# Value of Statistical Life of Workers in Brick Kilns and Marble Industry: A Case Study of Peshawar


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## CERTIFICATE

This is to certify that this thesis entitled: **"Value of Statistical Life of Workers in Brick Kilns and Marble Industry: A Case Study of Peshawar"** submitted by Shah Rome Khan is accepted in its present form as satisfying the partial requirement of the degree in **Master of Philosophy in Environmental Economics**.

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# *Dedication*

***Dedicated to all my friends, family members and teachers especially to my mother, father (late), and brothers Doctor Muhammad Abbas Khan, Muhammad Naveed Khan, and Muhammad Adil Khan***

**(May ALLAH shower his blessings on all of them)**

# Acknowledgement

"All praises to **Almighty ALLAH**, to whom belongs whatever is in the heavens and whatever is in the earth, and to Him belongs [all] praise in the Hereafter. And He is the Wise, the Acquainted". And who bestowed us the perfect code of life through His Prophet, **Hazrat Muhammad** (**P.B.U.H**)

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## Abstract

*Government agencies and policy makers confronted with the necessity to introduce health and safety regulations and wonder how to value of the benefits from that safety regulations. The evaluated value could be placed on the reduction of death risks and health risk, through comprehending of how people compensated for the risks they accept/take. And this approach is known as compensating wage differentials method. Which estimates the wage premium a worker needs to be given/paid to accept a small increase in his/her risk of dying and injuries, likewise, what the worker would pay to reduce the risk to their health and dying or achieve small increase in safety. Wage premium estimated from market and computed the value of statistical life, a value that how much population may be willing to pay to reduce the risk of one death among them.*

*This study estimated the value of statistical life and injury for workers in brick kilns and marble industry in Peshawar, KPK based on compensating wage differential. The sample size for this study is 200, Pakistan standard annual hours have been taken that are 2500. The VSL for marble workers estimated PKR 68.25 million (USD 0.4265) and perceived injury rated PKR 6825 and for the bricks kilns the value of statistical life estimated PKR 54.625 million (USD0.3414) we did not attempted the value of statistical injury for brick kilns workers because the variable is insignificant.*



*Key words: Compensating Wage Differential, Informal Sectors, Value of Statistical Life/injury, Perceived Risks, Marble Factories, Brick kilns, Safety Regulations, Standard Hours.*

# CHAPTER I

# Introduction

## 1.1. Introduction

Economic development may have a significant impact on environment. The exposure to environment contaminants may cause hazardous risks to human health, which actually occur in adverse environmental conditions. So to regulate such risks government undertakes a wide variety of environmental policy projects which involve costs and benefits to human health. The key component of benefit is improvement of human health due to improvement in safety and environment.

The health benefits due to enhanced environmental policies and programs include reduction of accidents and environmental-related diseases to human health. Such policies and programs to ameliorate the working condition, reduced the risk of health diseases and to reduce the probability of death as well. Due to such environmental safety programs contributing a small reduction in risks could contribute a large health benefits to the society. And the literature tells that the above benefits estimated as the sum of willingness to pay (society willingness to pay) for the reduction in risks to all affected individuals and if workers reveal overwhelmingly wage and risk tradeoffs then a researcher can estimate "value of statistical life".( Viscusi & Masterman, 2017). The value of statistical life represents the total amount of wages that the labors willingness to forgo the health risks, the value of statistical life used as a tool to estimate the individual's willingness to pay to reduce the risks and provides benefited information for the policy makers to evaluate the safety programs for labors better health.

But the price paid (willingness to pay) for reductions of risks and death risks and for the improvement of safety regulations are not directly obtained because such risks reduction cannot directly be purchased in the market. However, there are procedures where willingness to pay of

labors for such services and goods can be measured indirectly. For instance, when people want to purchase seatbelts for their automobiles, they are making decision that the reduction in risks hazards and other losses which are associated with road accidents is worth more than the cost of the seatbelt( Hersch, & Viscusi, 2010). So in the literature several revealed preference theories of environmental valuation such as travel cost, contingent valuation method household hedonic function, and hedonic prices estimating the possible value of environmental risk reduction and the value of the benefits taking from the reduced health risks.(Sunstein & Nash, 2013), (Viscusi, 2012).

Thus, we have a bargain in the reduction of death risks and probability of injury risks reduction with money. So the economists term this tradeoff, the "value of statistical life". The value of statistical life is the exchange between money and very small risk of death. This is the most prevalent approach used by the government agencies to value a small changes in risk. In the context of labor market, it is the wage fatality interchange of workers. Decision about how much compensation or pay require for accepting those jobs which have extra additional risks. Most of the economists do have controversies with concept and meaning of VSL. It defines the monetary value of small and similar among the population mortality risks reduction that would prevent one statistical death and, it should not be interpreted that the society are willing to pay for to save one identified lives(Andersson & Treich, 2009). In short, how much compensation the labors are agreed to take a riskier job.

### 1.2. Background of the Study

Government agencies in all over the world adopted different safety measures which is actually grounded on the estimation of WTP (willingness to pay) for people to reduce the probability of health risks i.e. death and injury. So to estimates these trade off, government agencies reached at

cost and benefit analysis of health issues and environmental issues and public safety measures on roads, highways, disasters like floods etc. (Bockarjova, Rietveld, & Verhoef, 2012). So the economists term this tradeoff between fatality risks or any health risks with money the value of statistical life. Thomas Schelling, (1968) first used the term (VSL) Value of Statistical Life in his essay titled 'The Life You Save May Be Your Own' (documented from google).

This value (VSL) is commonly predicted in any country or in any sectors and three approaches has been used for estimating value of human life. first approach is the workers must be paid to take jobs related risks, called the "compensation wage differential" used this method by(W. K. Viscusi & Aldy, 2003). The next approach examining behaviors wherever publics consider costs in contradiction of risks used this approach by (Blomquist, 2004). The third approach is the contingent valuation approach where people respond that they have willingness to pay, for the reduction in health risks and death risks. And then The VSL estimated by apportioning the WTP by the reduction of risk being valued (Simon et.al, 2002).

However, there is only one study conducted in Pakistan for the blue color workers in Lahore city, that study is generally implied for formal sectors in Pakistan. But for labors working in marble factories and brick kilns in Peshawar have a lot of problems of occupational risks and health hazardous problem are facing, so there need to be implied value of statistical life for them. Because marble and brick industry has also a very big contribution in air pollution and water pollution as well. People along with these industry labors are severely affected by dust from stones and bricks making. It has a very big contribution in the country development and degradation of environment as well.

Loss of life is more horrible than loss of property or investment. The impact of mineral industry is significant for socio economic development especially for developing country like Pakistan.

