HEALTH AND PRODUCTIVITY OF SMALL AND MEDIUM INDUSTRIAL ENTERPRISE (SMIE) WORKERS: THE CASE OF BANGLADESH

NASRIN SULTANA

A thesis submitted to the University of Dhaka in accordance with the requirements for the Degree of Doctor of Philosophy

Institute of Health Economics
University of Dhaka
Dhaka 1000, Bangladesh

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DECLARATION

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma in any university or equivalent institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Dhaka University
March, 2014

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Nasrin Sultana
Registration No. 156/ 2012-13 (Re.)
Institute of Health Economics
University of Dhaka
Dhaka 1000.

CERTIFICATE OF THE SUPERVISOR

This is to certify that the thesis entitled "Health and Productivity of Small and Medium Industrial Enterprise (SMIE) Workers: The case of Bangladesh" and its findings are the outcome of the research work carried out by Nasrin Sultana under my supervision in the Institute of Health Economics.

Date:

....

Professor Shamsuddin Ahmad, Ph.D
Institute of Health Economics
University of Dhaka
Dhaka 1000.

ABSTRACT

Small and medium manufacturing industries (SMIEs) have significant contribution in terms of employment creation and share of GDP in the economy of Bangladesh.Evidence shows that workers of SMIEs usually work and live in unsafe, unhygienic and unhealthy conditions.As a result, the workers' are exposed to illness and disability whichlead to a productivity loss of the worker. Therefore, the study seeks to assess the relationship of health with the productivity of SMIE workers in Bangladesh.The specific objectives we like to investigate are:

i. To examine the relationship between health and productivity of SMIE workers
ii. To find out the association between wages and productivity of SMIE workers
iii. To estimate their income and expenditure on health
iv. To observe the disease pattern and health care seeking behavior of SMIE workers
v. To examine the health and working and residential environment of SMIE workers
vi. To discuss the wage determination system of SMIE workers
vii. To examine the impact of illness of SMIE workers on their productivity
viii. To estimate and monetize the lost productivity of the selected SMIEs and the total SMIE sector due to illness of worker and its importance in the whole economy.

A combination of qualitative and quantitative research technique is used to carry out the study. The study interviewed 259 workers and 44 owners/managers from selected 44 SMIEs which are located in three divisions like Dhaka, Chittagong and Khulna in Bangladesh. The workers and managers were interviewed by using two sets of questionnaire, one for the workers and another for the managers.

It is found that SMIE workers are mostly below middle aged, married, Muslims, less educated and inexperienced. A good health of SMIE workers is found to have a significant positive impact on workers' productivity by both literally and empirically. The regression finding suggests that decrease in 1 absent day due to illness increases worker's productivity by 94. 52 unitsand a 1 unit increase in BMI (ill health to good health) increases worker's productivity by 318.16 units. The studyreveals that labor

productivity and wages are positively related; sometimes higher productivity determines higher wages and sometimes higher wages leads to higher productivity. It is estimated that a 1 unit increase in labor productivity increase the wage by 0.28 units from workers' response and by 0.19 units from managers' response. On the other hand, a 1 unit increase in wage increases the labor productivity by 1.34 units from workers' response and by 1.52 units from managers' response. The study identifies a significant wage-productivity gap of SMIE workers. It finds that insufficient expenditure on health care is a cause of depleted health stock of SMIE workersindicating a 1 unit increase in health care expenditure (insufficient amount to sufficient amount) reduces the ill days of worker by 1.026 units. It is apparent that most of the SMIE workers mainly suffered from occupational asthma, bronchitis, allergic rhinitis, low back pain, anemia, fever, typhoid, headache and diarrhea. The SMIE workers usually seek treatment from pharmacy based doctor, kabiraj/hekim, and paramedics. It is evident that working and residential environment of SMIE worker have considerable impact on workers' health. The average absenteeism rate due to illness of the SMIE workers is found 7.3 %. It estimates that the workers annually miss 22 work days due to their illness.

Monthly mean lost productivity of SMIE worker due to their illness is estimated Tk 413 to Tk 708 from workers' response and Tk 466 to Tk 739 from managers' response based on wage and output respectively. This lost productivity is found as 4% to 7% of average productivity from workers' response and 6% to 9% from managers' response. Monthly mean lost productivity of total SMIEs in Bangladesh is estimated as Tk 19.44 crore to Tk 33.13 crore from workers' response and Tk 19.81 crore to Tk 31.38 crore from managers' response.This lost productivity of total SMIE sector is estimated as 0.05% to 0.09% of GDP, 2.5% to 4.2% of health sector's total budget and 0.12% to 0.20% of national total budget.

Due to unavailability of most recent data, the study uses SMIE data available in the report on survey of manufacturing industries 2005-2006 but it collects the data on productivity of SMIEs workers in the year 2012-2013. Because of this time lag our estimated lost productivity of total SMIE sector is undoubtedly underestimated. The underlying reason for this is that during this time gap both the number and employment of SMIEs increased manifold in the presence of government promotional policies.

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LIST OF ABBREVIATIONS

APEC	Asia Pacific Economic Cooperation
ARP	Average Revenue Product
BMI	Body Mass Index
BSCI	Business Social Compliance Initiative
CDR	Crude Death Rate
DALY	Disability Adjusted Life Years
ETI	Ethical Trading Initiative
EU	European Union
FLA	Fair Labor Association
GDP	Gross Domestic Product
GNP	Gross National Product
GOB	Government of Bangladesh
HCA	Human Capital Approach
ILO	International Labor Organization
IMR	Infant Mortality Rate
ISO	International Organization for Standardization
KLEMS	Capital, Labor, Energy, Materials and Services
LBM	Lean Body Mass
LEB	Life Expectancy at Birth
LYs	Life Years
MAC	Mid-Arm Circumference
MFP	Multi-Factor Productivity
MOF	Ministry of Finance
MOHFW	Ministry of Health and Family Welfare
MRP	Marginal Revenue Product
MSME	Micro, Small and Medium Enterprise
OLS	Ordinary Least Squares
PHC	Primary Health Care
QALY	Quality-Adjusted Life-Years
RHR	Resting Heart Rate

RMG	Readymade Garments
SAI	Social Accountability International
SKOP	SromikKormochariOikkoParishad
SME	Small and Medium Enterprise
SMEDA	Small and Medium Enterprise Development Authority
SMI	Survey of Manufacturing Industries
SMIE	Small and Medium Industrial Enterprise
U5MR	Under 5 Morality Rate
UHC	Upazila Health Complex
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
W HO	World Health Organization
WFH	Weight for Height
WRAP	Worldwide Responsible Accredited Production
YLD	Years Lost Due to Disability
YLL	Years of Life Lost

CHAPTER ONE

INTRODUCTION, OBJECTIVES AND SCOPE OF THE STUDY

1.0 Introduction

Health is an important form of human capital. It can enhance workers' productivity by increasing their physical as well as mental capacities. Physical capacities comprise of strength and endurance, and the mental capacities encompass cognitive functioning and reasoning ability (Bloom and Canning, 2005). A healthy workforce is one of the most important economic assets of any nation whether it is developed or developing (Karen et al., 2005). Good health allows individuals to lead long lives free from excessive pain and discomfort (Andrew and Murray, 2011).

Disease and poor health generate enormous burden to the affected individuals. Suffering from illness may lead individuals to general weakness, inability to work or study well. This in fact affects the individual's productivity and thereby causes inability to provide sufficient support for their family. At a more aggregated level, it seems likely that high disease burden may have an adverse impact on a country's productivity, growth and, ultimately, economic development (Matthew and Neumayer, 2006).

Hazardous work can result in injuries and work-related diseases, and subsequent consequences in terms of absenteeism and work disability (Benavides, 2006). Compensation claims, disability and sickness absence have been considered as indicators to measure the health status of working populations (Berger et al., 2003). Illness and disability reduce hourly wages substantially especially in developing countries, where a higher proportion of the work force is engaged in manual labor than in industrial countries (Bloom, et al., 2003).

Traditionally, human capital has been interpreted as education and skills. However, increasing attention has been given to health as a form of human capital. Accordingly, health is both a final consumption good and a capital good. Human capital theory tells that at the individual level an increase in a person's stock of knowledge and health raises his or her productivity in both market and non-market activities (Tompa, 2002).

Wheeler (1980) finds that improved health significantly increases labor productivity. However, evidence shows that health problems with subsequent functional limitations cause a decreased productivity while at work (Schultz and Edington, 2007). Meerding et al. (2005) have shown that reduced productivity at work due to health problems was prevalent among 5–12% of construction and industrial workers, with an estimated mean loss of 12–28% in productivity.

At the aggregate level, Bloom and Canning (2000) identify four pathways by which health can affect productivity:

Firstly, a healthy labor force may be more productive since workers have more physical and mental energy and are less absent from work;

Secondly, individuals with a longer life expectancy may choose to invest more in education and receive greater returns from their investments;

Thirdly, with longer life expectancy, individuals may be motivated to save more for retirement, resulting in a greater accumulation of physical capital; and

Finally improvement in the survival and health of young children may provide incentives for reduced fertility and may result in an increase in labor force participation which may, in turn, result in increased per capita income if these individuals are accommodated by the labor market.

Small and Medium Enterprises (SMEs) contribute significantly to a country's economy. There is consensus among policy makers, economists and business experts that small and medium enterprises (SMEs) are drivers of economic growth in both developed and developing countries. A healthy SME sector contributes prominently to the economy through creating more employment opportunities, generating higher production volumes, increasing exports and introducing innovation and entrepreneurship skills (Mahembe, 2011).

The global contribution of SMEs to economic development is significant in both developed and developing countries (Tambunan (2008). The number of SMEs is increasing because of the global trend for large companies to reorganize, downsize, outsource and franchise. Kachembere (2011) points out that SMEs are playing pivotal role in promoting grassroots economic growth and equitable sustainable development. However, SMIEs face many obstacles as they struggle to compete in difficult local business environments that favor larger firms.

It is estimated that SMEs employ 22% of the adult population in developing countries (Daniels & Ngwira, 1992). Across the South Asia, the contribution of SMEs to the overall economic growth and the GDP is high.

It is estimated that SMEs contribute 25% of Bangladesh's GDP and provide employment to 80% of the total industrial sector employment. In Nepal, SMEs constitute more than 98% of all establishments and contribute 63% of the value-added segment. In India, SMEs' contribution to GDP is 30% (Economic Survey of Pakistan, 2008-09). In Pakistan, SMEs account for more than 95% of the total number of establishments, 80% of employment outside agriculture (SMEDA, 2007). UNIDO (1999) estimates that SMEs represent over 90% of private business and contribute more than 50% of employment and of GDP in most African countries.

In Bangladesh, 90% of private sector enterprises are in fact SMEs. 70% to 80% of non-agricultural workforce in Bangladesh is working in the SME sector. SMEs contribute 40% of manufacturing output and employ around 25% of the total labor force (Governor, Bangladesh Bank, 2013).

International experience with small and medium manufacturing enterprises (SMIEs[1]) suggests that SMIEs can be an important driver of employment, investment, exports and economic growth. Such enterprises are crucial especially in developing countries where growth of large scale enterprises might be constrained by technology, finance, skills, external competition and domestic institutions. A healthy SMIE sector can provide the bridge for transition from an agrarian economy to a modern manufacturing and service based economy. The economic development of Taiwan is an important example of the potential of SMIEs (Ahmed and Rahman, 2012).

In Bangladesh during 1970s to 1980s, the performance of the manufacturing sector was lack luster, growing below the average growth of the economy but it started to improve during the 1990s. The faster pace of expansion of manufacturing relative to total GDP since FY 91 caused its share to increase gradually, rising from its low level 12 percent in FY 91 to 19.6 percent in FY 13. During that time, the share of large and medium scale manufacturing has grown from 5.55% to 14.3% of GDP but the share of small manufacturing to GDP has remained at around 5%. Thus, for accelerating manufacturing as well as the overall growth in the economy special attention is needed

[1] Small and Medium Manufacturing Enterprises are termed as SMIEs.

to the small and medium manufacturing enterprises (SMIEs) because of more flexibility and labor absorptive capacity (MOF, 2009, 2010 and 2013; Nath, 2012).

