቱ?
	If yes, what is the reason?

መዝጊያ፡ ጥያቄ አለዎት? ስለትብብርዎና ስለሠጡኝ ጊዜ እጂግ በጣም አመሰግናለሁ፡፡

የመረጃ ሰብሳቢው፡ስም_____ቀን_____የተቆጣጣሪ ስም_____

ፊርማ_____ቀን___

C Appendix III፡ data collected from manufacturing industries

ከፋብሪካዎች አስተዳደር ክፍል የሚሰበሰብ መረጃ መጠይቅ

የአዲስ አበባ ዩኒቨርስቲ ህክምና ፋከልቲየህብረተሰብ ጤና ሳይንስ ትምህርት ክፍል፡

ከፋብሪካዎች አስተዳደር ክፍል የሚሰበሰብ መረጃ

2.**የጥናቱ-ዓላማ**፡- በ2007 ዓም የስራ ላይ ጉዳት ስለደረሰባቸው የፋብሪካ ሰራተኞች ስለ ጉዳቱ ሁኔታና ተያያዥ ቀጥተኛና ተዘዋዋሪ ወጭዎችን በተመለከተ ለትምህርታዊ ምርምር የሚሆን መረጃ በማሰባሰብ ከጥናቱ በሚገኘው ውጤት መሰረት የስራ ላይ ደህንነት አጠባበቅ ሊሻሻል የሚችልበትን ሃሳብ ለማቅረብ-ነው፡፡ከፋብሪካው-የሚገኙ መረጃዎች ለጥናቱ ብቻ የሚውሉና ሚስጥራዊነታቸው-የተጠበቀ ነው፡፤

I. የፋብሪካው ስም_____ባለቤትነትቱ(የግል/የመንግስት)

II.የፋብሪካው ምርት_____

III. አድራሻ_____ IV. የተቋቋመበት ዓመት_____

የፋብሪካ ሰራተኞች	ቋሚ ሰራተኞች ብዛት		ጊዜያዊ ሰራተኞች		ጥያቄ	መልስ
	ወንድ	ሴት	ወንድ	ሴት	ፋብሪካው በቀን ስንት ሰዓት ይሰራል?	
የአስተዳደር ሰራተኞች					ፋብሪካው በቀን በስንት ፈረቃ ይሰራል?	
የቴክኒክ ክፍል ሰራተኞች					ፈረቃው በየስንት ሰዓቱ ይከናወናል?	
ድምር					በሳምንት ለስንት ቀን ይሰራል?	

ጉዳትና እረፍት	በ2007ዓም በፋብሪካው ውስጥ የስራ ላይ ጉዳት የደረሰባቸው ሰራተኞች ብዛት ሰንት ናቸው?_____	
201	በ2007ዓም የስራ ላይ ጉዳት የደረሰባቸው ሰራተኞች የወሰዱት ጠቅላላ የህክምና የእረፍት ቀንብዛት?_____	
202	የተጎዱ ሰራተኞች ከስራ ታውከው በቀሩበት(በህክምና እረፍት) ጊዜ የባከነ ገንዘብ በደመወዝ ሲለካ?	
203	ሰራተኞች በስራ ላይ ጉዳት ምክንያት እረፍት ላይ ሲሆኑ የሚሰሩት ስራ በምን መልኩ ይሸፈናል? 1. በረዳት ሰራተኛ 2. በተጨማሪ ክፍያ 3.ሌላ _____	
204	በ2007ዓም ሰራተኞች በስራ ላይ ጉዳት ምክንያት እረፍት ላይ ሆነው የሚሰሩትን ስራ ለመሸፈን የወጣ ወጪ?	
205	በ2007 ዓምየስራ ላይ ጉዳት ከደረሰባቸው ሰራተኞች ውስጥ ስራቸውን የለቀቁ ስንት ናቸው?	
206	በ2007 ዓምየስራ ላይ ጉዳት ከደረሰባቸው ሰራተኞች ውስጥ ስራቸውን ቀይረው እየሰሩ ያሉ ብዛት?	