Thousands of labors are directly involved from extraction to final usage of these minerals. Marble and brick industry is traced back to ancient Egyptian, which makes marble, granite and brick industry one of the largest and oldest industries in the world. With the introduction of technology based operations for these industries around the globe, the labor intensive industry shifted to capital intensive. Abundance of resources led Pakistan to rely on resource based marble industry for socio-economic development and the brick kiln as well. Due to lack of technology, Pakistan marble and brick industries can still be called as labor intensive. It is estimated that more than 1500 marble processing units exists in KPK and about 300+ industries of bricks are situated in and with surroundings of Peshawar. Involvement of labor without safety arrangements during extraction, transportation and processing can lead to an irreversible accident. Claims of organizations and government agencies providing safe environment need to be assessed through a scientific decision making tool. As indicated by news items and reports accidents related to marble industry and brick kilns are usually fatal. The scientific and systematic analysis becomes more prompting. Accidents disturb ecosystem around the site and also hamper the productivity significantly to motivational level and their productivity is also related to their safety. Accidents provoked to hands and feet are termed common by industrialist and project manage. Production of marble and bricks passes through several stages, these include exploration and identification of a quarry location. Extraction, lifting and transporting, inventory management, cutting the stones into slabs and tiles, polishing.

In addition, making bricks then keep that in a high magnitude of fire and for that they use rubber in combustion to generate hazardous and toxic chemical in the environment. That toxic chemicals have directly impact on labors health, Production accompanied by different incidents, injuries, loss of lives and property damage. Safety affects the morale of the workers directly (Akhtar, 2014).

## 1.3. Objectives of the Study

The overall objective of the study is to estimate the value of statistical life and value of statistical injury of workers in marble factories and brick kilns at Peshawar. The specific objectives are as follow:

1. To know the status of environmental safety regulations and their implementation in the two industries.
2. To estimate the monetary value of risks in the two industries.
3. To differentiate the monetary value of risks between the marble and brick kiln industries.

## 1.4. Research Question

The research questions of the study are the following:

1. Does environmental degradation effect the labors health and their productivity at marble industry and brick kiln in Peshawar?
2. What is the value of statistical life of workers in marble industry?
3. What is the value of statistical life of workers in brick kilns?

# CHAPTER II

# Literature Review

There is a substantial literature since the last 40 years which have evaluated the tradeoffs between mortality risk and money and has confirmed the Adam smith intuition on the compensating wage differentials for occupational hazards.

## 2.1. Thematic Literature

The study reviewed thematically an enormous literature in a significant number of countries and to monetize small changes of death risks reductions and a small reduction in probability of severe injuries and diseases, and then these values in turn serve as a human life value or value of statistical life.

## 2.2. Value of Statistical Life

As value of statistical life and injury estimated for an Indian workers using hedonic model are 10.28 million and 4876 respectively (Shanmugam, 2016).

The value of statistical life and injury for India among the Chennai and Mumbai people. Using the compensating wage differentials and hedonic wage model, estimated the wage/earning premiums a labor would pay to accept/take a small increase in his/ her risk of death, or, equivalently. A value that abridges what a society/population are willing to pay for the reduction in the risk of one death in numerical sense. They also estimated approximately 15 million rupees for life and for injury ranges from 4000 to 6000(Majumder & Madheswaran, 2017).

The value of statistical life for Pakistan ranges from the minimum value of PKR 27.67 million and value of 66.67 million (Rafiq, n.d.-a). Estimation the value of statistical life for Taiwan labors are (S$413 000 (corrected sensitivity bias) and US$461 000 (uncorrected) according to 1990 dollar rate(Liu, Hammitt, & Liu, 1997).

For the value of statistical life between US$235000 and US$325000. And value of statistical injury are between US$3500 and US$11 000(James K. Hammitta, 2006). Many times in different studies the econometric problems occur in implication of VSL. In a combination of data for the fatal accidents and nonfatal injury has generated two problems of bias selection and endogeneity, during estimating hedonic log wage equation, the human life was US$ 4,625,958, after correction of the endogeneity the human value estimated (US$12,826,520) more than the value estimated with endogeneity for Chilean workers.(Contzen, Won, &Lavin, 2013)

Herzog & Schlottmann, (2018) concluded the value of statistical life in England based on adam smith intuition wage differentials compensation, who suggested that work with dis agreeable characteristics must demand higher wages, and in white color labor market this ratio would be very high, applied the hedonic wage model equation and assumed that the reduction for risk resulted diminishing wage or earnings of the labor the labor extracted from the estimation is above 2.5 million pond.

Kim, (1999) examined in their study the compensating differential for work place accidents and risks for the labor in south Korea labor market and they experienced two main institutional changes in the middle of 1984 and 1990. First the study noticed that a relation in the restriction policy impose on labor unions through they got a bargaining environment which actually associated with the reduction compensating differences and the second main policy were the reform in the Korean worker compensation since 1989 led the labor markets to higher rise in risks reduction benefits which also served in the reduction in compensating.

(Majumder & Madheswaran, 2017) concluded the Meta analysis of statistical value of life using the hedonic wage model. This study examined that out of 30 studies has refined VSL which has corrected the problems of endogeneity and heterogeneity that's why there is a variation in the VSL.

This meta-analysis approach showed that there is a heterogeneity in the studies, and that is the main cause of variation.

Weitzman, (2007) analyzed the structural uncertainty and value of statistical life of economics of low probability high impact catastrophe. There is a lot of issues in the VSL, an econometrics issues, the effects of age on VSL and the unionization of risk premiums, the meta-analysis indicates elasticity in income of the VSL from 0.5 to 0.6 approximately.

W. Viscusi, (2003) Due to scarce data VSL estimation are unavailable and difficult in developing countries, in industrialized countries meta-analysis of VSL studies has been conducted to derive a VSL prediction function for the developing countries to encounter differences in risks, income, human capital levels and demographic characteristics, taking four variable income, risk, education and age, robust techniques have been used to estimate VSL applied to assess the willingness to pay for reduction in death risks which has linked to air pollution for Santiago city in Chile ranged between 519000$-675000$. Furthermore some researchers found that the variation occurs due to some other reasons are in implicit labor market through revealed preference approach, which is based on wage risk tradeoffs analyses the value of statistical life which is vary with differences in ages of labor (Aldy & Viscusi, 2007).