Despite the fact that SMEs contribution in economic development is noteworthy but the workers work with hazardous condition and there exists work insecurity (the lack of protection for workers' health and well-being in the form of work-related accidents, illness and stress, lack of workers' compensation and paid sick leave, lack of maternity protection, excessive hours of work, etc). ILO household surveys show that in developing countries most workers live with extreme work insecurity. In Bangladesh, nearly 50% of all wageworkers feel insecure about the health and safety conditions of their workplace, in Tanzania, 80% of casual agricultural workers said the same; over 25% of Ukraine's industrial workers said their working conditions are unsafe, while nearly half of all wageworkers in Latin America said the same (ILO, Fact Sheet No. 11: Work insecurity).

Ahasan (1993 and 1994), Khan (1994, 1997, 2000) and Raihan (1997) have investigated many industries in Bangladesh and found that majority of SMEs do not have a long-term stake in environmental and climatic considerations. Some others (Ahmad *et al*. 1997, Sadeque *et al*. 1998) have surveyed different workplaces in Bangladesh and analyzed local workers' health, safety and ergonomic issues. They have found that the workers usually worked long hours in unsafe conditions without using any personal protective devices. As a result, they are less productive than those who are working in environment friendly workplace and have good health. (Ahsan, 2002). Alavinia et. al. (2008) have pointed out that work-related factors seem also important determinants of productivity loss.

Large scale industries are mainly the formal sector industries in Bangladesh. The main laws related to occupational health & safety in Bangladesh is the Factory Act 1965 and the Factory Rule of 1979. This act is generally applicable to any `factory'. `Factory' means any premises including the precincts thereof whereon 10 or more workers are working or were working on any day of the preceding twelve months. This act defines worker as a person employed in any manufacturing process or in cleaning any part of the machinery or premises used for a manufacturing process, or in any other kind of work incidental to or connected with, the manufacturing process. It does not include any person solely employed in clerical capacity in any room or place where no manufacturing process is carried on (ILO, 2002). Moreover, Bangladesh Garment

Manufacturers and Exporters Association (BGMEA) and Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) set standards for compliance like factories must have alternative stairs, basic fire equipment, approved layout plan from concerned authority for ensuring safe building construction, group insurance for workers, hygienic sanitation facility and first aid appliance, as well as ensuring minimum wages and flexible jobs for the workers. There are many recognized compliance bodies worldwide like ILO, ISO 14001, WRAP, BSCI, ETI, SAI, FLA. Owners of factories and government can seek help from those bodies to improve the standard of environment as well as products of these industries. The formal sector industries usually follow the industrial compliance. As a result, the workers of large scale industries both in manufacturing and non-manufacturing sector work with safe and healthy environment and thereby, they used to miss less work days due to their illness.

The SMEs are mostly the informal part of industrial sector. Due to the informal sector industries, the actual numbers of SMEs are not available and not updated on a regular basis. Among the informal SMEs, manufacturing SMEs are to some extent formal and some data on this are available. Moreover, manufacturing SMEs (SMIEs) are basically labor intensive compared with non manufacturing SMEs which are mainly home based.

Evidence shows that workers of manufacturing SMEs in Bangladesh usually work and live in unsafe, unhygienic and unhealthy conditions. The reason is that generally SMEs are labor intensive with relatively low capital intensity though the government of Bangladesh has taken various initiatives such as providing SME loan, technical support to boost up this sector. Most of the SMEs cannot afford big investments in compliance issues. As a result, the workers of SMIEs work with unhygienic and unhealthy work environment. Hence, the workers' are exposed to illness and disability. It is more likely that there is productivity loss due to the illness of the worker. Specific illnesses and diseases may lead to a reduced productivity while at work. There exists hardly any study on this.

In view of these, it is more appropriate to examine the association of health with productivity of manufacturing SMEs (SMIEs) workers rather than the large scale manufacturing industry workers in Bangladesh.

1.1 Objectives of the Study

The overall objective of the study is to assess the relationship between health and productivity of workers in the Small and Medium Industrial Enterprises (SMIEs) in Bangladesh.

To achieve the general objective of the study, the specific objectives we like to investigate are:

i. To examine the relationship between health and productivity of SMIE workers
ii. To find out the association between wages and productivity of SMIE workers
iii. To estimate their income and expenditure on health
iv. To observe the disease pattern and health care seeking behavior of SMIE workers
v. To examine the health and working and residential environment of SMIE workers
vi. To discuss the wage determination system of SMIE workers
vii. To examine the impact of illness of SMIE workers on their productivity
viii. To estimate and monetize the lost productivity of the selected SMIEs and the total SMIE sector due to illness of worker, and its importance to the economy of Bangladesh.

1.2 Hypotheses of the Study

The hypotheses we intend to test for the study are:

Hypothesis I: A good health has a positive impact on productivity of SMIE worker.

Hypothesis II: A positive relationship exists between wage and productivity of SMIE workers.

Hypothesis III: Insufficient expenditure on health causes depleted health stock of SMIE workers.

Hypothesis IV: Working environment affects the health of SMIE workers

Hypothesis V: Bad Residential environment of SMIE workers are responsible for their illness.

1.3 Scope of the Study

The scopes of this study are discussed under the following grounds:

The study selects only the manufacturing SMEs in Bangladesh considering that manufacturing sectors' contribution in employment creation and GDP is the highest among other industry categories. It does not consider large scale manufacturing as well as non-manufacturing industries.

I. The basis of the sample selection of the study is the report on Bangladesh Survey of Manufacturing Industries, 2005-2006.This report has published in January, 2010 and it is the latest report on manufacturing industries in Bangladesh. But the study has collected the data during June 2012 to December 2012. So, there exists a time lag between the period of data collection and the SMI report 2005-2006. During this gap, both the number of SMIE establishments and employments has most likely increased. Thus, to that extent our estimation of productivity loss of SMIE sector is underestimated.

II. The study selects only the 10 categories of establishment among the 57 categories of manufacturing small and medium enterprises which are located in three major divisions like Dhaka, Khulna and Chittagong in Bangladesh. So, generalization cannot be made precisely based on the findings. There is a need to extend the study with larger sample on categories of factories covering more sample areas before generalization could be made.

III. The study chooses the workers among them who were ill during the last 4 weeks only. If the worker were selected randomly irrespective of good or bad health, more accurate finding on absenteeism rate among the SMIE workers could have found.

IV. Information on total SME is available for the year 2003 (Ahmed and Chowdhury, 2009) but the study data has collected in FY 2012-13. So, this time gap might not give correct estimation of lost productivity of SME workers, because during this period both number and employment of SMIEs are likely to have increased given the SME policies adopted by the government of Bangladesh.

V. The study uses the definition of SME in terms of employees 10 to 150, according to Industrial policy 2009.But in the survey of manufacturing industries 2005-06, SMEs are defined in terms of employees 10 to 99, according to Industrial policy 1999. So, the study had to readjust the definition of SME for selecting the sample SMIEs. This readjustment may cause errors of measurement in estimation of number and employment of SMIEs.

VI. The study considers only the physical health of worker. Besides the physical health there are some other kinds of health say, mental health, social which are discussed in chapter three. These aspects of health were not considered while the workers and managers were interviewed with the questionnaires.

VII. It examines and estimates only the direct productivity loss of illness of the SMIE workers .There are some indirect effects of illness which were not taken into account in the study. Examples of such indirect effects include disease burden, mortality, morbidity etc. which were discussed in chapter three. Disease burden increases individual as well as government health expenditure, reduces family's other expenditure say on food, clothing, children's education, and reduces the welfare of the society. QALY and DALY while speak about the effective /quality life of SMIE workers suffering from illness are not attempted to estimate here.

1.4 Plan of the Study

To fulfill the objectives of the study we have planned to discuss the study under nine chapters including this one. Chapter one contains the general orientation to the study which includes the background of the study, hypotheses on which the study is based, objectives and the scope of the study. Chapter two broadly discusses the methodology of the study. Chapter three provides an extensive literature review on the aspects related to the overall objective of the study. The empirical findings on the relationship between health and productivity of SMIE workers are also discussed here. To examine the association between wages and productivity of SMIE workers, chapter four discusses different theories on wages, different models that relate wage to labor productivity and empirical findings that estimate wage-productivity relationship. Chapter five estimates the income and expenditure pattern of SMIE workers and examine their disease pattern and health care seeking behavior. Chapter six examines how and in what extent the working and residential environment influences the health status of SMIE workers by reviewing relevant literature and analyzing the empirical findings on these views. In the light of the literature review in chapter four, the empirical relationship between wage and productivity of SMIE workers in Bangladesh are estimated and analyzed in chapter seven. Chapter eight estimates and monetizes the lost productivity of SMIE workers in the selected 44 factories and in the total SMIE sector, and its importance to the economy as a whole. Finally, our findings are summarized and some conclusions have been drawn in chapter nine.

CHAPTER TWO

METHODOLOGY OF THE STUDY

2.0 Introduction

It is discussed in chapter one that small and medium manufacturing industries (SMIEs) have enormous contribution in the economy of Bangladesh in terms of employment creation and share of GDP. But most of the SMIE workers work and live in unsafe, unhygienic and unhealthy environment. As a result, they become ill and remain absent from work. This absence from work due to illness leads to reduce productivity of the workers. Therefore, the study seeks to examine the relationship between health and productivity of SMIE workers in Bangladesh. To do this, it is required to collect the necessary data on SMIE workers' productivity, illness, diseases pattern, health care seeking behavior, working and living environment. It is also necessary to discuss the methods of measuring health related productivity loss as well as its monetizing method.

In view of this, the study uses the following three methods in different chapters: (a) review of relevant theoretical and empirical literature, (b) collection of secondary data from published sources, and (c) collection of primary data through interviewing SMIE workers and managers from selected SMIEs.

Thus, the methodology of the study is designed under eight sections. First section discusses the methods of measuring health related productivity loss of the SMIE workers and section two describes the methods for monetizing lost productivity. Third section gives definition of SMEs both internationally and nationally. Section four discusses the selection procedure of SMIEs at 3-digit and 4- digit levels. Section five talks about the selection process of SMIE workers and managers from selected SMIEs. Section six discusses the preparation of questionnaire, pre-testing and finalization of questionnaire. Section seven explains data collection process, and finally section eight discusses the methods of data analysis.

2.1 Methods of Measuring Health Related Productivity Loss of the SMIE Workers

The study estimates the health related productivity loss of the SMIE workers by determining absenteeism (how much time or how many days the worker missed from work due to illness of himself or herself) and presenteeism (unable to concentrate on working because of not feeling well) of the worker following Mitchell and Bates (2011), and Mattke et al.(2007).

2.1.1 Measuring Absenteeism and Presenteeism

Absenteeism is measured by asking workers how many days they missed from work because of their illness.

Measuring presenteeism is complex. Usually the following methods are used to measure presenteeism of workers: (i) assessment of perceived impairment, (ii) comparative productivity, performance, and efficiency, and (iii) estimation of unproductive time while at work.

i) Assessment of Perceived Impairment

The most common approach to measuring presenteeism is the assessment of perceived impairment, accomplished by asking employees how much their illness hinders them in performing common mental, physical, and interpersonal activities and in meeting job demands. This approach assesses presenteeism by using the information on workers' productivity.

ii) Comparative Productivity, Performance, and Efficiency

Measuring comparative productivity, performance, and efficiency is another way to capture presenteeism. This method, which is used by the Information on Productivity Questionnaire, seeks to understand how an employee's performance differs from his or her usual performance.

iii) Estimation of Unproductive Time While at Work

Estimation of unproductive time while at work due to illness is another way to assess presenteeism (ie, asking employees to estimate lost time due to illness). For example, asking employees to estimate how many unproductive hours they spent at work during the recall period when they were ill.

2.1.2 Study Method of Measuring Absenteeism and Presenteeism

To estimate the productivity loss of SMIE workers due to illness, two recall periods were chosen. The first recall period was the last month and the second recall period was the last 6 month. When the recall periods are short (ie, 1-4 weeks) it is easy to give the data and therefore such self reported data have been found to be reliable and valid.

The study measures absenteeism by interviewing the SMIE workers with questionnaire to ask how many days they missed from work because of illness, and also by collecting data from the owner/managers of the respective factories.

On the other hand, presenteeism is measured similarly by interviewing the workers to approximate their unproductive time while at work and then multiplied the time with per hour output/wage of the particular worker.

2.2 Methods for Monetizing (estimating the cost of) Lost Productivity

In general, there are three methods for monetizing lost productivity due to absenteeism and presenteeism. The methods are:

Firstly, salary conversion method which use survey responses and salary information to estimate productivity loss;

Secondly, introspective method which use survey responses as a basis for thought experiments to give businesses an idea of the magnitude of their lost productivity; and

Thirdly, firm-level methods which attempt to monetize productivity losses based on the cost of countermeasures used to deal with absenteeism and presenteeism.