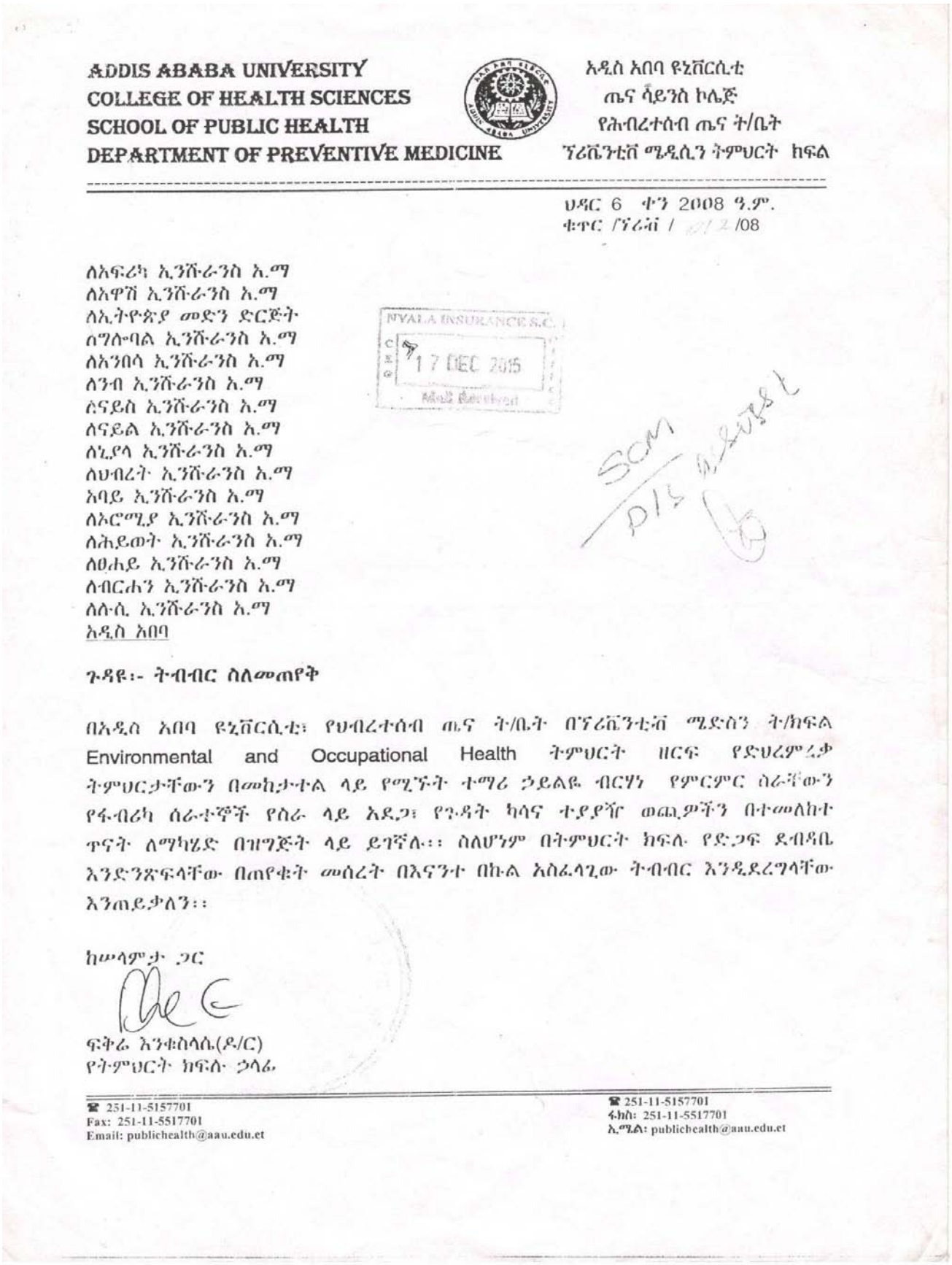
207	አደጋ ከደረሰባቸው ውስጥ ስራቸውን የቀየሩ ካሉ ምክንያቱ? 1. በአቅም ማነስ 2.ሌላ_____			
208	ስራቸውን የቀየሩ ካለ ደመወዛቸውን ቀንሰው የቀየሩ ስንት ናቸው?			
209	በ2007 ዓም በተከሰተ የስራ ላይ ጉዳት የደረሰ የሞት ብዛት?		ለቀብር ማስፈፀሚያ የወጣ ወጭ?	
210	በ2007 ዓምየስራ ላይ ጉዳት የደረሰባቸውን ሰራተኞች ወደ ህክምና ቦታ ለማድረስ የወጣ የትራንስፖርት ወጭ?			
ጉዳትና ህክምና	ፋብሪካው የመድህን ዋስትና ሽፋን አለው?1.አዎ[የመድህን ድርጂቱ ስም?_____] 2. የለም			
211	አዎ ከሆነ በ2007ዓም ምን ያክል የኢንሹራንስ ቅድመ ክፍያ(premium) ተከፈለ?			
212	በ2007 ዓም ለተከሰተው የስራ ላይ ጉዳት ምን ያክል የህክምናና የካሳ ክፍያ ገንዘብ ተከፈለ? የህክምና ክፍያ_____የካሳ ክፍያ_____ጠቅላላ ክፍያ_____			
213	ለህክምናና ካሳ ክፍያ ከፋብሪካው የወጣ ሆኖ ነገር ግን በኢንሹራንስ ያልተወራረደ/ያልተተካ ወጭ ካለ ስንት ይሆናል?			
214	የስራ ላይ ጉዳት ደርሶባቸው የካሳ/የህክምና ክፍያ የተከፈላቸው ሰራተኞች ብዛት?			
215	የስራ ላይ ጉዳት ደርሶባቸው የካሳ/የህክምና ክፍያ ያልተከፈላቸው ሰራተኞች ብዛት?			
በጀት	የ2007 ዓም የፋብሪካው የስራ ላይ ደህንነት በጀት ምን ያክል ነበር?			
217	የፋብሪካው በ2007 ዓምአጠቃላይ የስራ ማስኬጃ በጀት ምን ያክል ነበር?			
ህግ	የ2007 ዓምበስራ ላይ ጉዳት ምክንያት የተከሰተ ክስ/ክርክር ነበር? 1.አዎ 2. የለም			
219	አዎ ከሆነ ለክርክር+መቀጫ+.... ምን ያክል ገንዘብ ወጭ ሆነ?			
ልዩ	ፋብሪካው የጤናና የስራ ላይ ደህንነት ባለሙያ አለው?1.አዎ 2. የለም			