The authors used hedonic approach and identifies that value of statistical life of younger age labor is more than the older one. And the younger one has high willingness to pay because of more life expectancy years based with the country average year. (Krupnick et al., 2002) estimated the value of life for Canadian workers ranges from C$l.2 to C$3.8 million (CD 1999) and further they examined VSL for ages that willingness to pay were constant for 40 year old up to 75 year workers. While there is an investigation of human value near to $4 million in year 2000 dollar from labor

and constructed market. And interestingly suggests that values for children and seniors are not less than middle aged and young people of US (Blomquist, 2004)

Hersch & Viscusi, (2009) examined that in a specific group of people such that the Mexican immigrants have receiving very less compensating wage differential regarding of high risks jobs, compared to native U.S workers. Non Mexican immigrants have high value of statistical life and have receiving less risks related to their jobs while Mexican immigrants have opposite to other groups of people they have different wage offer curves because they do not know English fare language this paper concluded VSL can also be applied on a specific group of people. Knowledge of English is actually related to safety training information, safety productivity.

### 2.3. Safety Provision or Risk Reduction

Adam smith's theory of compensating wage differential suggests that jobs with high risks characteristics will demand high wages. Hedonic wage equation implicitly assumed that labors willingness to pay for safety improvement or risk reduction in a workplace via diminished wages, and the valuation of the prices of these reduction in risk or improvement in safety are equivalent (Press & Review, 2018). In addition, the estimations of marginal value of perceived job risks and the implication of quitting behavior of labors at chemical industry in Taiwan, and found that compensating wage differential exist in the chemical industry and found some positive relation between quitting intentions and perceived risk(Yang, Liu, & Xu, 2016). As well as this paper estimated the statistical value of life and injury that are $624 000 and $44 000 (1995 dollars) respectively.

### 2.4. Health Hazards in Marble Industry

The small scale and large scale marble industries which have occupational health and safety issues. The workers who have exposure to different types of occupational hazards at the workplace,

identification of those hazards such that hazardous chemical uses in polishing, unguarded sharp edges and blades in machinery, excessive noise, personal protective equipment, silicosis disease , eye, skin, and respiratory diseases as well, examined by (Akhtar, 2014). They also implied potential measures to reduce the related risk.

Khan *et al*, (2015) examined that material handling is done by labor in marble industry and unsafe working place effects the morale of labor and reduces their productivity. The bad environment effects labor inhalation and cause them tuberculosis and skin burn, suggested that personal protective equipment should use by each labor and material handling system should be modified regularly reuse and recycling should be made mandatory for each of the marble zone.

**2.5. Brick Kilns**

A study conducted on air pollution and brick kilns examined that Pakistan is the third largest producer of bricks and these industries has a very big contribution in air pollution which makes Peshawar on seventh most polluted city in the world. According to the research brick kilns are the main cause of air pollution in Peshawar. About 36 percent of contribution in the total air pollution of the country Bangladesh (Shandana, Rahim, 2016). Every kilns consume 60 to 80 tons of coal and 6 to 8 tons of rubber and 12 to 17 tons of wood. Even though rubber has been banned throughout the country according to environmental protection act 1997. These pollution become caused of diseases like asthma, heart diseases, cancer, blood pressure, bronchitis and sometime due to very hot weather labor being a victim of heart attack and caused fatality in brick kilns examined by (Shandana, Rahim, 2016).

**2.6. Literature Gap**

There are different kind of research done on value of statistical life and injury in western countries they have done lot of work in this area. Even India has done a lot of work in this area as well. But

Pakistan did a negligible research in this area, and work done in Pakistan is just for the formal and registered companies or factories with the government. No academics research available in Pakistan for the informal sectors such as marble industry and brick kilns. In spite the fact that these industries have very big contribution in air pollution. And have adverse impact on human and labor health. Labor faces severe injuries and death in these industries due to unsafe environment and no safety regulations there, no health facilities are being given to labors not even first aid boxes are available at any of the factory, no alarming and precaution signals are installed in such industries. Neither policy nor insurance for them, the government are also ignoring this category.

Categorically, there is no safety regulations for them so an enormous number of labor force are losing their productivity in these specific fields , this research may help in policy making for safety programs projects for informal industries labor, and may also helpful for the self-protective equipment institute as well.

# CHAPTER III

## Data Collection Technique

This chapter includes the description of area the sampling the questionnaire methodology sample size and theoretical framework explained thoroughly.

### 3.1. Description of the Study Site

This study is basically based on the Hedonic Wage Model**,** which assessed demand for safety and estimating the relationship between job-related risks and wages, as well as to monetized the reduction of risks in the marble industry and brick kilns of Peshawar city, Peshawar is not the only capital of Khyber Pakhtunkhwa, but it is also the economic hub of the province and the second largest producer of marbles and the first largest of the brick kilns in Khyber Pakhtunkhwa.

### 3.2. Data Description and Methodology

Under this title, there are multiple sections included and have been explained such that data collection and sampling design, sample size, and questionnaire structure with detailed tables. And theoretical framework has also been explained with detail.

#### 3.2.1. Data Collection and Sampling Design

The data is based on primary data which have collected through questionnaire, and interviews have been conducted for some extra information related to labors health in the study area. Furthermore, data have also conducted on convenient sampling from the labor in the two different industries such that the marble and brick kiln factories in Peshawar city.

#### 3.2.2. Sample Size

This study has collected samples from the marble and brick factories which is in the Peshawar. About 450 brick kilns in and around Peshawar districts, in which 80 of them were well

operationalized and, producing high volume of bricks supplying to all the construction companies and household throughout the district explained. Some of them were not properly functioning due to lack or depletion of brick soil in that surrounding area, every brick kiln has about 6 to 9 labors doing different jobs. Total labors in brick industry are about 500-600 according to local people living in brick fields in which 100 labors have been taken as sample. On the other side marble and granite industry are spread over in Peshawar in different regions, about 120 on average hundred large scale factories of marble and granite are operating in Peshawar, and every factory hired 10 to 13 labor. In which 1000 labors round about are working (according to granite and marble factories owners and marble factories President in Peshawar). In this study 200 total sample observation will be collected from both the industries mentioned in the study; 100 observations from each industry through an appropriate and precise questionnaire.

### 3.2.3. Questionnaire Design

The questionnaire is designed to get the appropriate data from the respondents according to their working condition to get the expected required outcomes for the study, the questionnaire contained three different sections through which the study monetized the reduced risks benefits and estimate the value of human life. The below table shows the different sections.

***Table 3. 1: Questionnaire Design Structure***

| Sections | Contents |
|---|---|
| Section – I | Worker's personal characteristics |
| Section – II | Worker's job related characteristics |
| Section – III | Information about risks in work place to labor's health and life |

### 3.3. Theoretical Framework

The background of the study expresses actually that, the labors are willingness to pay for the reduced death risk in the labor market, which is actually the deal between risk and wages. This notion is the Adam Smith intuitions, the wages of labor vary with the ease or hardship, the cleanliness or dirtiness, the honorableness or dishonorableness for the employment so Adam Smith defined this trade off already very clearly.