Salary Conversion Method

Salary conversion method attempts to estimate productivity losses based on self-reported lost time or decreased productivity. The simplest version is the human capital approach (HCA), which expresses the loss as the product of missed workdays multiplied by daily salary/wage.

That is, productivity loss (due to absenteeism) = Missed work days * Daily salary/wage

Originally developed for monetizing absenteeism, the method has been extended to presenteeism losses by using self-reported unproductive hours or self-reported percentage reduction of performance instead of missed days.

The noticeable attraction of this method is its computational ease. The HCA is the method typically used in studies reporting the economic effect of health-related productivity losses. An extension of the HCA is the team production model developed by Pauly and colleagues, who argue that simple salary-based conversion is appropriate for workers performing discrete tasks in isolation, but the model fails to take into account the interdependence of job functions in the modern economy. For example, if the only surgeon in a hospital stayed home sick, the entire operating room would remain idle, causing much greater losses than just the surgeon's salary.

Introspective Method

Introspective method reflects an attempt to overcome the theoretical and practical challenges of converting self-reported productivity reduction into monetary units.

Some researchers (Kessler et al., 2004) have argued that conversion should be abandoned in favor of providing guidance to firms on deriving their own estimates: for example, managers would be provided with an analysis of the productivity survey and asked to consider questions such as "How much would you be willing to pay a contractor who can raise everyone's productivity by 20%?" or "How many full-time employees could you cut off if the productivity of your chronically ill workers decreased by 20%?". The aim of such thought experiments is to illustrate the magnitude of the problem rather than to derive precise estimates. Although helpful, their validity remains untested, and their results have not been compared with those of the HCA.

Firm-level Method

Firm-level method represents a logical extension of the introspective methods and uses a top down approach that assesses firm-level information to derive cost estimates for lost productivity. These methods are based on the premise that managers have a good sense of how their company's productivity is affected by health-related problems and use countermeasures to deal with them. For example, they may have redundant staff to compensate for absences, or they may hire temporary workers or offer overtime payment to maintain output. Alternatively, they could forgo revenues.

Economic theory suggests that a competitive firm combines these different strategies to maximize profits. Therefore, information about a firm's cost for those countermeasures can be used to approximate its lost productivity. The attraction of this approach is that it does not require detailed individual-level data and that the cost of many of the countermeasures (such as the fees paid to temporary employment agencies) is easy to quantify. The downsides are that some of the cost may be intangible and that forgone revenue estimation must rely on a manager's perceptions. It may also prove difficult to elicit countermeasures to presenteeism as opposed to absenteeism because presenteeism is not immediately visible to a firm and may not provoke a conscious response.

2.2.1 Study Method for Monetizing Lost Productivity of SMIE Workers

The study selects salary conversion method which uses survey responses and salary information of the SMIE workers to estimate their health related productivity loss by using the following formula:

Productivity loss (due to absenteeism) = Missed work days * Daily wage

Productivity loss (due to presenteeism) = Missed work hours * Hourly /wage

Thus, productivity loss due to illness

= Loss from absenteeism + Loss from presenteeism

= (Missed work days * Daily wage) + (Missed work hours * Hourly wage)

2.3 Defining SMEs

Though the importance of the SME sector and the informal sector is acknowledged internationally, defining SME is a challenging task because every country has its own definition. Storey (1994) has stated that there is no single, uniformly accepted definition of SME. Firms differ in their levels of capitalization, sales and employment. Hence, this section provides an overview of small and medium enterprise definition across the world with the rationale of what an SME really is.

2.3.1 SMEs around the World

The European Union (EU) defines SMEs by using two different indicators: staff headcounts, and annual turnover or annual balance sheet total. According to EU definition, medium enterprises are the enterprises employing fewer than 250 persons and whose annual turnover or annual balance sheet total does not exceed 50 million euro; and small enterprises employing less than 50 persons and whose annual turnover or annual balance sheet total does not exceed 10 million euro (EU, 2003).

The World Bank defines medium enterprises as enterprises having at most 300 employees and an annual turnover not exceeding 15 million dollars. The small enterprises are those which have fewer than 50 staff members and up to 3 million US dollars turnover (Gibson and Vaart, 2008). United Nations Development Program (UNDP) defines SMEs as enterprises having maximum 200 employees (Gibson and Vaart , 2008).Asia Pacific Economic Cooperation (APEC) defines SMEs as enterprises with less than 100 people, whereby, a medium sized enterprise employs between 20 and 99 people, a small firm employs between 5 and 19 persons (defiworld.htm).

In USA, several U.S. government agencies, including the Small Business Administration (SBA), the U.S. Department of Agriculture, and the U.S. Census Bureau define small businesses and small farms in various industries using a variety of employee, revenue, and asset criteria. But SMEs in the overall U.S. economy includes enterprises with fewer than 500 employees (USITC, 2010). Industry Canada defines a small business as one that has fewer than 100 employees (if the business is a goods-producing business) or fewer than 50 employees (if the business is a service-based business). A firm that has more employees than these cut-offs but fewer than 500 employees is classified as a medium-sized business. (www.about.com).

In India**,** SME is defined in terms of investment in plant and machines (for manufacturing enterprise) and on equipments for enterprises providing or rendering services. . According to the Micro, Small and Medium Enterprises (MSME) Development Act of India, SMEs include those industries where the investment in Plant & Machinery is more than 25 lakh rupees but does not exceed 10 crore rupees for manufacturing enterprises, and investments on equipment is more than ten lakh rupees but does not exceed 5crore rupees for service industries (Reserve Bank of India, 2013). In Pakistan, SME is defined as a business with an investment in productive assets (not including land and building) ranging between Rs. 2-40 million and employing between 10-99 workers (SMEDA, 2002).In Nepal Small enterprises comprise of total assets and total annual sales up to 30 million rupees whether the medium enterprise has this assets between 30 to 100 million rupees (Nepal, The Industrial Enterprises Act 1992).In Srilanka SMEs is defined in terms of persons employed, capital investment, and annual turnover. It includes enterprises whose employment size is fewer than 50 people and capital investment less than 5 million Rs or annual turnover less than 50 million Rs. (Jayasekara and Thilakarathna, 2013).

The following table 2.1 shows the summary of the definition of SMEs around the world.

Table 2.1: Summary of the definition of SMEs around the world

Country/Institutions Name	Small Enterprises		Medium Enterprises	
	Employment (persons)	Total assets/total annual sales	Employment (persons)	Total assets/total annual sales
European Union (EU)	< 50	≤ €10 million	< 250	≤ €50 million
World Bank	< 50	≤ $ 3 million	Up to 300	≤ $15 million
APEC	Between 5-19		Between 20-99	
UNIDO	Maximum 200 employees			
USA	< 500			
Canada	< 100 for goods producing enterprises and < 50 for service producing enterprises		< 500	
Nepal		Up to 30 million rupees		Between 30-100 million rupees
India	Investment between 25 lakh and 10 crore rupees for manufacturing enterprises, and between ten lakh and 5crore rupees for service industries			
Pakistan	Employing between 10-99 workers and investment in productive assets (not including land and building) is Rs. 2-40 million			
Srilanka	Fewer than 50 people and capital investment less than 5 million Rs. or annual turnover less than 50 million Rs.			

Source: Author's compilation

It is observed that a unique pattern is noticeably reflected within various definitions and criteria of SMEs adopted by different institutions and different countries whether it may be developed or developing. Some of definitions refer to the number of employees as their distinctive criteria for SMEs, others use invested capital, and some use a combination of the number of employees, invested capital, sales and industry type.

2.3.2 SMEs in Bangladesh

The Industrial Policies of Bangladesh prior to 1999 divided the industrial sector into three categories — large, small and cottage. The cut-off limit of these size categories was determined on the basis of the size of fixed assets.

The Industrial Policy 1991 defines "Small Industry" as industrial undertakings whose total fixed investment excluding the price of land, expenses for inland transportation and commissioning of machinery and appliances, and duties and taxes, was limited to Tk. 30 million (US $800 thousand) including initial working capital, while the upper limit on the investment level in "Cottage Industry" was Tk. 500,000 (US $13 thousand).

In contrast, the Industrial Policy 1999 distinguishes medium from large industry and defines the size categories in terms of both capital and employment size. Thus, Large Industry" has defined to include all industrial enterprises having 100 or more workers and/or having a fixed capital of over Taka 300 million (US $6 million). Medium industry covers enterprises employing between 50 and 99 workers and/or with a fixed capital investment between Taka. 100-300 million (US $2-6 million). 'Small Industry" means enterprises having fewer than 50 workers excluding the cottage units and/or with a fixed capital investment of less than Taka 100 million (US $2 million). "Cottage Industry" coveres household-based units operated mainly with family labor.

In the industrial policy in 2005, significant changes have been brought about in the definition of the various size categories. In the Industrial Policy 2005, a distinction has been made between manufacturing and non-manufacturing enterprises. In the case of the manufacturing enterprises, sizes have been defined in terms of the value of the fixed assets while in the case of the non-manufacturing enterprises the cut-off line has been identified in terms of employment size.

Thus, in manufacturing sector 'large industry' in industrial policy 2005, was defined as units with fixed capital of more than Tk. 100 million (US $1.6 million) excluding the value of land and building while non manufacturing large enterprise was defined as units having more than 100 workers. *Medium industry* was defined as units with fixed capital of Tk. 15-100 million (US $246 thousand $1.6 million) excluding the value of land and building while non manufacturing medium enterprises were those with employment size between 25 and 100 workers. Manufacturing enterprises with fixed assets of less than Tk. 15 million excluding the value of land and non-manufacturing enterprises with fewer than 25 workers were to be treated as small enterprise.

The Industrial Policy 2009 reclassifies the industry and redefines the size of industry. It classifies industry into five categories – large, medium, small, micro, cottage and reserved industries and redefines all types of industries – whether manufacturing or non-manufacturing (service) – in terms of both fixed capital and the employment of labor.

According to the industrial policy 2009, in the case of manufacturing activity, 'large industry' includes enterprises with either the value (replacement cost) of fixed assets excluding land and building in excess of Tk. 200 million or enterprises having more than 150 workers whether in the case of non-manufacturing industrial activities, large industry includes enterprises with either the value (replacement cost) of fixed assets excluding land and building in excess of Tk. 100 million or enterprises having more than 50 workers.

'Medium industry' in the manufacturing sector is defined with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 15 million to Tk. 200 million or enterprises having between 50 and150 workers while in the non-manufacturing sector it includes enterprises with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 5 million to Tk. 100 million or enterprises having between 25 and 50 workers. If one criterion puts an activity in the medium category while the other criterion puts it in the large category, the activity will be considered to belong to the large category.

'Small Industry' in the case of manufacturing activity includes enterprises with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 0.5 million to Tk. 15 million or enterprises having between 10 and 50 workers while in the case of non-manufacturing industrial activity, it is defined with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 0.5 million to Tk. 5 million or enterprises having between 10 and 25 workers. If one criterion puts an activity in the small category while the other criterion puts it in the medium category, the activity will be considered to belong to the medium category.

Hence, in the industrial policy 2009, SMEs in the manufacturing sector include enterprises with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 0.5 million to Tk. 200 million or enterprises having between 10 and 150 workers whereas in the non-manufacturing sector include enterprises with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 0.5 million to Tk. 100 million or enterprises having between 10 and 50 workers .

The draft Industrial policy 2010 defines SMEs as enterprises with either the value (replacement cost) of fixed assets excluding land and building in the range of Tk 5 million to Tk. 300 million for manufacturing industries and 0.5 million to 150 million for service industries or enterprises having between 25 to 250 workers for manufacturing industries and 10 to 100 workers for service industries. The following table summarizes the definition of SMEs in Bangladesh according to different industrial policies.