d. Appendix IV: List of sampling frame

1. Food products, beverages and tob.=20		**Leather; footwear, luggage &handbags =9**		**79**	NIGAT MECH'L ENGIN'G
1	AWASH WINE SC	**40**	Kangaroon shoe	**80**	DH Geda GIS Factory
2	AA ABATTOIRS ENTERPRISE	**41**	Anbessa shoe factory	**81**	Ethio car assembly
3	BGI Ethiopia	**42**	**Addis Ababa Tannery**	**82**	**Hayal nail factory**
4	National Tobacco	**43**	Batu Tannery	**83**	Kotebe metal industry
5	AKAKI ANIMAL FOOD INDUSTRY	**44**	Awash leather industry	**84**	የኢትዮጵያ ብረት ማቅለጫ ፋብሪካ
6	East Africa Bottling	**45**	Colba Tanner PLC	**85**	Ada metal and engineering
7	DH Geda flour	**46**	Nile shoe & sole PLC	**86**	Riyos Engineering
8	MOHA Soft drink	**5.Chemicals and chemical products-=11**		**87**	Kaliti metal factory
9	Shoa Bakery & flour factory	**47**	CORA GAS & CHEMICAL PRODUCTS	**88**	Ayalneh Trading PLC
10	Tasty foods PLC	**48**	DH Geda Zemilli Paint Factory	**89**	Addis quary development
11	Alme food processing	**49**	Repi soap and detergent	**90**	Daylight applied technology
12	Tasty food PLC	**50**	Zenit cosmotics	**91**	Vision aluminium
13	Desta PLC(keremela factory)	**51**	Addis Ababa Foam and plastic	**92**	Ethiopian steel proofing & building PLC
14	Ethiopian spices extracion PLC	**52**	Amba pharmaceutical	**93**	MOENCO
15	Bishangari purification	**53**	Abem Industries PLC	**94**	Ethiopian steel PLC
16	AGMAS WATER	**54**	CAUSTIC SODA SHARE COMPANY	**95**	Bethel Engineering PLC
17	FAFA FOOD COMPLEX	**55**	East Africa pharmaceuticals	**96**	BMET ENERGY TELCOM INDUSTRY & TRADE LLC
18	Universal Foood Complex	**56**	Gulele soap factory	**97**	FERRIC BELT METAL PROCESSING MANUFACTURING & ENGINEERING
19	K.O.J.J Food Process	**57**	Amnya PLC Chora And Chemichaila	**98**	GNM INDUSTRIES PLC.
20	National Alco + Bever	**6.Rubber and plastics products=11**		**99**	HABESHA STEEL MILLS PLC
2. Wood & Paper products፣ printing & publishing-=10		**58**	HF TAFO PLASTIC P.L.C	**100**	Dan lift technology
21	ETHIOPIAN PULP & PAPER S.C	**59**	MODERN MULTI PLAST PLC	**101**	Maru metal engineering
22	ኢትዩ ኮምፖርሳዶ ድርጂት	**60**	Burayu Dev't PLC	**102**	Akaki Basic Metal
23	Dugda industry PLC	**61**	Eth. tire & rubber econ'c plant PLC	**103**	Ultimate Motor
24	ARTISTIC PRINTING ENTERPRISE	**62**	Horizon Addis Tire	**104**	Beza Industry