The hedonic equilibrium is basically the result of the wages offered to labors for job with different types of risk and labor choices from the suitable set of opportunity. Let's consider the available opportunity to the worker "the firms offer" show the costs borne by the employers to provide an environment which is less risky. So to maximize his profit the employer will pay less or no compensation to the worker because of the safety improvements. Which means that the offer level decreases as the risk level decreases at the workplace which implies that income or wages increases with increase in risks and vice versa.

The worker is indifferent between the different combinations of wages and risks available at the place. Which combination of risk and wages the worker will choose and which firm that would be most desirable depend on the workers' willingness to accept to bear how much risk.

The market equilibrium for each worker is at best attainable combination of wage and risk from the choice set available to the worker. The observed market equilibrium for a number of workers which yields a set of wage-risk combinations in labor market, or relationship between risk and wage, where risk denotes p and wages denotes w, where we know that wages is a function of risk w(p). Where the slope of risk and wage denotes the worker's marginal willingness to pay for the marginal reduction in risk, and the firm's marginal willingness additional cost of providing more safety and better environment. Whereas w(p) does not mean to represent the individual marginal

willingness to pay for the reduction in risks, either it represents the combine willingness to pay of the workers, or the average tradeoffs of the risk and wage.

# CHAPTER IV

# Data Analysis

In this chapter we have explained the detail thoroughly about model of the study, variables explanation and a briefed note on the computation concept of the value of statistical life. And the summarization of the data through tables, and statistical analysis of the observations.

## 4.1. Methods

In this study hedonic wage model based on compensating wage differential applied to estimate the wage-risks equation. The econometrics technique, Ordinary Least Square (OLS) applied to the hedonic wage model to get the expected results. In short, the value of statistical life and injury have been estimated for marble factory workers as well as monetized this value for the brick kiln workers in district Peshawar, through hedonic wage model. It has implied separately for marble industry and for brick kilns as well, and then both the values have been compared.

### 4.1.2. Econometric Model

$$W_i = \beta_0 + \beta_1 AGE_i + \beta_2 EDU_i + \beta_3 SKLD_i + \beta_4 EXP_i + \beta_5 REGH_i +$$

$$+\beta_6 DSTN_i + \beta_7 MIST_i + \beta_8 LPM_i + \beta_9 CHESD_i + \beta_{10} BACKPAIN_i +$$

$$\beta_{11} INTRDMY_i + \beta_{12} INCOG_i + \beta_{13} INTRDMY\_B_i + \beta_{14} PINJ_i +$$

$$\beta_{15} PFATL_i + \varepsilon_i$$

The above variables mentioned in the econometric model are defined below in the table. W (hourly wage rate) is the dependent variable in the study, $B_0$ is the constant term in the model and others, such that the labor personal's characteristics and the job's characteristics are clearly mentioned in the below variables table. $B_{is}$ is the vector of variables in the model, $\varepsilon$ is the error term in the study.

On the other hand, this study also measures the perceived risks of injury and fatal, these risks based on labor perception about the risks at the two different industries to labor health.

### 4.1.3. Computation of Monetary Value of Statistical Life and Injury

This study further computed the monetary value of statistical life and value of statistical injury via using the standard hedonic equation used in the literature.

$$\mathbf{VSI = \beta_{14}PINJ*W_m*2000*100}$$

$$\mathbf{VSL = \beta_{15}PFATL*W_m*2000*10{,}000}$$

**$B_{14}$PINJ** is the coefficient of the injury in the model will be multiplied to the mean of hourly wages (we have taken average of the dependent variable which is hourly wage rate) and then will be multiplied to international standard hour time (2000) of labor work, and then to the 100 which is the standard scale kept for an injury frequency. (Shanmugam, 2016).

**$\beta_{15}$PFATL** is the coefficient of fatal risk in the econometric model, multiplied it with hourly mean wage to standard hours 2000 and then to fatal measured as per 10,000 to finalize the value of statistical life.(Rafiq, 2011.)

But in this study we have used Pakistan standard annual hours that are 2496 (2500 round about) rather than 2000, which is best fit in our scenario. Because mostly private sectors have 6 working days in a week and per day working time is almost 8 hours according to factories act 1934 and labor law of Pakistan.

### 4.1.4. Variables Explanation

The source of data for 'job risk' is the workers themselves in the different industries marble factories and bricks kiln industry, the risk related data collected from the respondents through questionnaire via a convenient sampling approach. The provided data pertaining to the total

number of workers and the number of perceived death and injury accidents to them on an annual basis, and based on their past experience of real fatal and injury risks at informal sectors such that marble and bricks sectors. Thus, these risks may vary substantially across years, specifically when there is a major calamity resulting in multiple deaths, we computed in this study the probability of perceived job-related fatal risks per 10,000 workers (FATAL) and the probability of perceived injury risk per 100 workers (INJURY) considering the last three years. These risk measures were then matched to the workers perception about risks. Obviously, there is a measurement problem common to this type of study because not all the workers face the same level of risks. While most studies cover only blue-collar workers in the 2 digit level industry and recommended that computed value can be implied to all workers/industries. While this study covers, workers who are full time expose to pollution and risks, the perceived level risks are used in this study, which is a subjective perception variable indicates that whether or not the worker's job exposes him to any environmental risks/problems and unnatural conditions. In this we have taken the Perceived fatal which will denote the perceived fatality with the scale of 10,000 and the injury denotes the probability of perceived injury per 100 workers in both industries and this variable data collected from the workers through long discussions and proper questionnaire. The expected signs of the risk variables comprised, perceived injury and perceived fatal are positive in the literature that it has a positive relationship with workers earning and wages, if risk increases the wages would also increase. (Madheswaran & Change, 2015)

**Demographic variables:** For the estimation of the Hedonic Wage Equation, we have used the take-home daily wages as a dependent variable. While we obtained directly this from the workers/respondents. However, there was no uniform rule for drawing wages, as some were receiving their wages monthly, some were weekly, and others were receiving after ten or fifteen

days. Therefore, we calculated first their monthly wages on the basis of given information then converted it to daily wages then converted to hourly basis and confirmed by them.

As the literatures defined that due to no uniform rules available at the sectors for wages so they did as transform to an annualized working hours that are 2000, while in our study it has also been annualized to working hours in our scenario discussed above on page 22, because of no uniform working hours available at the industry some were working 13 hours some were 12 hours others were 10 and 8 hours, which annual average is far more than standard annual 2000 hours. Because of non-uniformness in the working hours we have taken Pakistan average annual regular hours (**2500**), of the 200 observation. So for an accuracy of work in order to obtain the value of statistical life (VSL) and value of statistical injury (VSI) we have used Pakistan annual hours (**2500**).