Table 2.2: Summary of the definition of SMEs according to different industrial policies of Bangladesh

National Industrial policies	SMEs in terms of fixed assets(Tk)	SMEs in terms of workers
Industrial policy 1999	Less than 100 million and up to 300 million	Up to 99
Industrial policy 2005	Less than 15 million and up to 100 million for manufacturing industries	Up to 100 for non-manufacturing industries
Industrial policy 2009	0 .5 million to 200 million for manufacturing industries and 0.5 million to 100 million for non-manufacturing industries	10 to 150 for manufacturing industries and 10 to 50 for non-manufacturing industries
Industrial policy 2010	5 million to 300 million for manufacturing industries and 0.5 million to 150 million for service industries	25 to 250 for manufacturing industries and 10 to 100 for service industries

Source: Author's compilation from Industrial policy 2005, 2009 and 2010 of Bangladesh

2.4 Selection of Small and Medium Industrial Enterprises (SMIEs)

The Bangladesh Bureau of Statistics (BBS) has been conducting Survey of Manufacturing Industries under the industrial Act 1942, on regular basis since 1973-74.The latest survey of manufacturing industry was conducted in 2005-2006 and this was upgraded using information obtained from Economic Census 2001 and 2003. Report on Bangladesh Survey of Manufacturing Industries 2005-2006 is the main source of data collection for the study.

Industrial policy 2005 defines manufacturing SMEs in terms of fixed assets and non-manufacturing SMEs in terms of number of workers only. Industrial policy 2009 defines both manufacturing and non-manufacturing SMEs in terms of both fixed assets and number of workers of the establishments. The draft industrial policy 2010 redefines SMEs in terms of assets and employment number for both manufacturing and non-manufacturing establishments. Though industrial policy 2010 is the latest one in Bangladesh, it is not approved by the appropriate authority. That is why, the study does not take it into consideration. Since the overall objective of the study is to examine the relationship between health and productivity of Small and Medium Industrial Enterprises workers (i.e. SMIEs workers) in Bangladesh, the study selects SMEs definition according to the industrial policy 2009 that is having employed 10-150 workers.

Report on Bangladesh survey of manufacturing industries 2005-2006 conducted survey on 34710 manufacturing enterprises. According to the definition of SME we accepted for the study, among 34710 enterprises 30,218 enterprises were small and medium sized and the rest 4492 were large enterprises. Survey of manufacturing industries 2005-2006 covered about 35% of the total large enterprises and 16% of the total small and medium enterprises. In fact, 18.5% of the total manufacturing enterprises were covered in that survey (Report on SMI 2005-06, p.1).

2.4. 1 Selection of 10 SMIEs at 3-digit level

Report on Bangladesh survey of manufacturing industries 2005-2006 showed the distribution of industries by both fixed assets and number of employment. As the purpose of the study is to observe the relationship between health and productivity of workers, it is logical to select the industry groups which have the maximum employment share among the 57 industry groups at 3-digit level. Table 2 and table 3

(Appendix D) summarize 3-digit level distribution of total manufacturing industries and SMIEs in terms of both establishment share and employment share respectively. These distributions are the author's calculation on the basis of survey of manufacturing industries 2005-2006.

We have selected 10 categories of SMIEs on the basis of descending order of employment share from table 3 (Appendix D). These 10 categories of selected SMIEs at 3-digit level are given in table 2.3 with their respective establishment and employment share. They constitute 81% share of total SMIE enterprises and 89% of total SMIEs' employment. Employment in the study indicates only the number of operative workers of respective enterprise.

Table 2.3: List of top ten 3-digit level SMIEs by establishment and employment shares

Sl. No.	BSIC (3-digit)	Category of Manufacturing Industry	Total no. of SMIEs	Industry category wise SMIEs as a percentage of total SMIEs	Total operative workers in SMIEs	Industry category wise operative workers as a percentage of total operative workers in SMIEs
1	181	Wearing Apparel	4165	13.78	349585	39.78
2	171	Manufacture of Textiles	10059	33.29	154905	17.63
3	269	Non metallic mineral product	2334	7.72	78680	8.95
4	173	Manufacture of knitwear	547	1.81	61998	7.06
5	153	Animal feeds and by-products	4101	13.57	40113	4.56
6	154	Manufacture of other food products	1627	5.38	27905	3.18
7	221	Publishing	546	1.81	26195	2.98
8	242	Manufacture of other chemical products	645	2.13	18920	2.15
9	160	Tobacco manufacturing	281	0.93	14322	1.63
10	172	Manufacturing of other textiles	276	0.91	12555	1.43
Other categories of SMIEs			5637		93582	
Total SMIEs			30218		878760	

Source: Table 3, Appendix D.

2.4.2 Selection of 10 SMIEs at 4-digit level

The following table 2.4 shows the distribution of 10 industry sub-group SMIEs at 4-digit level whose employment share is the highest among the same industry group at 4-digit level. For example, in a 3-digit level SMIE, say, wearing apparel consists of 39.78 % employment share of total SMIEs employment. This 3-digit wearing apparel comprises of garments (woven), manufacturing of hats and caps; embroidery, textile and wear goods, and manufacturing of wearing apparel N.E.C as 4-digit level. Among these 4 categories of 4-digit level SMIEs, the study selected garments (woven) because its employment share is the highest which is 85 % of 3-digit level wearing apparel's employment. Therefore, the study selected RMG (woven) as 4-digit level SMIE from wearing apparel as 3-digit level. This way the study selected one 4-digit SMIE from each 10 industry groups at 3-digit level SMIEs. Thus, cotton textile except handloom, bricks and tiles, knitwear, rice milling, bakery products, printing and publication of newspaper, pharmaceuticals, bidies manufacturing, and manufacture of spooling and thread ball industry sub-groups were selected at 4-digit level from which we would select the factories to interview workers and managers.

Table 2.4: List of ten 4-digit manufacture SMIEs in terms of highest employment share

Sl. No.	BSIC (3-digit)	Category of 3-digit SMIEs	Total employment at 3-digit level SMIEs (Persons)	Industry category wise employment as % of total SMIE employment at 3-digit level	BSIC (4-digit)	Category of selected SMIEs at 4-digit level	Category wise employment of selected SMIEs at 4-digit level	Employment of selected SMIEs at 4-digit level as percentage of 3-digit SMIEs' employment in the same category (column 8 as % of column 4)
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
1	181	Wearing Apparel	349585	39.78	1811	RMG (woven)	298778	85
2	171	Manufacture of Textiles	154905	17.63	1711	Cotton textile except handloom	105451	68

(Continued Table 2.4)

3	269	Non metallic mineral product	78680	8.95	2692	Bricks & Tiles	52725	67
4	173	Manufacture of knitwear	61998	7.06	1730	Knitwear	57119	92
5	153	Animal feeds and by-products	40113	4.56	1535	Rice Milling	37305	93
6	154	Manufacture of other food products	27905	3.18	1541	Bakery products	20092	72
7	221	Publishing	26195	2.98	2212	Printing and publication of newspaper	13621	52
8	242	Manufacture of other chemical products	18920	2.15	2423	Pharmaceuticals	10027	53
9	160	Tobacco manufacturing	14322	1.63	1603	Bidies Manufacturing	8020	56
10	172	Manufacturing of other textiles	12555	1.43	1724	Manufacturing of spooling and thread ball	8640	68
Other categories of SMIEs			93582					
Total SMIEs			878760				611778	

Source: Table 2.3 and survey of manufacturing industries, 2005-2006.

The following table shows the distribution of selected 10 SMIEs at 4-digit level along with their respective employment share in total SMIEs' employment. The selected 10 SMIEs' employment constitutes 70% of total SMIEs' employment.

Table 2.5: List of selected 4-digit level 10 SMIEs' employment share as of total SMIEs' employment

Sl. No.	BSIC (4-digit)	4-digit level SMIE category	Selected 4-digit level SMIE category wise total employment	Selected 4-digit level SMIE category wise employment as percentage of total SMIEs' employment
1	1811	RMG (woven)	298778	34.0
2	1711	Cotton textile except handloom	105451	12.0
3	1730	Knitwear	57119	6.5
4	2692	Bricks & Tiles	52725	6.0
5	1535	Rice Milling	37305	4.2
6	1541	Bakery products	20092	2.9
7	2212	Printing and publication of newspaper	13621	1.8
8	2423	Pharmaceuticals	10027	1.6
9	1603	Bidies Manufacturing	8020	1.2
10	1724	Manufacturing of spooling and thread ball	8640	0.99
Selected total 10 SMIEs at 4-digit level			611778	70.0

Source: Table 2.4

2.4. 3 Selection of 50 Factories with their Location

There may exists differences in diseases pattern, health care seeking behavior, working environment and living condition in different divisions in Bangladesh. The survey of manufacturing industries 2005-2006 covered the six divisions in Bangladesh. A large number of SMIEs are located in Dhaka division. Moreover, Dhaka division is more crowded and polluted division. Among the other five divisions, Chittagong and Khulna divisions are called industrial city, port city. Thus, to examine whether there are any regional variation among the workers with respect to disease pattern, health care seeking behavior, working environment, and living environment, Dhaka, Chittagong and Khulna divisions were chosen.

If population is homogeneous, sample size 30 is a representative sample. Here, the selected ten 4-digit SMIEs are homogeneous in the sense that all of these factory category are manufacturing industry i.e. produced final goods from intermediate goods or raw materials, uses labor intensive technology, and follows ILO labor standard with respect to work time, over time payment, work leave as well as other work environment. Therefore, selection of 30 factories from these 10 industry sub-group SMIEs would be a representative sample. Since the study chooses 10 categories of factory among 3 divisions where the factories are located on the basis of employment share, to understand the variation extensively we think 50 factories would be sufficient to be a representative sample of 10 categories of SMIEs. So, I had to select 50 factories in total.

The number of factories under each 4-digit level SMIE category was selected according to the employment share of that category. For example, RMG (woven) comprises 34 percent employment share (Table 2.5), 34 percent of the 50 SMIEs is 17 SMIEs. Therefore, the study selects 17 RMG (woven) factories and so on. But in some cases, say for manufacture of spooling and thread ball factory the employment share is as low that as 0.99 percent. According to the above distribution of factories, the number of factory to be included in the sample should be 0.5. However to examine the regional difference in such cases one factory from each division were selected. In this case, 1 thread ball factory from each division was selected.

Thus, the study chooses 50 factories from 10 selected sub sectors from three divisions, which is shown in following table 2.6.

Simple random sampling technique was used to select the SMIEs from Dhaka, Chittagong and Khulna divisions by using random numbers tables and sampling frame prepared with SMEs lists collected from the Bangladesh Small and Cottage Industries Corporation (BSCIC), Bangladesh Garment Manufacturers and Exporters Association (BGMEA), Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA), Bangladesh Export Processing Zones Authority (BEPZA), Bangladesh Yellow Pages and internet sources.

Table 2.6: Distribution of 50 selected factories by 10 industry sub-group SMIEs and 3 divisions

Sl. No.	BSIC	4-digit Industry sub-group of SMIEs	No. of Factories	Division wise factory distribution		
				Dhaka	Chittagong	Khulna
1	1811	Readymade garments (woven)	17	12	3	2
2	1711	Cotton textile except handloom	6	2	2	2
3	1730	Knitwear	6	4	1	1
4	2692	Bricks & tiles	3	1	1	1
5	1535	Rice Milling	3	1	1	1
6	2423	Pharmaceuticals	3	1	1	1
7	1541	Bakery products	3	1	1	1
8	2212	Printing and publication of newspaper	3	1	1	1
9	1603	Bidis Manufacturing	3	1	1	1
10	1724	Manufacturing of spooling and thread ball	3	1	1	1
N			50	25	13	12

Source: Author's computation

2.5 Selection of Workers and Managers from selected SMIEs

For determining the sample size (n) of the workers the following formula (Ahmad et al. 1994) was used:

$$n = \frac{z^2 P(1-P)}{d^2}$$

Where,

d = the maximum error deemed acceptable

z = the normal variable corresponding to the assumed degree of precision = 1.96

p = probability of absenteeism, it is assumed p= 0.064 following CARCADIAN's (2005) finding that average absenteeism rate of workers in manufacturing sector is 6.4%, and d = 0.05 (5% error).

Therefore, $n = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)(0.064)(1-0.064)}{(0.05)^2} = \frac{0.117}{0.0025} = 46.86 = 47$

That is, if we select 47 SMIE workers from 50 factories, it will be a representative sample. It is most likely that the workers of different sub-sections in a factory suffered from the same type of diseases. For our study, we select six workers randomly from each SMIE and accordingly the total number of workers selected for the interview would be 300. In addition, we would select 50 owners/managers, one from each SMIE.

The criterions for eligibility of sample selection in the study are given below:

(i). The workers who had suffered from illness and whose duration of work in the same establishment was at least six months were selected randomly.

(ii). A worker was considered as ill if he/she missed workdays1, 2-5 or 6+, in the last month due to illness of himself/herself or if he/she is unable to concentrate on work because of not feeling well.

(iii). The criterion for selection of owner/manager was the duration of work in the same establishment at least one year.