25	Berhaneena selam PRINTING ENTERPRISE	**63**	Summit partner	**105**	Asmen Plc
26	COMMERCIAL PRINTING ENTERPRISE	**64**	Universal plastic	**8. Furniture**	
27	DA packagung PLC	**65**	Bisrat PLC	**106**	EDUCATIONAL MATERIAL PRODUCTION & DISTRIBUTION ENTERPRISE
28	Dugda agro industry PLC	**66**	Mebruk plastic	**107**	Sini furniture
29	Heptik Publishing	**67**	Excel plastic	**108**	3F Furniture
30	Centeral Printing Press	**68**	GEOSYNTHETICS INDUSTRIAL WORKS PLC	**109**	Kalu Works Ethiopia(Aluminum Household production)
31	Yekitite Paper Converting	**7.Basic metals, fabricated metal products and machinery & equip. batteries, motor vehicle bodies, parts and accessories=39**		**110**	Kolfe House Hold
3. Textile and wearing apparel products=6		**69**	ABYSSINIA COLD ROLLING MILL	**111**	WANZA Furnishing
32	Tays PLC	**70**	ABYSINIA FLAT PRODUCTS	**9.Other non-metallic mineral products=8**	
33	Yirgalem Textile Factory	**71**	ABYSSINIA INTEGRATED STEEL PLC	**112**	EMRDC, MINERAL PRODUCTION WORK PROCESS CAOLIN PRODUCT UNIT
34	G-7 FIBER PROD. FACTORY	**72**	CORK AND CAN MAN S.CO.	**113**	SEDE PLC
35	Conplus industrial PLC	**73**	HIBRET MNFG & MACHINE BLDG INDUS	**114**	A.A BOTTLE & GLASS SCO.
36	DH Geda blanket Factory	**75**	BROTHERS STEEL FAC	**115**	ECAFCO PLC
37	KK PLC	**76**	METEC NEW BUSINESS DEV'T	**116**	Sets General Trading
4. Leather; footwear, luggage &handbags =9		**77**	METEC POWER ENGINEERING INDU	**117**	BRICK PRODUCT PROCESSING SHARE COMPANY
38	ETHIOPIAN TANNERY S.C	**78**	METALS AND ENGINEERING CORPORATION	**118**	PREFABRICATED BUILDING PARTS PROD. ENT
39	United vans leather PLC				

e. Appendix VI: Support letters



ADDIS ABABA UNIVERSITY
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DEPARTMENT OF PREVENTIVE MEDICINE

አዲስ አበባ ዩኒቨርሲቲ
ጤና ሳይንስ ኮሌጅ
የሕብረተሰብ ጤና ት/ቤት
ፕሪቬንቲቭ ሜዲሲን ትምህርት ክፍል

ህዳር 6 ቀን 2008 ዓ.ም.
ቁጥር ፖነሪሕ / 27 2 /08

ለአፍሪካ ኢንሹራንስ አ.ማ
ለአዋሽ ኢንሹራንስ አ.ማ
ለኢትዮጵያ መድን ድርጅት
ሰግሎባል ኢንሹራንስ አ.ማ
ለአንበሳ ኢንሹራንስ አ.ማ
ለንብ ኢንሹራንስ አ.ማ
ለናይስ ኢንሹራንስ አ.ማ
ለናይል ኢንሹራንስ አ.ማ
ለኒያላ ኢንሹራንስ አ.ማ
ለህብረት ኢንሹራንስ አ.ማ
አባይ ኢንሹራንስ አ.ማ
ለኦሮሚያ ኢንሹራንስ አ.ማ
ለሕይወት ኢንሹራንስ አ.ማ
ለዐሐይ ኢንሹራንስ አ.ማ
ለብርሐን ኢንሹራንስ አ.ማ
ለሉሲ ኢንሹራንስ አ.ማ
አዲስ አበባ