**The independent variables**: which include risk measures, explained in former paragraph. To these we added worker capital variables (such as age, education, experience, leaves per month etc.) as covariates. Other covariates which include job attributes (such as distance from the working place, job-related diseases, and mistakes happened in workplace, etc.). Dummy variables include skills if the worker skilled 1 otherwise 0, mistakes effect wages 1 otherwise 0 (if the worker does a mistake he may get injuries so therefore he will demand more money in order to high rate of mistakes which may lead labors to high rate of injury) etcetera. We also included diseases which are almost 4 different diseases that are mostly faces by the workers most frequently such that chest infection(coughing, pain in breath, head ache), back pain and last one but not least is cognitive ability that mostly workers were dull minded due to exposes in excess and glut of pollution. The cognitive disease was mostly found in brick kilns workers.

**Interaction dummy** variable consist of two type and both taken as a dummy, firstly, used for marble industry (**INTRDMY**) explains that if the worker has both the diseases Chest Disease along

with Back Pain will be considered 1 otherwise 0 and for Brick Kiln interaction dummy (**INTRDMY_B)** consists two diseases as well chest disease and cognitive ability which means dull minded. We have considered these variables for the present study after reviewing related literature. For instance, while Shanmugam, (2016) employed the same variables except diseases (diseases variables have been used for the first time in our study to evaluate the VSL) for India blue collar worker, W. K. Viscusi & Aldy, (2003) used them for the purpose of the Meta Analysis and Rafiq, (2011) used them to estimate value of statistical life and limb for Pakistan. And the expected signs have been taken from the above mentioned references.

**Table 4. 1: Variables Definitions and their Expected Signs**

| Variables | Definitions | Expected Signs |
|---|---|---|
| | **Worker level variables** | |
| WAGE | Hourly basis wages | **Dependent variable** |
| AGE | No of year | **Negative (+)** |
| EDU | Years of schooling | **Positive (+)** |
| SKLD | If the workers are skilled = 1, otherwise 0 | **Positive (+)** |
| EXP | Counted in number of years | **Positive (+)** |
| REGL | Regular hours of works in numbers | **Positive (+)** |
| DIST | Distance from the work place in minutes | **Negative (+)** |
| MISTKS | If the worker job requires mistakes=1, 0 Otherwise | **Positive (+)** |
| LPM | How much the worker leaves per month | **Negative (-)** |
| | **Worker Diseases** | |
| CHESTD | If worker has a chest disease infection=1 Otherwise 0 | **First time used in VSL** |
| BACKPAIN | If worker feel back pain=1 Otherwise 0 | **First time used…** |
| INTRDMY | If the worker face both diseases=1 otherwise 0 | **First time used…** |
| INCOG | If the worker face in cognitive ability=1 otherwise 0 | **First time used…** |
| INTRDMY_B | If the worker face chest disease and in cognitive=1 otherwise 0 | **First time used…** |
| | **Risks variables** | |
| PERINJ | Job related perceived injury risk per 100 workers per annum measured on 1-5 Likert scale | **Positive (+)** |
| PERFATL | Job related perceived fatal risk proportions measured on a 1-5 Likert scale per 10,000 | **Positive (+)** |

### 4.2. Marble Factories and Brick Kilns

The descriptive statistics have been defined in table 4.2 of continuous variables for both industries, marble and brick kilns. Wage rate is dependent variable counted on daily basis where the minimum wage is 500 PKR up to the maximum 1000 PKR in marble factories as well as 600 to 1000 in brick kilns , age, education and experience are the explanatory variable that are counted in number of years. Minimum years of schooling for education is 0 which means illiterate as far as it is also 0 years of minimum schooling of workers in brick kilns industry. Minimum experience of workers are 1 year those who were less than one (1) year of experience have not been considered in our study. How many regular hours they are working per day, distance measured in KM from the workplace to the labor residence/home some workers are living day and night in the marble industry which estimated as 0 km minimum and 10km maximum distance measured while in the kilns 0 km means they have nearer home next to their working place. How much days have been missed while a worker receive injury or diseases, the detail given in the below table 4.2.

*Table 4.2: Descriptive Analysis of Variables*

| Variables Name | Mean | Minimum | Maximum | Mean | minimum | Maximum |
|---|---|---|---|---|---|---|
| | Marble factories | | | Brick kilns | | |
| **Wage** | 797 | 500 | 1000 | 853 | 600 | 1000 |
| **Age** | 28.95 | 18 | 40 | 35 | 18 | 53 |
| **Education** | 2.83 | 0 | 9 | 1.33 | 0 | 7 |
| **Experience** | 6.53 | 1 | 16 | 12.52 | 1 | 30 |
| **Regular Hours** | 9.17 | 7 | 12 | 9.4 | 8 | 12 |
| **Distance** | 3.97 | 0 | 10 | 3.97 | 0 | 10 |
| **Leaves per Month** | 4.03 | 0 | 30 | 2.13 | 0 | 30 |
| **No of observation** | **100** | | | **100** | | |

Diseases detail provided in table 4.3 that are different types of diseases workers are facing while working in marble or kiln in comparison to any other job that workers can do. Herein some detail for marble workers, 45 percent of the population have chest infection i:e coughing, burning throat, Pain in breath, 35 percent felt they have severe back pain due to putting up heavy stones/weight while some have head ache. Interaction dummy variable generated for diseases that if workers facing chest diseases as well as back pain that those are considered through interaction dummy, 20 workers have incorporated in the study to encounter the problem of those workers who have both diseases i.e chest diseases and back pain. On the other side if we look upon the diseases found in kilns labor we will know that their diseases met on some points with marble industry workers. 73 percent workers have chest diseases found in brick kiln workers, 17 percent were found cognitive disability. Although interaction dummy has also generated for brick kilns workers those who are

facing chest disease and cognitive disability are counted10 percent and the interaction dummy for brick kilns is denoted as interaction dummy_B, where the letter B is extracted from brick kilns..

***Table 4.3: Descriptive Analysis of Diseases that are Common in Workers***

| **Diseases** | **Marble workers** | **Brick kiln workers** |
|---|---|---|
| **Chest diseases** | 45 | 73 |
| **Back pain** | 35 | 0 |
| **Interaction dummy** | 20 | 0 |
| **In cognitive** | 0 | 17 |
| **Interaction dummy_B** | 0 | 10 |
| **No of observation** | 100 | 100 |

Skill is the other explanatory variable used as dummy that explains 0 for not skilled workers while 1 for the skilled labors. The table 4.4 shows that 26 percent of labors at marble industry in our sample population are not skilled whether 74 percent of labors are skilled. Simultaneously in brick kilns these figures for not skilled and skilled workers are 58 and 42 respectively.