2.6 Questionnaire Preparation, Pre-Testing and Finalization of Questionnaire

Two sets of preliminary questionnaire were designed to collect necessary data required for this study. One set was designed for SMIE workers and another for owner/managers of the SMIEs. The questionnaire for workers was designed by incorporating 7 sections, namely identification of worker, general information of workers, worker's income, information on worker's productivity, health care seeking behavior of workers, working environment of worker and finally the worker's living condition. Another questionnaire was designed for the managers of respective SMIEs (Questionnaire are attached in Appendix A and Appendix B).

Pre-testing of questionnaire was done on 3rd March 2012 in an establishment, named ABBA garments, located in 13, Tongi Bazer, Tongi, Gazipur. Randomly selected 10 workers from five sub sections: sewing, cutting, machine operating, ironing and finishing were interviewed whose duration of work is at least six months in the same establishment and who have suffered from illness. Two management personnel, one is welfare officer named Tahmina Begum and another one is quality control manager, Abdul Mannan, were interviewed. Both workers and management personnel were interviewed with the semi-structured questionnaire. It was found from the pre-testing of questionnaire that workers from different sub-sections in the same establishments have suffered almost from similar diseases.

On the basis of pre-test result, we have finalized the two questionnaires to interview SMIE workers and owner/managers.

2.7 Data Collection

The final data collection for the study was started from 1st June 2012. I have collected data by myself interviewing SMIE workers as well as managers. Initially data was collected from Dhaka division, then from Khulna Division and last of all it was collected from Chittagong division. From 1st June 2012 to 30th August 2012, data were collected from Dhaka division. From Khulna and Chittagong divisions it was collected from 1st September to 30th October 2012 and from 1st November 2012 to 30th December 2012 respectively.

Data were collected entirely from all categories of factories in Dhaka division. But in Khulna division, no RMG, cotton textile and manufacturing of spooling and thread ball factories were found available to collect data. Moreover, in Chittagong division no spooling and thread ball enterprise was found. Hence, the study ultimately collected data from 44 SMIEs in total where 25 establishments from Dhaka division, 12 establishments from Chittagong division and 7 establishment from Khulna division (Table 2.7). The lists of 44 factories are given in Appendix C.

It is interesting to mention here that in pharmaceutical industry, the workers work with healthy environment and they became less ill compared with the workers of other categories of industries in Bangladesh. Due to inadequate number of ill workers the study collected data from 4 workers in each pharmaceutical establishment in all three divisions. In case of one RMG in Dhaka division, 7 workers are interviewed mistakenly instead of 6 workers (Table 2.7).

Thus, in fact the study collected data from (40*6) + (1*7) + (3*4) = 259 workers and 44 owner/managers of respective SMIEs.

Table 2.7: Distribution of 44 SMIEs actually selected by factory category and location for interviewing of workers and managers

Factory Category	Area of Factory Located			
	Dhaka Division (No. of SMIEs)	Chittagong Division (No. of SMIEs)	Khulna Division (No. of SMIEs)	Total (No. of SMIEs)
RMG (woven)	12	3	0	15
Cotton Textile	2	2	0	4
Knitwear	4	1	1	6
Bricks and Tiles	1	1	1	1
Rice Milling	1	1	1	1
Bakery products	1	1	1	1
Pharmaceuticals	1	1	1	1
Newspaper	1	1	1	1
Bidi factory	1	1	1	1
Manufacturing of Spooling and Thread ball	1	0	0	1
N	25	12	7	44

Source: Author's computation

As a result, the final sample size of the study combining workers and managers who were actually interviewed were 303.

2.8 Methods of Data Analysis

Collected data were processed, tabulated and analyzed using microcomputers. The activities involved in this process were:

(i) Programming for data and statistical analysis
(ii) Entering the data into computers
(iii) Visual checking of the data set
(iv) Logical checking of total data (where applicable) through conducting validation checks
(v) Preparation of output tables
(vi) Checking consistency of output tables
(vii) Statistical analysis by using statistics software IBM SPSS Statistics 20 and Stata/SE 11.1 where applicable in order to draw statistical inference.

CHAPTER THREE

HEALTH AND PRODUCTIVITY

3.0 Introduction

To fulfill the overall objective of the study, this chapter firstly reviews the theoretical background on the relationship between health and productivity, and then it analyzes the empirical findings on the relationship between health and productivity of SMIE workers. To perform it, the chapter is designed under four sections. Section one deals with the concept of health and its different measurement. Section two discusses the concept of productivity and its different measurement, section three analyzes the existing theoretical and empirical literature relating health to productivity. Section four analyses the regression result on the relationship between health and productivity of SMIE workers, and finally it concludes the chapter.

3.1 The Concept of Health and its Different Measurement

3.1.1 What is Health?

'Health' is elusive to define and ways of thinking about it have evolved over the years. In 1948 during a preamble to the constitution of the World Health Organization (WHO), health is defined as a state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity (medical news today, 21 May 2009).

Later in 1986 during the Ottawa Charter for Health Promotion, the WHO defined health as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities (WHO, 1986). Canadian expert Jeff (2008) has defined health as a constantly evolving state towards greater and greater degrees of optimal well-being, physically, mentally, emotionally, socially, environmentally, and spiritually, marked by personal responsibility and the irresistible, persistent impulse towards making positive life-enhancing, life-affirming choices for a richer, rewarding life.

People's explanations of health are diverse and can be contradictory as demonstrated by examples taken from four studies on different populations (http://3mr.me/1-2-2-reviewing-the-research-how-people-understand-health/).

Firstly, Herzlich's research (1973) on the middle-class French people has identified three distinct ways of conceptualizing health:

i) health as something to be had – a reserve of strength, a potential to resist illness, which is determined by temperament or constitution
ii) health as a state of doing – the full realization of a person's reserve of strength, characterized by equilibrium, wellbeing, happiness, feeling strong, getting on well with other people
iii) health as a state of being – the absence of illness.

Secondly, Williams' study (1983) of the health histories of older men and women in Aberdeen identified four similar categories of beliefs about health:

i) health as the absence of illness and disease
ii) health as stamina – the ability to keep going
iii) health as inner strength – a reserve of fitness
iv) health as the capacity to cope with illness or endure chronic pain.

Thirdly, Blaxter's survey (1983) of health and lifestyles has revealed a multiplicity of meanings of health and distinct differences according to age, gender and class. Her research identified six main definitions of health:

i) health as not being ill
ii) health as a functional capacity
iii) health as physical fitness
iv) health as leading a healthy lifestyle
v) health as a psychological concept
vi) health as a reserve

Fourthly, Calnan's research (1987) has identified categories broadly similar to the others, but also indicated the need to look systematically at differences between the social classes. He proposed four different concepts of health:

i) health as never being ill
ii) health as being able to get through the day – to carry out routines
iii) health as being fit – being active, taking exercise
iv) health as being able to cope with stresses and crises in life

Different definitions and different studies discussed above identify that there exists multiple meaning of health rather than a single or unitary concept. Therefore, there is no exact or unique definition of health.

3.1.2 Different Aspects of Health and its Determinants

Most of the people accept that health can be divided into two broad aspects - physical health and mental health (Medical News Today, 21 May 2009).

3.1.2. 1 Physical Health

In fact, when, someone is asked for a definition of health, he /she talks about physical health. Physical health relates to anything concerning our bodies as physical entities. Physical health has been the basis for active living campaigns and the many nutrition drives that have swept the industrialized world. People are exposed to so much "physical health" data these days that it is hard to decide what is relevant and what is not.

Another term for physical health is physical wellbeing. Physical wellbeing is defined as something a person can achieve by developing all health-related components of his/her lifestyle. Fitness reflects a person's cardio respiratory endurance, muscular strength, flexibility, and body composition. Other contributors to physical wellbeing may include proper nutrition, bodyweight management, abstaining from drug abuse, avoiding alcohol abuse, responsible sexual behavior (sexual health), hygiene, and getting the right amount of sleep.

Thus for humans, physical health means a good body health which is healthy because of regular physical activity (exercise), good nutrition, and adequate rest. When a country's or region's people experience improved nutrition, health care, standards of living and quality of life, their height and weight generally increase.

3.1.2. 2 Mental Health

Mental health refers to people's cognitive and emotional well-being. A person who enjoys good mental health does not have a mental disorder. According to WHO, mental health is "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”

People have always found it easier to explain what mental illness is, rather than mental health. Most people agree that mental health refers to the "absence of mental illness". For some, this definition is not enough. They argue that if someone picks 100 people who do not suffer from any mental disorder or illness could be diagnosed by a psychiatrist, some people within those 100 will be mentally healthier than others. Most people also agree that mental health includes the ability to enjoy life, the ability to bounce back from adversity, the ability to achieve balance (moderation), the ability to be flexible and adapt, the ability to feel safe and secure, and self-actualization (making the best of what you have).

3.1.2. 3 Social Health

Social health refers to the physical, mental and social well being of the people in a particular society or setting. This term can also be defined as the act of getting well along with people in the society. According to WHO, the social determinants of health are the conditions in which people are born, grow up, live, work and aged including the health system.

3.1.2. 4 Determinants of Health

Physical, mental or social health of individual people and their communities are affected by a wide range of contributory factors which are discussed below:

Firstly, socioeconomic status – the higher a person’s socioeconomic status, greater the person’s opportunity of enjoying good health. In fact, socioeconomic status affects all members of a family including newborn babies. Amir and Trobe (2000) have found that women of lower socioeconomic status are less likely to breastfeed their newborn babies - a factor which will have an impact on the health of the baby just as he/she enters the world.

Secondly, education – people with lower levels of education generally have a higher risk of experiencing poorer health. David (2007) has found that elderly people who had a higher level of health literacy were more likely to live longer.

Thirdly, physical environment – with clean and safe physical environment, people are more likely to enjoy good health compared to the individuals whose physical environment is not clean and safe. Paul (2008) has found that just an hour of sniffing car exhaust fumes induces a stress response in the brain's activity.

Fourthly, support from people around you – an individual's support from family as well as from friends and his/her community increases his/her chances of enjoying good health far greater than somebody who has none of these things. James et al. (2009) has found that strong family support, not peer support, is protective in reducing future suicidal behavior among young adults when they have experienced depression or have attempted suicide

Fifthly, culture - the traditions and customs of a society and how a family responds to them play an important role in people's health. Anna (2008) has found that when young people dress according to the customs of their own ethnic group, they may be less likely to have mental health problems later in life.

Sixthly, what we do and how we manage - what we eat, our physical activity, whether or not we smoke or drink or take drugs, and how we cope with stress play an important role on our physical and mental well-being.

Seventhly, access and use of health services - a society that has access and uses good quality health services is more likely to enjoy better health than one that doesn't have the same. For example, developed countries that have universal health care services enjoy longer life expectancies for their people compared to under developed countries that don't have the same health care services.

Eighthly, genetic inheritance - people's longevity, general health, and propensity to certain diseases are partly determined by their genetic makeup. (www.medicalnewstoday.com/articles/38934.php)

Ninthly, job prospects and employment conditions – usually an employed person is more likely to enjoy better health than people who are unemployed. Strully (2009) has found that workers who lost their job through no fault of their own were twice as likely as continuously employed workers to report over the next 18 months that they developed a new illness, such as high blood pressure, diabetes or heart disease.

Tenthly, gender - men and women are susceptible to some different diseases, conditions and physical experiences, which play a role in our general health. In some societies women are not given the same access to education as men - education is a factor that influences health.

Finally, religious and spiritual beliefs -when families face tough situations, including health problems, their religious beliefs and practices can help them fight feelings of helplessness, restore meaning and order to life situations, and promote regaining a sense of control. For some families, spirituality can be a powerful and important source of strength.

3.1.3 Critical Evaluation of Different Measures of Health

Since health depends on multiple factors, and as a result, using multiple measures is a great way of getting an overall assessment of an individual's health as well as population health. Each one has its own merits, and each has its own drawbacks. To distinguish individual health and population health, their different measures are discussed separately.

3.1.3 .1 Measures of Individual Health

Individual health measures include the followings:

Body Mass Index (BMI)

It is a statistical measure of body weight based on a person's weight and height. Though it does not actually measure the percentage of body fat, it is used to estimate a healthy body weight based on a person's height. Body mass index is defined as the individual's body weight divided by the square of his or her height (Garabed,E., 2008). That is,

BMI = body weight (kg) ÷ height (meters) squared

A frequent use of the BMI is to assess how much an individual's body weight departs from what is normal or desirable for a person of his or her height. The weight excess or deficiency may, in part, be accounted for by body fat (adipose tissue) although other factors such as muscularity also affect BMI significantly. The WHO regard a BMI of less than 18.5 as underweight and indicate malnutrition, an eating disorder, or other health problems, while a BMI greater than 25 is considered overweight and above 30 is considered obese. These ranges of BMI values are valid only as statistical categories when applied to adults, and do not predict health (Table 1).