NYALA INSURANCE S.C.
17 DEC 2015
Mail Received

ጉዳዩ፡- ትብብር ስለመጠየቅ

በአዲስ አበባ ዩኒቨርሲቲ፣ የህብረተሰብ ጤና ት/ቤት በፕሪቬንቲቭ ሜድስን ት/ክፍል Environmental and Occupational Health ትምህርት ዘርፍ የድህረምረቃ ትምህርታቸውን በመከታተል ላይ የሚኙት ተማሪ ኃይልዬ ብርሃነ የምርምር ስራቸውን የፋብሪካ ሰራተኞች የስራ ላይ አደጋ፣ የጉዳት ካሳና ተያያዥ ወጪዎችን በተመለከተ ጥናት ለማካሄድ በዝግጅት ላይ ይገኛሉ፡፡ ስለሆነም በትምህርት ክፍሉ የድጋፍ ደብዳቤ እንድንጽፍላቸው በጠየቁት መሰረት በእናንተ በኩል አስፈላጊው ትብብር እንዲደረግላቸው እንጠይቃለን፡፡

ከሠላምታ ጋር

ፍቅሬ እንቁስላሴ(ዶ/ር)
የትምህርት ክፍሉ ኃላፊ

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የሕብረተሰብ ጤና ት/ቤት
ፕሪቬንቲቭ ሜዲሲን ትምህርት ክፍል

ታህሳስ 26 ቀን 2008 ዓ.ም.
ቁጥር ፖፕሪቭ / 0227 /08

ለሰራተኛ ማህበራዊ ጉዳይ ሚኒስቴር
አዲስ አበባ

ጉዳዩ፡- ትብብር ስለመጠየቅ

በአዲስ አበባ ዩኒቨርሲቲ፣ የህብረተሰብ ጤና ት/ቤት በፕሪቬንቲቭ ሜድስን ት/ክፍል Environmental and Occupational Health ትምህርት ዘርፍ የድህረምረቃ ትምህርታቸውን በመከታተል ላይ የሚኙት ተማሪ ኃይልዬ ብርሃነ የምርምር ስራቸውን በስራ ላይ ጉዳት የደረሰባቸውን ሰራተኞችና ተያያዥነት ያላቸውን ወጪ ቆጠራ በተመለከተ ለመስራት በዝግጅት ላይ ይገኛሉ፡፡ ስለሆነም በትምህርት ክፍሉ የድጋፍ ደብዳቤ እንድንጽፍላቸው በጠየቁት መሰረት በእናንተ በኩል አስፈላጊው ትብብር እንዲደረግላቸው እንጠይቃለን፡፡

ከሠላምታ ጋር

ፍቅሬ አንቱስላሴ(ዶ/ር)
የትምህርት ክፍሉ ኃላፊ

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በአዲስ አበባ ከተማ አስተዳደር
ሠራተኛና ማኅበራዊ ጉዳይ ቢሮ
Addis Ababa City Government
Bureau of Labour & Social Affairs

ቀን 13 ጥር 2008
Date

ቁጥር 66/2/16/8
No.