***Table 4.4: Descriptive Analysis of Skills***

| | **Marble factories** | | **Brick kilns** | |
|---|---|---|---|---|
| | **Percent** | **Cumulative percent** | **Percent** | **Cumulative percent** |
| **No (0)** | 26 | 26.0 | 58 | 58.0 |
| **Yes (1)** | 74 | 100.0 | 42 | 100.0 |
| **No. observation** | 100 | | 100 | |

Table 4.5 explains mistakes also taken as a dichotomous variable with yes, no option What if mistake happens during working, will that be increased risk hazard to life or health in the industry. Thus this ratio is 50:50 in marble factories while 69:31 is the ratio in kilns.

*Table 4.5: Descriptive Analysis of Mistakes*

| | Marble factories | | Brick kilns | |
|---|---|---|---|---|
| | **Frequency** | **Cumulative** | **Frequency** | **Cumulative** |
| **No (0)** | 50 | 50 | 69 | 69.0 |
| **Yes (1)** | 50 | 100 | 31 | 100.0 |
| **No. Observation** | 100 | | 100 | |

This table 4.6 explains the perceived injury that what the labors/respondents think about risk in their work, the perception were totally based on the past experiences of the workers in the working field that what they had seen in the last three years and what they think about their job risk to their health that might face by them in the coming future, so herein what are their perceptions regarding risks that how much is the probability of getting injury in the specific field of work for both sectors. Whereas, 11 percent of workers felt that there is no risk in their work or have very minimal risk of injury, 19 percent felt they may face injury risk but below than the average, 22 percent faces average risks, though 31 percent may face high risk and 17 percent might be get injury at any time because of maximum level of risk in marble industry. Moreover in brick kilns 32 percent felt minimal risk 24 percent felt below average, 26 were on average risk 12 percent felt above risk and 6 percent of the population of workers in brick industry felt they might have high risk in their job.

*Table 4.6: Descriptive Analysis of Perceived Injury*

| | | Marble factory | | Brick kiln | |
|---|---|---|---|---|---|
| **Scaling** | | **percent** | **cumulative** | **percent** | **Cumulative** |
| **1** | Minimal | 11 | 11 | 32 | 32 |
| **2** | Below Average | 19 | 30 | 24 | 56 |
| **3** | Average | 22 | 52 | 26 | 82 |
| **4** | Above Average | 31 | 83 | 12 | 94 |
| **5** | Maximum | 17 | 100 | 6 | 100 |
| **No. obs** | | 100 | | 100 | |

Table 4.7 also explains the same as explained in table 4.6, but additional point that this is the perceived fatal injury that what the labors/respondents think about risk in their work, the perception were totally based on the past experiences of the workers in the working field that what they had seen in the last three years and what they think about the occupational risk to their life that might face by them in the coming future. Where in marble industry, 25 percent felt they may have high risk of fatal injury, and 14 percent felt that they have an enormous amount of risk that they might face any time during working.

***Table 4.7: Descriptive Analysis of Perceived Fatal Injury***

| | | **Marble factory** | | **Brick kilns** | |
|---|---|---|---|---|---|
| **Scaling** | | **Percent** | **Cumulative** | **Percent** | **Cumulative** |
| **1** | Minimal | 3 | 3 | 24 | 24 |
| **2** | Below Average | 19 | 22 | 22 | 46 |
| **3** | Average | 39 | 61 | 23 | 69 |
| **4** | Above Average | 25 | 86 | 20 | 89 |
| **5** | Maximum | 14 | 100 | 11 | 100 |
| **No. obs** | | 100 | | 100 | |

# CHAPTER V

## Results and Discussions

The results and estimations have been discussed under this title, every single coefficient has been argued and discussed according to the estimation table.

### 5.1. Estimation of Econometric Model

According to the literature most wage model studies and economist in the labor market utilized the logarithm of the dependent variable wage, but there is no such comparable theory that specify the functional form of wages linked with death and injury risks in the workplace. This functional form that links log of the wage (dependent variable) to the death risk, in the compensating differential theory it is still an unresolved issue.

Thus following Gentry & Viscusi, (2016), Madheswaran & Change, (2015) estimated log of wage in the model, However lnwage dependent variable in the model best fit to the data while estimating the reduced risks benefits.

The table 5.1 shows the OLS estimation of the hedonic wage model. Where coefficients show the relationship of the explanatory variables with the wage dependent variable for both the sectors. Where mostly variables have negative relationship with the wage, and in $4^{th}$ and $8^{th}$ column show the steric sign explains the level of significance of the variable that some of them are significant on 1 percent some on 5% and few of them are significant on 10% percent. The variables with no signs of steric means those are insignificant and have no impact on labor earnings.

Age is insignificant and has no impact on the earnings of the labor in marble industry as well as in brick kilns, it means the workers with the age of 50 and 30 will get the same amount of wages in ceterus paribus condition.

Education is negative and insignificant in both sectors that has negative impact on labor earnings if he has attended more years of schooling will earn less amount or low rate of wage. If not attended or less years of schooling will earn more money in the two different production units. Because mostly labor with numbers of years in schooling came late to working field with less experience and no skills and one other reason the labor with education were all the late comers to these industry that's why they paid less amount of wages than those who came a couple of years earlier than the educated ones. The earlier ones are more experienced and skilled than the educated ones.

Experience is the most important factor for earn more this variable is significant on 5% confidence interval in marble factories and significant on 1% in brick kilns which means same as expected before conducting the study from the literature, in marble and bricks factory as experience increases with the unit of 1 year, wage will be increased to 1.3 percent (0.013 × 100) and 1.6 percent (0.016×100) respectively. Skill (they knew the work already and mostly were foreman) is also significant on 1% in both industries if the worker is skilled he will earn 27 percent (0.27×100) higher wages than others who are not skilled in marble and the figure is 17.7 percent (0.177×100) in kilns.

Regular hour, is positive and significant in the first industry (marble), if one hour increases in working of the marble workers will earn 6 percent more wages. While interestingly, regular hour is insignificant and has negative impact on labor wage rate or earnings the reason caused by labor bondage with the factory owners, the owners lend money up to PKR 1lac to their mostly labors due to which they cannot left the work by their leave time.

Distance, from the work place to worker's residence, is negatively significant because most of the workers stay in the same factory where they were working. Through which their wages cut down by expenses they made in the factory living place for stone industry but in the case of bricks it is

insignificant. Mistakes, if there is any chance of mistakes happened in the work will lead the worker to the higher risk of injury which is significant for marble industry and insignificant for brick kilns.