BMI is used differently for children. It is calculated similarly for adults, but then it is compared to typical values for other children of the same age (CDC, 2009).

Table 3.1: BMI Index

Category	BMI range
Severely underweight	less than 16.5
Underweight	from 16.5 to 18.4
Normal	from 18.5 to 24.9
Overweight	from 25 to 29.9
Obesity	BMI of 30 or greater

The medical establishment has acknowledged major shortcomings of BMI because the BMI is dependent only upon weight and height (NIH, 2008). It makes simplistic assumptions about distribution of muscle and bone mass, and thus may overestimate adiposity on those with more lean body mass (e.g. athletes) while underestimating adiposity on those with less lean body mass (e.g. the elderly). Flegal et al. (2005) have found that overweight people had a similar relative risk of mortality to normal weight people as defined by BMI.

Lean Body Mass (LBM) / Body Fat %

Lean body mass is simply estimation of how much a person's weigh without the body fat. As the other factors are assumed to be relatively static, by monitoring LBM a person can get a fairly accurate estimate of the amount of muscle he/she is gaining or losing (**lean-body-mass**.html). LBM can be calculated as follows:

Body Fat in lbs. = [Total Bodyweight in lbs] [Body Fat Percentage (in decimal form)]

Lean Body Mass =Total Bodyweight in lbs - Body Fat in lbs.

This is a better assessment than BMI because it tells an individual the quality of his/her weight not the quantity (Brett Blumenthal - Sheer Balance, 2008).

Weight

Weight is another type of individual health measure. It is purely a number that provides an individual with a very quick and accessible way of understanding where he or she stands. It helps to understand a person's body's fluctuations and to see if he or she is gaining weight or losing weight unexpectedly.

Waist-to-Height Ratio

This measure of health is determined by dividing a person's waist circumference by his/her height. Waist-to-Height ratios of 0.5 or greater are indicative of intra-abdominal fat for both men and women and are associated with a greater risk of cardiovascular disease (Brett Blumenthal - Sheer Balance,2008).

Weight for Height (WFH)

It is a measure to assess the nutritional status & growth pattern of children. A weight-for-height between the 5th and 95th percentile reflects normal variation while a weight-for-height less than the 5th percentile or greater than the 95th percentile may indicate under nutrition or obesity, respectively (Narayan ,S., 2008).

Height for Age

This is another measure of nutritional status and growth pattern of children. According to USA National Center for Health Statistics (NCHS) and WHO growth reference, children who fall below the fifth percentile of the reference population in height for age are defined as stunted, regardless of the reason.

Mid-Arm Circumference (MAC)

Mid-Arm Circumference (MAC) has been extensively used at 1-5 years of age as an age- independent indicator of protein-energy malnutrition (Bhatia et al, 1999). This is an easy and useful measurement; the middle of the upper arm circumference (MUAC) is measured while it is hanging relaxed at the side of the body. The tape is directly placed gently but firmly without compression of the soft tissues round the midpoint. There is rapid increase in the circumference from birth to 1 year: the increase is from about 11cms to 12 cm. After till 5th birthday it remains fairly constant at about 16-17 cms in well nourished children. During this period muscles replace the fat of early infancy. A measurement below 80 percent of normal i.e about 12.8 cms indicates moderate to severe malnutrition. A colored strip for measuring arm circumference is available (Mandal & Bose, 2009).

Resting Heart Rate (RHR)

In most cases, the lower an individual's heart rate, the more healthy and strong his/her heart is. If RHR is lower than 70 beats per minute, it reveals healthy heart and RHRs that are higher than 80 beats per minute reflect a not so healthy heart that may benefit from some exercise. But if a person is sick or have a medical condition, this may not be a good measure of health (Brett Blumenthal - Sheer Balance, 2008).

3.1.3. 2 Measures of Population Health

The major measures of population health are discussed below:

Morbidity Measures

Morbidity refers to the occurrence of diseases in a population (www.sanantonio.gov/HEALTH/pdf/healthprofiles/hp2005/Glossary.doc). It indicates the number of cases of a particular disease reported within a particular country and within a particular period of time (nzdl.sadl.uleth.ca/cgi-bin/library).Two basic measures of morbidity are prevalence and incidence.

Prevalence is the presence of morbidity in a given population at a particular point of time or over a period of time. On the other hand, incidence is its new occurrence of a specific disease occurring in a defined population during a specified period of time. The term incidence refers only to new cases, but prevalence refers to both new and old cases (Indrayan & Satyanarayana, 2000).

The formula for prevalence and incidence rate can be expressed as follows:

$$\text{Prevalence Rate} = \frac{\text{Number of cases of disease present in the population of a country at a specified period of time}}{\text{Number of persons at risk of having the disease at that specified time}}$$

And

$$\text{Incidence Rate} = \frac{\text{Number of new cases of a disease occurring in the population of a country during a specified time}}{\text{Number of persons exposed to risk of developing the disease during that period of time}}$$

The above ratios are multiplied by 1,000 or 100,000 to yield statistics that are more readily interpretable.

Mortality Measures

Death is easy to identify in nearly all the cases and the date of death is generally available in records. Thus, the mortality statistics are considered reliable and used all across the world. A higher rate of mortality among the children is considered an indicator of poor health, though this may not be so for old age people.

Indicators used to measure deaths in a population of a country are crude death rate (CDR), Infant mortality rate (IMR), under 5 morality rate (U5MR), life expectancy at birth, *etc*. Among the child mortality indicators, the infant mortality rate is widely used as an indicator of a population's health status because it is associated with education, economic development, and availability of health services.U5MR is also called child mortality rate. This is used as an indicator of social well being by UNICEF. Sometimes mortality in 1-4 years age-group is termed as child mortality rate (Indrayan & Satyanarayana, 2000).

These measures can be formulated as:

$$\text{Crude Death Rate (CDR)} = \frac{\text{Number of deaths in the population of a country during a specified time period}}{\text{The number of persons in the population during the specified time period}}$$

The denominator is usually defined as the number of persons in the population at the midpoint of the time period (usually 12 months). The rate is multiplied by 1,000 or 100,000 for ease of interpretation. Death rates or mortality rates also can be calculated for deaths from specific causes, and for specific age and gender groupings.

$$\text{Infant Mortality Rate (IMR)} = \frac{\text{Deaths of infants under age 1}}{\text{Total Live births}} * 1000$$

$$\text{Under 5 Mortality Rate (U5MR)} = \frac{\text{Deaths of children} < 5\ years}{\text{Live births} < 5\ years} * 1000$$

<u>Life Expectancy</u>

It is the average number of additional years a person can expect to live from a given age onward. Life expectancy at birth is the statistic usually calculated for population groups. Lower life expectancy in developing countries is usually a result of high infant mortality.

<u>Life Years (LYs) Gained</u>

Life Years gained is a modified mortality measure where remaining life expectancy is taken into account. This method accrues more weight to young target populations, because saving the life of an infant yields more life years than saving the life of an old person. Life years are calculated as the remaining life expectancy at the point of each averted death. LYs gained is indicated as a relatively easy and transparent method for measuring population health. Life years are calculated as the remaining life expectancy at the point of each averted death. Life expectancies may be taken from life tables that are specific for each setting or standardized across larger regions. The choice of life table is not uncontroversial, as a life table with high life expectancies will yield more life years and render interventions more attractive than life tables with shorter life expectancies.

Measures of Disease Burden

There are some measures of health through which the burden of disease can be measured. These measures are discussed below:

Quality Adjusted Life Years (QALYs)

The most widely used approach for estimating quality of life benefits in economic evaluations is the Quality-Adjusted Life-Year (QALY). In this approach, states of health are assigned a health state preference or 'utility' value, on a scale including 1.0 (full health) and 0 (death). The amount of time an individual spends in a given health state is then multiplied by the health state preference value to calculate the quality-adjusted life-years (QALYs) gained.

The QALYs gained from a given health care intervention are estimated by considering the difference in progression, through the various health states, with and without the intervention concerned. This is shown schematically in Figure 3.1. Here the intervention leads to QALY gains both by increasing or maintaining quality of life and by extending life. The main advantage of the QALY approach is that it provides one combined measure of the benefits of a program that both extends life and maintains quality of life (www.health.gov.au).

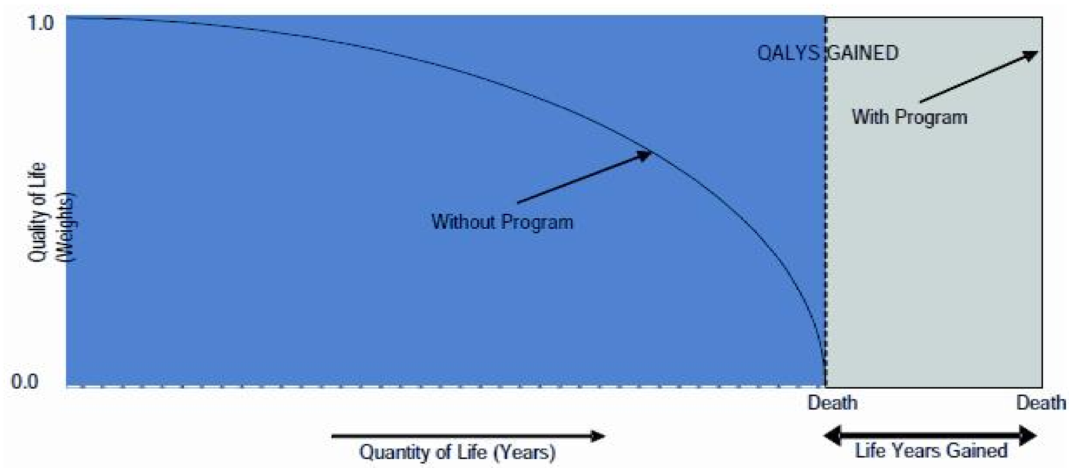


Figure 3.1 Quality-adjusted life years

The diagram shows that without the program as the quantity of life (years) increase, the quality of life (weights) decreases from 1.0 to 0.0 (death). The diagram also shows that with the program, there is a gain in life years.

Disability Adjusted Life Years (DALYs)

DALY is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. This concept was originally developed by Harvard University for the World Bank in 1990; the World Health Organization subsequently adopted the method in 1996.

DALYs for a disease or health condition are calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the equivalent 'healthy' years lost due to disability (YLD) for incident cases of the health condition:

$$DALY = YLL + YLD$$

The loss of healthy life due to non-fatal health conditions requires estimation of the incidence of the health condition (disease or injury) in the specified time period. For each new case, the number of years of healthy life lost is obtained by multiplying the average duration of the condition (to remission or death) by a severity weight that measures the loss of healthy life using an average health state weight (Mathers et al, 2001).

3.1.4 Common Difficulties with Definition and Measurement of Health

Over the decades, there have been many criticisms of the definition and measurement of health and of the shorthand version of "health as a human right". Some considered the definition too inclusive and should focus rather on the physical domain of health, the rationale being that health and its achievement was best left to health professionals and to the application of specific health and medical interventions. Protagonists of this view point out that there are genetic impediments to the attainment of health by all; that there are limits to the availability of resources to ensure that all can attain the highest level of health; and that our scientific knowledge remains incomplete with regard to the true determinants of health and effectiveness of interventions.

Additional difficulties follow from these definitions and relate to the problem of measuring health and implementing programmes that would improve the health of individuals and populations. The physical dimension of health could be measured in terms of life expectancy, the infant mortality rate and other relatively objective measures. However, with advances in technology, particularly in the fields of imaging and genetic screening, we now recognize that almost all of the population either has an actual or potential predisposition to some future disease.

Over the last few decades, psychiatrists and psychologists have made considerable progress in quantifying and defining mental disease. Progress has been less substantial in defining mental health. Certainly, the presence of organic brain disease or major metabolic abnormalities leading to clearly identifiable mental disease are now routinely diagnosed and treated.

Greater difficulties are experienced in measuring the social aspects of health. In recent years, attention has been given to the notion of social capital, a term used to acknowledge the importance of formal and informal networks that individual, family, and communities depend upon if they are to function optimally. Furthermore, inequalities in social and economic status can be regarded as impediments to the attainment of the full state of social health.