ለ ናስ የምግብ ማምረቻ
ለ ሰበታ አግሮ ኢንደስትሪ
ለ ብሔራዊ የትንባሆ ማምረቻ
ለ ብሔራዊ አልኮልና አረቄ ፋብሪካ
ለ ፋፋ የምግብ ፋብሪካ
ለ ኢስት አፍሪካ ቦትሊንግ
ለ ዩኒቨርሳል የምግብ ኮምፕሌክስ
ለ ቃሊቲ ምግብ ማምረቻ
ለ አቃቂ የእንስሳት መኖ ማደራጃ
ለ ጤና የምግብ ማምረቻ
ለ አዲስ አበባ ቄራዎች ድርጂት
ለ አዲስ ሞጆ የምግብ ዘይት ፋብሪካ
ለ ኮክብ ፓስታና መኮረኒ ማምረቻ
ለ ላሜ የውተት ማምረቻ
ለ ካ.አ ጀጄ የምግብ ማምረቻ
ለ ቅዱስ ጊዮርጊስ ቢራ ፋብሪካ
ለ አዋሽ ወይን ጠጅ አ/ማ
ለ ሞሃ የለስላሳ መጠጦች ፋብሪካ
ለ ኢትዮጵያ ቅመማ ቅመም ፋብሪካ
ለ አሮማ ፉድ ስታፍ ኢንዱስትሪ
ለ ረጲ ላሙናና ዲተርጀንት አ.ማ
ለ ንፋስ ስልክ ቀለም ፋብሪካ
ለ ድል ቀለም ፋብሪካ
ለ አዲስ አበባ ፎምና ፕላስቲክ ፋብሪካ
ለ አቃቂ ልብስ ስፌት ፋብሪካ
ለ ዋልያ ቆዳና የቆዳ ውጤቶች ማምረቻ
ለ አዲስ አበባ ቆዳ አክሲዮን ማህበር
ለ ኢትዩ ሌዘር ኢንዱስትሪ
ለ አንበሳ ጫማ ፋብሪካ
ለ እድገት ድርና ማማ ፋብሪካ
ለ አዲስ ጡብ ማምረቻ
ለ የኢትዩጵያ ሃንሰን የመስታውት ፋብሪካ
ለ አየር ጤና ብረታ ብረት
ለ የቤትና የቢሮ ፅቃዎች ማምረቻ
ለ ኮልፌ የቤት እቃዎች ፋብሪካ
ለ ፌንፊኔ የቤትና ቢሮ እቃዎች ፋብሪካ
ለ ጄኤም ፈርኒቸር
ለ ሬንቦው ፕላስቲክና ፎም ኢንዱስትሪ
ለ አርቲስቲክ ማተሚያ ድርጅት
ለ ፌንፊኔ ማተሚያና ፕብሊሽንግ ድርጅት
ለ ማምኮ የወረቀት ውጤቶች ፋብሪካ
ለ ቦሌ ማተሚያ ድርጂት
ለ አቃቂ ብረታ ብረት ፋብሪካ
ለ ዋልያ ብረታ ብረት ፋብሪካ
ለ ኮምቦልቻ ብረታ ብረት ፋብሪካ
ለ የኢትዩጵያ ብረታ ብረት ማምረቻ
ለ ማሩ የብረት ኢንዱስትሪ
ለ አቃቂ የመለዋወጫ እቃዎች ፋብሪካ
ለ ግሎሪዩስ ባለቀለም ቲቪ ማምረቻ

<u>አዲስ አበባ</u>

ጉዳዩ፡- <u>ትብብር ስለመጠየቅ፡</u>

ተማሪ ኃይልዬ ብርሃነ የመመረቂያ ወረቀታቸውን ለማዘጋጀት ሙሉ መረጃ ለማግኘት እንዲችሉ በአዲስ አበባ ዩኒቨርስቲ የህብረተሰብ ጤና ት/ቤት ለመ/ቤታችንን በ11/05/2008 ፕሪቫ/026/08 በተፃፈ ደብዳቤ ጠይቀውናል፡፡

መለስ ዜናዊ፤ ለህዝብ የተፈጠረ፤ ለህዝብ የኖረ፤ ለህዝብ የተሰዋ ታላቅ መሪ!!
ሌጋሲህ ይቀጥላል ራዕይህም በትውልዶች ቅብብሎች ይሳካል!!

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አዲስ አበባ ኢትዮጵያ
Addis Ababa-Ethiopia

እባክዎን መልስ ሲጽፉ የደብዳቤያችንን ቁጥር አሚልተው ይጥቀሱ:: Please Quote Our Reference No. When Reply.

በዚሁ መሠረት በአዲስ አበባ ዩኒቨርስቲ የህብረተሰብ ጤና ት/ቤት በፕሪቨንቲቭ ሜድስን ት/ክፍል Environmental and Occupational Health ትምህርት ዘርፍ የድህረ ምረቃ ትምህርታቸውን በመከታተል ላይ የሚገኙት ተማሪ ኃይልዬ ብርሃነ የምርምር ስራቸውን የስራ ላይ ጉዳት በደረሰባቸው የፋብሪካ ሰራተኞች ፤ የካሳና ተያያዥ ወጪዎችን በተመለከተ ጥናት ማካሄድ እንዲችሉ ከዩኒቨርስቲው ተፈቅዶላቸዋል፡፡ በመሆኑም ከፋብሪካው የአስተዳደር ክፍልና ሰራተኞች ለሚያሰባስቡት መረጃ በእናንተ በኩል አስፈላጊው ትብብር እንዲደረግላቸው እየጠየቅን ለሚደረግልቸው ትብብር በቅድሚያ እናመሰግናለን፡፡

ከሠላምታ ጋር

አቶ [illegible]
የኢንዱስትሪ ሰላም የመጀ
ደህንነት የሥራ ሂደት መሪ

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