Diseases break into two main sub-diseases that workers are majorly affected by, and reduced their productivity as well that eventually effect their earnings, chest infection which includes coughing, pain in breath, wheezing or breathlessness, and headache(Chirgwin, et.al, 2019) according to medical science(Linden, et.al, 2014) and second is back pain both the disease found in marble workers are significant but have negative coefficients which makes their earning negatively affected and losing their productivity of marble workers, dummy interaction is also negatively significant. In addition, Brick kilns, two common diseases were taken, that chest disease is also insignificant in brick kilns and cognitive disability has been significant for brick workers because the owners consider the cognitive disable workers are the poorer and naive ones so they compensated them, leaves per month is also insignificant equally in kilns and marble factories.

Perceived injury and perceived fatal injury are the interest of this study. And we expected these 2 variables to have positive impact on the earnings. And as expected in marble factories both are significant and positive influence on workers wage rate, the results show that risks in the marble industry effect earnings positively both significant on 5 percent confidence interval. For marble industry 5.1 table shows us that the effect of a unit increase in perceived injury and perceived fatal risk on the value of workers earning is 2.6% in each, both have the same coefficients but different t-values and standard errors. And have a positive impact on labor earnings.

Moreover the perceived injury for the kilns is insignificant while perceived fatal injury is significant on 5 percent. Increase in fatal injury means if they are on ‘average’ risk, and one unit increase in risk means ‘above average’ or ‘maximum level’ of risk, same as the case of injury.

**Table 5.1: Result of Linear Regression Hedonic Wage Model**

| lnwage_hour | Coef. | t-value | p-value | Sig | Coef. | t-value | p-value | Sig |
|---|---|---|---|---|---|---|---|---|
| | Marble factories (model 1) | | | | Brick kilns (model 2) | | | |
| AGE | 0.003 | 0.71 | 0.482 | | 0.001 | 0.15 | 0.879 | |
| EDU | -0.007 | -1.32 | 0.192 | | -0.004 | -0.56 | 0.575 | |
| EXP | 0.010 | 2.18 | 0.032 | ** | 0.016 | 3.24 | 0.002 | *** |
| SKILL | 0.275 | 6.25 | 0.000 | *** | 0.177 | 5.94 | 0.000 | *** |
| REGLR | 0.066 | 5.00 | 0.000 | *** | -0.001 | -0.09 | 0.925 | |
| DIST | -0.010 | -2.04 | 0.045 | ** | -0.004 | -1.13 | 0.262 | |
| MISTKS | 0.032 | 1.10 | 0.074 | * | 0.037 | 0.82 | 0.415 | |
| CHESTD | -0.080 | -1.79 | 0.077 | * | 0.012 | 0.27 | 0.789 | |
| BACKPAIN | -0.101 | -1.94 | 0.055 | * | | | | |
| INTRDMY | -0.187 | -3.08 | 0.003 | *** | | | | |
| INCOG | | | | | 0.019 | 0.35 | 0.023 | ** |
| INTRDMY_B | | | | | -.010 | -0.15 | 0.885 | |
| LPM | 0.000 | 0.04 | 0.965 | | 0.001 | 0.45 | 0.653 | |
| PERINJ | 0.026 | 2.22 | 0.029 | ** | 0.008 | 0.81 | 0.423 | |
| PERFATL | 0.026 | 2.01 | 0.047 | ** | 0.023 | 2.40 | 0.018 | ** |
| Constant | 3.876 | 27.66 | 0.000 | *** | 4.407 | 36.53 | 0.000 | *** |
| R-squared | | 0.803 | | | | | 0.690 | |

Note: ***, ** and * indicated the level of significance at 1%, 5% and 10% respectively.

## 5.2. Computation of Value of Statistical Life and Injury

For the computation of statistical value of life and injury we have used the following standard equations are as:

For marble industry:

VSL= β PERFATL *W*2500*10,000= (.026*105*2500*10,000) = Rs68.25 million

VSI= β PERINJ*W*2500*100 = (0.026*105*2500*10,000) = Rs:6825 only

For brick kilns:

VSL= β PERFATL *W*2500*10,000 = (0.023*95*2500*10,000) = Rs54.625 million

Where β is the coefficient of the lethal injury risk measured as the number of fatal per 10,000 in case of value of statistical life, W is mean hourly wage rate that is multiplied by annual hours 2500 that is Pakistan standard to annualize the figure and multiplied by the scale of the variable which is 10,000 workers for the perceived fatal risk variable.

**Table 5.2:** ***Value of Estimated Statistical Life and Injury***

| | **Marble Factory** | **Brick kiln** |
|---|---|---|
| **Value of Statistical life** (**2500** Pakistan annual hours) | Rs68.25 million (USD426,562) | Rs54.625 million (USD341,406) |
| **Value of Statistical injury** (**2500** Pakistan annual hours | Rs:6825 (USD42.6) | |

*Note: USD 1 = 160 Pakistani rupees during the estimation of VSL, August, 2019*

Value of statistical life is estimated for marble workers in consideration of Pakistan annual hours (2500) is Rs 68.25 million equal to (USD 0.4265 million) and for brick kilns the estimated value of life is Rs 54.625 million equal to (USD 0.3414 million). The coefficient of perception about injury is significant and calculated Rs6825 in marble industry but still they are not compensating

properly in the said industry, majorly reasons, abundance of labor supply in the market and higsh unemployment, provide weak bargaining environment for labors to accept high risk with less compensation. Job quitting risk, and temporary work are largely contributor to small differential and it explains the inadequate wage premium for risky jobs. We have not attempted to imply value of statistical injury for workers in brick kilns because the coefficient of perceived injury for brick kilns is insignificant.

We have also calculated the statistical human life values for both the brick kiln workers and marble industry workers, considered the international standard hours which is 2000**, (APPENDIX B)**

# CHAPTER VI

## Conclusion and Policy Recommendation

This Chapter comprised of two sections, the first section given the detail on conclusion remarks of the study and the second section contained the recommendation policy through the help of the conducted study.

### 6.1. Conclusion

Whether we may computed the value of benefits of reduced risks or hazardous or risks to health and life, in environmental economics it has always been debatable however we argued that workers always make decisions between risks and money or earnings, in the two different industries.

So in our study it is found that workers make decision about their rationale and the workers are rational and on the other side the owners also take rational decisions. So both parties used to do bargaining, the workers mostly want a platform for better bargaining to accept a riskier job on higher wages.