3.1.5 Summary

Health can be seen as a multifaceted dimension of human life, and as a ‘reserve stock’ of vitality, fitness and strength (whether psychological or physical or both) which individuals can draw upon to pursue their goals and actions. The overall health is achieved through a combination of physical, mental, emotional, social, environmental and spiritual well-being.

3.2 Defining and Measuring Productivity

"Productivity is not everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker"-Paul Krugman (1994).

The word 'Productivity' has become a household word as almost everyone talks about it. However, the term 'productivity' means different things to different persons. As a phenomenon, it ranges from efficiency to effectiveness, to rates of turnover and absenteeism, to output measures, to measure of client or consumer satisfaction, to intangibles such as disruption in workflow and to further intangibles such as morale, loyalty and job satisfaction (Gboyega A. Oyeranti).

Productivity growth comes from technological change (new ways of producing goods and services) and better organization of production (better ways of using available resources given available technology, including economies of scale).Both processes operate simultaneously and, in practice, it is difficult to distinguish between the effects of each process. The processes are dynamic and affect individual activities differently over time.

Measuring productivity has given a great importance within economics for half a century. Over this period, there have been substantial changes and improvements in the construction of the underlying data and methods. Particularly there are improvements in measuring output and prices and in implementing improved indices, particularly the use of "superlative" price and output measures by government statistical agencies.

This section analyzes the different concepts of productivity, its different measures and puts some problems with the definition and measurement, and finally it concludes this section.

3.2.1 Defining productivity

The least controversial definition of productivity is that it is a quantitative relationship between output and input (Iyaniwura and Osoba, 1983).

This definition enjoys general acceptability because of two related considerations:

One, the definition suggests what productivity is thought of to be in the context of an enterprise, an industry or an economy as a whole.

Two, regardless of the type of production, economic or political system, this definition of productivity remains the same as long as the basic concept is the relationship between the quantity and quality of goods and services produced and the quantity of resources used to produce them (Prokopenko, 1987).

Eatwell and Newman (1991) have defined productivity as a ratio of some measure of output to some index of input use. Put differently, productivity is nothing more than the arithmetic ratio between the amount of output produced and the amount of any resources used in the course of production.

This conception of productivity goes to imply that it can indeed be perceived as the output per unit input or the efficiency with which resources are utilized (Samuelson and Nordhaus, 1995).

Simply Expressed:

$$\text{Productivity} = \frac{\text{total output}}{\text{total input}} = \frac{\text{total results achieved}}{\text{total resources consumed}} = \frac{\text{Effectiveness}}{\text{Efficiency}}$$

In general, productivity signifies the measurement of how well an individual entity uses its resource to produce outputs from inputs.

There are three common approaches to defining productivity, which are discussed below:

Physical productivity

This is a ratio of the amount of product to the resources consumed (usually effort). Product may be measured in lines of code, classes, screens, or any other unit of product. Typically, effort is measured in terms of staff hours, days, or months.

Functional productivity

This is a ratio of the amount of the task delivered to the resources consumed (usually effort).It is measured in terms of use, cases, requirements, features, or function points (as appropriate to the nature of the software and the development method). Typically, effort is measured in terms of staff hours, days, or months. Traditional measures of Function Points work best with information processing systems.

Economic productivity

This is a ratio of the value of the product produced to the cost of the resources used to produce it. Economic productivity helps to evaluate the economic efficiency of an organization. It is not used to predict project cost because the outcome can be affected by many factors outside the control of the project, such as sales volume, inflation, interest rates, and substitutions in resources or materials, as well as all the other factors that affect physical and functional measures of productivity.

However, understanding economic productivity is essential to making good decisions about outsourcing and subcontracting. The basic calculation of economic productivity is as follows:

$$\text{Economic Productivity} = \frac{\text{Value}}{\text{Cost}}$$

Cost is relatively easy to determine. The numerator of the equation, value, usually is recognized as a combination of price and functionality. More functionality means a higher price. Isolating the economic contribution of the software component of a system can be difficult. Often, that can be accomplished by comparison with the price of similar software available commercially. Ideally, the revenue stream resulting from a software product represents its value to the customer. That is, the amount that the customer is willing to pay represents its value. Unfortunately, the amount of revenue can only be known when the product has finished its useful life. Thus, the value must be estimated in order to compute economic productivity, taking into consideration all the factors affecting the customer's decision to buy.

Thus, Value = f (Price, Time, Quality, Functionality)

Poor quality may result in warranty and liability costs that neutralize revenue. Similarly, time must be considered when determining the economic value of a product - a product which is delivered late to a market will miss sales opportunities. Thus, the amount of revenue returned by it will be adversely affected. Consequently, the calculation of value for economic productivity must include timeliness and quality, as well as price and functionality.

3.2.2 Measuring Productivity

Productivity measures can broadly be placed into two categories.

Single factor, or partial, productivity measures relate a particular measure of output to a single measure of input, such as labor or capital.

Multi-factor or total productivity measures (MFP) relate a particular measure of output to a group of inputs, or total inputs used.

The five most widely used single or multi-factor productivity measures are:

1. Labor productivity, based on gross output:

This productivity measurement traces the labor requirement per unit of output. It reflects the change in the input coefficient of labor by industry and is useful for the analysis of specific industry labor requirements. Its main advantage as a productivity measure is its ease of measurement and readability; particularly, the gross output measure requires only price indices on gross output. However, since labor productivity is a partial productivity measure, output typically reflects the joint influence of many different factors.

2. Labor productivity, based on value-added:

Value-added based labor productivity is useful for the analysis of micro-macro links, such as an individual industry's contribution to economy-wide labor productivity and economic growth. From a policy perspective, it is important as a reference statistic in wage bargaining. Its main advantage as productivity measure is its ease of measurement and readability, though it does require price indices on intermediate inputs, as well as to gross output data. In addition to its limitations as a partial productivity measure, value-added labor productivity has several theoretical and practical drawbacks including the potential for double counting production of benefits and double deflation.

3. Capital productivity, based on value-added:

Changes in capital productivity denote the degree to which output growth can be achieved with lower welfare costs in the form of foregone consumption. Its main advantage as a productivity measure is its ease of readability but capital productivity suffers the same limitations as other partial productivity measurements.

4. Capital-labor multi factor productivity, based on value-added:

This productivity measurement is useful for the analysis of micro-macro links, such as the industry contribution to economy-wide MFP growth and living standards, as well as, for analysis of structural change. Its main advantage as a productivity measure is the ease of aggregation across industries. The data for this measurement is also directly available from national accounts. The main drawback to the value-added based capital-labor MFP is that it is not a good measure of technology shifts at the industry or firm level. It also suffers the disadvantage of other value-added measures that have been double deflated with a fixed weight Laspeyres quantity index.

5. KLEMS (capital, labor, energy, materials and services) **multi-factor productivity**:

KLEMS-MFP is used in the analysis of industry-level and sectoral technical change. It is the most appropriate tool to measure technical change by industry because it fully acknowledges the role of intermediate inputs in production. Domar's aggregation of KLEMS-MFP across industries renders an accurate assessment of the contributions of industries to aggregate MFP change. It is difficult to communicate inter-industry links and aggregation across industries using KLEMS-MFP than in the case of value-added based MFP measures.

3.2.3 Productivity Measurement Difficulties

Economic measurement and analysis, particularly relating to productivity, have become more difficult and complicated. The main problem involves properly defining units of measurement, evaluating qualitative changes and obtaining reliable data for both inputs and outputs. Measurement of inputs is problematic. Variations in the rate of input utilization are at best partially picked up in data series. In particular, the rate of capital equipment utilization, i.e. the measurement of machine hours, is rarely accomplished.

Moving beyond this general notion, a glance at the productivity literature and its various applications quickly reveals that there is neither a consensus as to the meaning nor a universally accepted measure of productivity.

3.2.4 Productivity Measurement used in the Study

Among the various methods to measure the productivity discussed above, labor productivity based on value added method is used in the study. This method shows how much value added output is created per employee. For the analysis of micro-macro links this method is more useful and easier than other method. By using this method it is easily possible to calculate a single labor's contribution to the total labors contribution of a firm or an individual industry's contribution to economy wide labor productivity.

The formula used for measuring labor productivity is given below:

$$\text{Labor productivity (based on value added)} = \frac{\text{Value added output (by labor)}}{\text{number of Employees}} = \frac{QL}{L}$$

Where, QL = Value added output produced by labor.

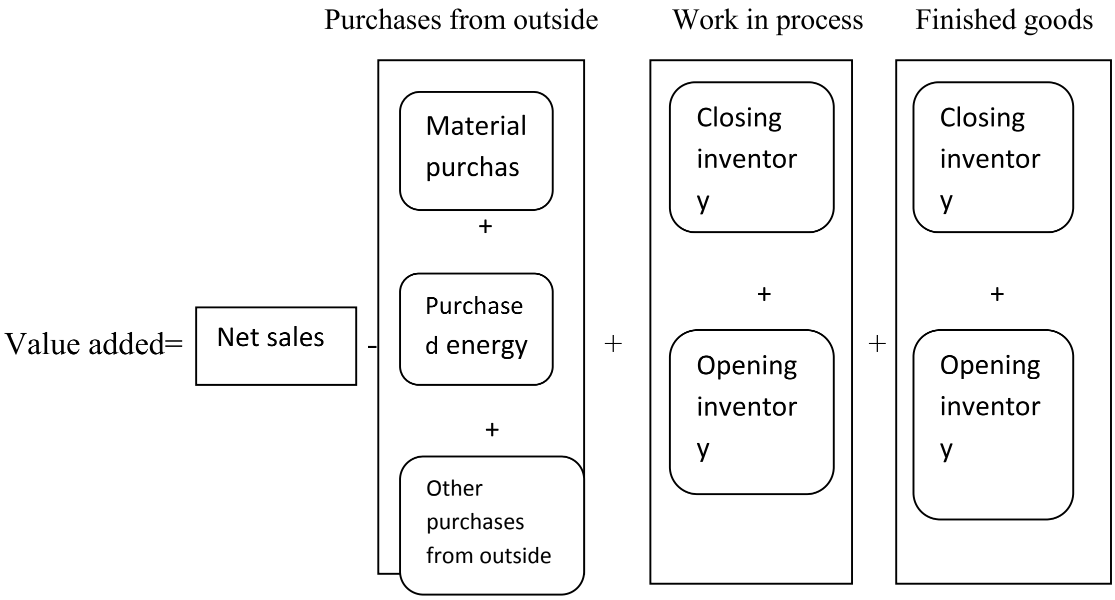
L= Total number of employees

Though 'L' implies total number of employees of a firm, in this study 'L' is used to mean only the workers excluding management employees of a firm.The above formula for measuring labor productivity has taken from a study of Masayaoshi et al. in 1997.The computation of value added is shown in the following Exhibit 1 (Masayaoshi et al., 1997).

Exhibit 1

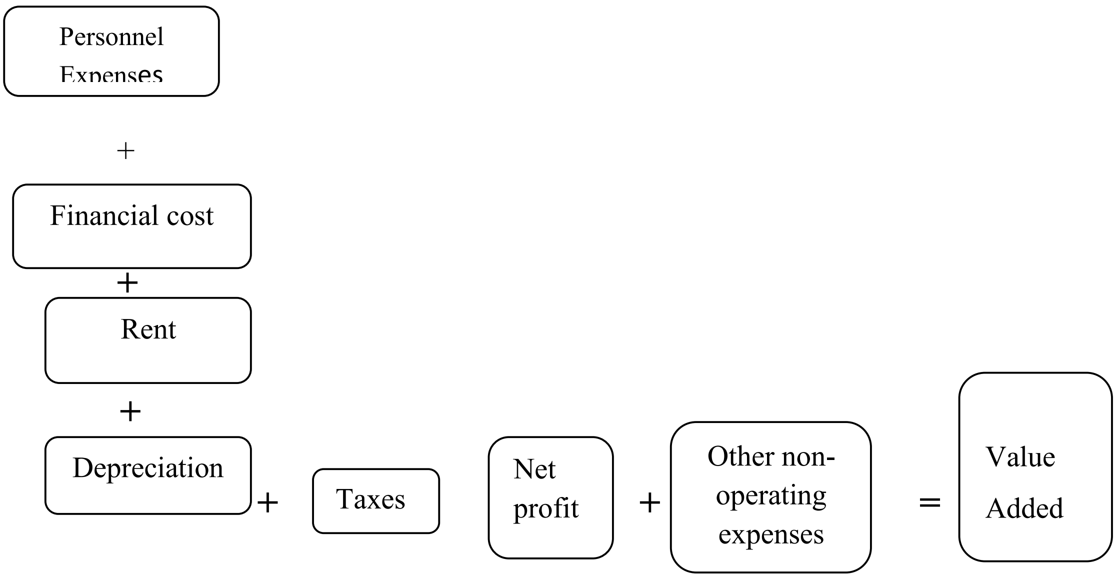
Computation of Value Added

Subtraction method



Value Added output=Net sales -Value of purchases from outside + Change in inventory

Addition method



Value Added= Personnel Expenses+ Financial cost + Rent+ Depreciation +Taxes + Net profit + non- operating expenses

The study selects the subtraction method of value added.