However, we estimated the wage risk relationships in this study in other words "the value of statistical life" for marble factory workers is Rs 68.25 million equivalent to (USD 0.4265 million) while the value of statistical injury is computed Rs 6825 per worker. Which means the workers are not compensating wage differential properly in marble industry. The values are computed in consideration of Pakistan standard annual hours (2500). Which are 7-8 hours per day work that is weekly 48 and annually calculated 2500.

Using the same terminology the value implied for brick kilns is Rs 54.625 million (USD 0.3414m) and the study did not attempted to value the statistical injury for brick kilns because the perceived

injury was insignificant statistically. And concludes that wage compensation differential does not exist in brick kilns either market does not even compensate them for risks.

### 6.2. Policy Recommendation

The values that have been evaluated in this study for the perceived injury and perceived death can be used for the cost and benefit analysis, like pollution control, it can also be used by the insurance companies for settling claims, Furthermore it can also be implied on the ongoing war on terror in Pakistan as well as implied on the floods affected people. This study will further help the policy makers to devise better and improved policies which will benefit the labors in the health context of the two industries.

### 6.3. Shortcomings of the Study

However, study conducted for the informal sectors in Pakistan for the first time, so largely, there are many limitations in this study, also that risks have been considered as exogenous variables, whereas it may be endogenous as well, further the study were no age specific. Thus future research may overcome to release such shortcomings.

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Appendices

## Appendix A:

Questionnaire:

Data collector: **Shah Rome Khan**

**Pakistan Institute of Development Economics**

Introductory Note for the Respondent

Dear Respondent,

This research is conducting only for the purpose of completion **MPhil** degree, and is designed to find out **the marble factories workers views about job safety issues and health risks regarding their jobs and job places as well as the brick kiln workers in Peshawar different regions**. The results obtained from this research can be utilized to recommend an appropriate policy recommendations for the concerned sector. We assure you that none of the information provided will be disclosed. It will be kept confidential, so you are requested to cooperate with the researcher/data collector by providing precise information. We will be thankful to your anticipated cooperation.

**Section I**.

**Worker's profile**

1. Worker's Name_____
2. Nationality: _____
3. District of Domicile: _____
4. Marital Status: _____
5. Education: _____ (years)
6. Skilled:_____ yes/no
7. Age: _____
8. Income: (daily basis) _____ (weekly basis) _____ (monthly basis) _____
9. Family size: _____ (members)
10. Dependent family members: _____ (in numbers)
11. Employed family members: _____ (in numbers)
12. Monthly income of the employed family members_____

13. Are your family expose to any kind of pollution generating by factory you are working in?

**Section II.**

**Job Characteristics**

14. Title of Job: _____
15. Status of the Job: (I) Full time (II) Part Time (III) Permanent (IV) Temporary
16. How many hours do you work regularly? _____ (In hours)
17. What is your regular pay in this job? _____
18. Are you working overtime in addition to your regular hours?
    i. Yes, If yes, How many hours (per day/week) _____.
    ii. No

17 Payment in PKR Per day/ week.

18 Are your Hours irregular?
    i. Yes
    ii. No

19 Your experience in present job: _____

20 How much time on average does it take from your residence to your job place? _____ (in minutes)

21 Do you think your job needs a speedy work?
    i. Yes
    ii. No

22 Does any kind of training proving to you by your employer?
    i. Yes
    ii. No

23 If yes, then what kind of training?

24 How many leaves in a month due to any fatal or non- fatal diseases?

25 Any health facilities providing by the employers or any other sector?

26 What is the distance between your home and factory _____in km?

27 What is the mode of transport you are using to approach to the working place?

**Section III.**

**Information about risks or working conditions**

28 Why you are doing this job? Any reason?

i. Unemployment

ii. high payment

iii. less risky

iv. Other.

29 Do you feel that your work is noisy?

i. Yes

ii. No

If yes, then how often_____ (hours/per day).

30 Does this job expose you to dust, smoke, or anything else during your work?

31 How often is your exposure?

i. Full time working hours

ii. Sometimes

iii. Always

32 How many days do you work in a week_____?

33 Tick the appropriate box below that indicating your perception of receiving a job related injury in marble industry/brick kiln in comparison with any other job that you can do.

| Level | Response |
|---|---|
| 1 | Minimal |
| 2 | below average |
| 3 | Average |
| 4 | above average |
| 5 | Maximum |

34 Please tick the appropriate box below that indicating your perception of risk related fatalities in marble industry/brick kiln in comparison to any other job that you can do.

| Level | Response |
|---|---|
| 1 | Minimal |
| 2 | below average |
| 3 | Average |
| 4 | above average |
| 5 | Maximum |

35 What kind of stones you are cutting in the factory_____?
36 Which disease you are facing most frequently_____?
37 What are the time duration of that disease?
   i. Temporally _____days/months
   ii. permanent

38 Are you using any kind of safety during your work hours?
   i. Yes
   ii. no
   If yes, what kind of safety that is? Masks, gloves, plastic shoes?
39 If you remain at marble industry/brick kiln for the next 12 months, what do you think, is your risk of dying in a job related accident out of 100,000?

| Level | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|

Scenario to the respondents regarding the above analogies: imagine 100,000 workers who work in a similar capacity. How many of them will receive fatal accidents in marble industry/brick kilns?

40 How many days do you expect to work in this industry for the next six months?
41 How many days of work do you expect to miss due to job related injuries in the same factory?
42 Do you have any health insurance by any means?
   i. Yes
   ii. No
   I. If yes, how much is you premium?
   II. Does your company/firm provide any kind of compensation?
      i. Yes
      ii. No
43 Do you remember any kind of fatal non-fatal accidents in marble factory in the last 3 years? If yes, then please provide the information?

| Name of the accident | Person's name |
|---|---|
| (fatal) death | |
| (non-fatal) injury | |

44 Did you face any accident during the past three years in the particular sector (marble factory/brick kiln?

i) Yes
ii) No

45 If yes, please share us the following information:

| Name the accident/s | Reasons | Workdays lost |
|---|---|---|
| 1.<br>2.<br>3. | | |

46 Have you received any pecuniary or non-pecuniary compensation from your employer or government?

47 What other benefit do you get from your company or government?

48 Is there any rule to financially compensate the worker's family who receives fatal or non-fatal accidents?

## Appendix B

**Table:** ***Value of statistical life (2000 standard annual hours)***

| | **Marble Factory** | **Brick kiln** |
|---|---|---|
| **Value of Statistical life**<br>(**2000** Standard annual hours) | Rs54.6 million per life<br>(USD 3,41,250) | Rs43.7 million per life<br>(USD 2,73,125) |
| **Value of Statistical injury**<br>(**2000** Standard annual hours) | Rs5460 per worker<br>(USD 34.12) | |