Suppose, $Q=Q_L+Q_K+Q_{others}$ ……………(1)

Where, Q= total value added output of a firm

Q_L= value added output produced by total labor of a firm

Q_K= value added output produced by total capital of a firm

Q_{others}= value added output produced by other factors of a firm

Rearranging equation (1),

$Q_L=Q- Q_K-Q_{others}$……………........... (2)

Therefore, Labor productivity (AP_L) = $\frac{QL}{L}$ ……………….(3)

Wake ford (2004) have pointed out that the most appropriate concept of productivity in economics is marginal productivity or output per hour of labor input i.e. average productivity.

Since our purpose is to measure the lost productivity of total SMIE sector, we think average labor productivity would be the best measure in this respect. Similar method of measuring labor productivity was used in the study like Andrew et al.(2008), Wake ford (2004) , SK Goh (2009), Matthew et al., (2010), Guiwen and Yanjuan (2010), Klein (2012), and Rath and Madheswaran (2008).

3.3 Literature Review on the Relationship between Health and Productivity

This section reviews the existing literature relating health to productivity. Although there are many intuitive reasons to expect a positive relationship consecutively from health to productivity, relatively little theoretical work has been done to formalize those intuitions. However, a substantial empirical literature provides evidence on the health-productivity relationship at both the micro- and macroeconomic levels.

At the microeconomic level, better health is associated with improved labor market outcomes for individuals. Health affects labor market participation and hours worked. At the macroeconomic level, evidence suggests that better health is associated with faster economic growth.

It is already discussed in earlier sections that both health and productivity can be measured in various ways. Countries may differ in the types of health issues that are important for their aggregate productivity performances, and different measures of productivity may have different relationships to a given health measure.

The best measure of labor productivity is output per hour worked because hours worked is a more accurate measure of labor input than other measures such as the number of workers, but most studies – especially at the micro and macro level – use output per worker or output per capita as the productivity index.

This literature review has the following five subsections:

Firstly, it outlines the general mechanisms linking health to productivity.

Secondly, it discusses two ways of incorporating health into standard neoclassical growth theory and describes related empirical work.

Thirdly, it addresses the impact of health on educational investment.

Fourthly, it discusses productivity losses due to absenteeism and presenteeism, and

Lastly, it provides a brief summary.

3.3.1 Mechanisms Linking Health to Productivity

There are several plausible mechanisms by which health could influence productivity. Bloom and Sachs (1998), and Bloom and Canning (2000) specify the following four mechanisms:

1. Direct impact on labor quality: Healthy workers have high physical stamina and mental courage relative to less healthy workers and are therefore likely to be more productive for a given number of hours worked.

2. Incentive for educational investment: Poor health is a barrier to school attendance and to the ability of students to learn while in school. Improved health removes these barriers. In addition, higher life expectancy increases the lifetime return to investment in education early in life.

3. Incentive for savings and capital investment: Longer life expectancy provides an incentive for greater retirement savings. Higher savings translates into higher capital investment and higher productivity.

4. Demographic effects: Greater survival rates for young children may lead to an increase in the proportion of the total population that is of working age. Female labor force participation may also rise as fewer births are required to achieve expected number of surviving children. These changes increase per-capita output.

Several of the above mechanisms are likely to play a more significant role in developing countries than in developed ones. It is plausible, for example, that a poor country would experience substantial increases in the incentive for savings and investment if health investments increased the average life expectancy. It is less likely that similar health investments in a rich, healthy country would have large effects because life expectancy is already high. At the individual level, high income persons may be more able to devote resources to the maintenance of their health than low-income persons. At the macro level, good average health may require investments in medical technologies or public awareness campaigns, or in underlying determinants of health such as education and early childhood development.

3.3.2 Health and Neoclassical Growth Theory

The baseline model for understanding growth in per-capita or per-worker output is the neoclassical growth model (Solow, 1956). It is an expansion on the Harrod-Domar formulation by adding a second factor, labor, and introducing a third independent factor, technology, to the growth equation. Unlike the constant returns to scale as assumption of Harrod-Domar growth model, Solow's neoclassical growth model exhibits diminishing returns to capital and labor separately and constant returns to both factors jointly. Technological progress becomes the residual factor explaining long-term growth, and its level is determined exogenously, that is independently of all other factors.

The Solow neoclassical growth model uses a standard aggregate production function in which

$$Y=K^{\alpha}(AL)^{1-\alpha}\text{……….}(1)$$

Where Y is gross domestic product, K is the stock of capital (which may include human capital as well as physical capital), L is labor and A represents the productivity of labor, which grows over time at an exogenous rate.

Dividing both sides of equation (1) by L, we get $Y/L= A\ (K/L)^{\alpha}\ (L/L)^{1-\alpha}$

$$y=A\ k^{\alpha}\ldots\ldots\ldots\ (2)$$

Equation (2) states that output per worker depends on the amount of capital per worker.

It is shown that the growth of k depends on savings sf(k), after allowing for the amount of capital required to service depreciation,δk, and after capital widening, that is, providing the existing amount of capital per worker to net new workers joining the labor force, nk. That is

$$\Delta k=sf(k)-(\delta+n)k\ldots\ldots\ldots\ldots\ldots(3)$$

To find the steady state, setting $\Delta k=0$, $sf(k^{*})=(\delta+n)k^{*}$

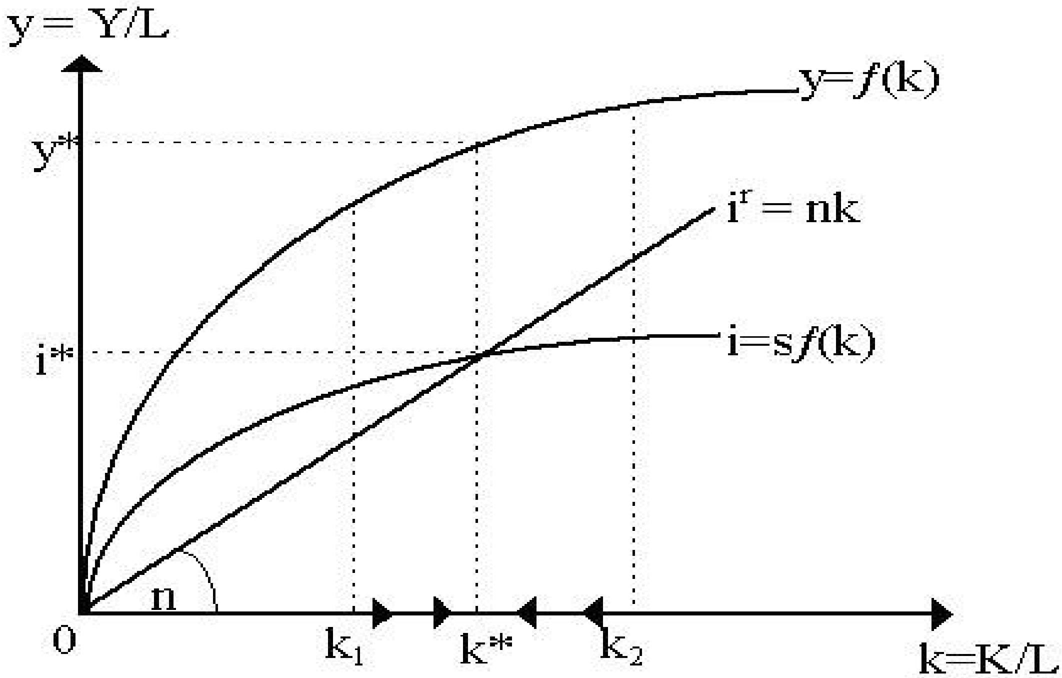


Figure 3.2: Steady-State Growth

The notion k^{*} means the level of capital per worker when the economy is in its steady state. If k is lower or higher than k^{*}, the economy will return to it and thus k* is a stable equilibrium. This is shown in the above figure3.2.

This model examines the happenings by raising the savings rate. A temporary increase in the rate of output growth is realized as k increases due to increase in s but in the long run an increase in s will not increase growth, it will increase the equilibrium k^{*}.

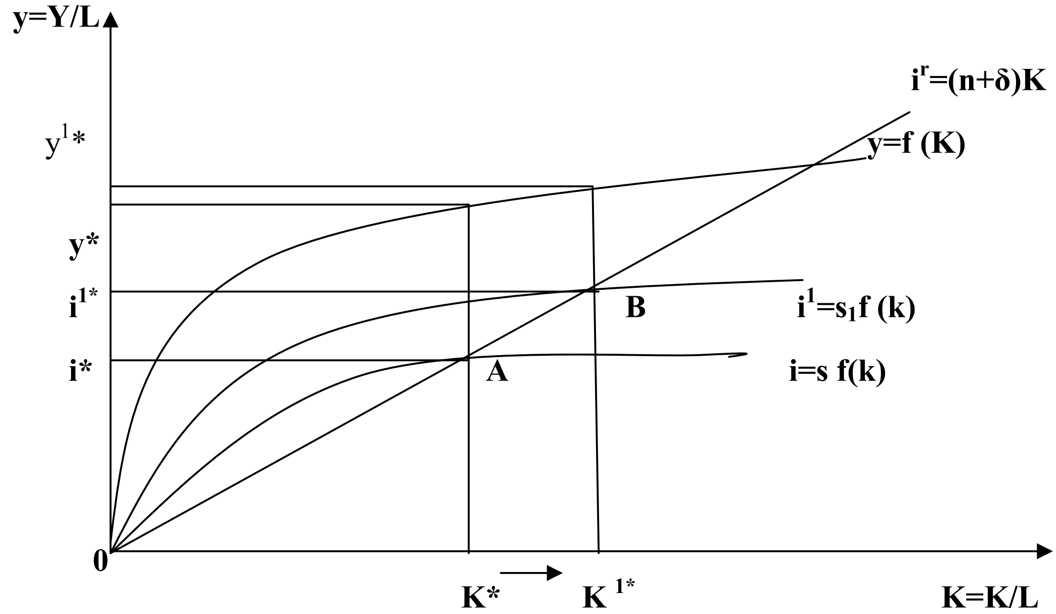


Figure 3.3: Solow Growth model and changes in the saving rate

It is also revealed that the rate of savings (and hence investment) is positively related to the rate of technological progress itself, so that the growth of A depends on s.

It is possible to augment the neoclassical model with additional factors of production in two ways.

The first is to add additional inputs, so that instead of physical capital and labour, we have physical capital, labour, and human capital (for example).

The second approach is to assume a precise functional form for the technology factor and explicitly include the additional factors as part of technology.

Both approaches have been used by different researchers to incorporate health into the neoclassical model.

The seminal work on the augmented neoclassical model is Mankiw *et al.* (1992), in which the authors include human capital as a third input in production. The term „human capital is broad in its meaning, but in their theoretical and empirical work, Mankiw *et al.* conceive of it as embodying only education.

Knowles and Owen (1995) use the same approach to build a neoclassical growth model in which education and health are included as separate inputs to production. Under this approach, health is considered to be a stock variable. Just as the economy has a stock of physical capital at any point in time, so too does it have a stock of health. The aggregate health stock can be influenced by saving a certain share of income in each time period (e.g. a share of GDP in each year) and devoting it to investment in health.

Health is assumed to depreciate at a fixed rate over time (e.g. through wear and tear on people's bodies), so a certain minimum level of investment is needed in each period to offset depreciation and maintain the health stock at a constant level. Moreover, additional health investment is required to keep the health-labour ratio constant because the population is assumed to grow over time. All of these statements also apply to the stocks of physical capital and educational capital.

The augmented neoclassical model gives rise to steady state equilibrium in which the stocks of health, physical capital and education are constant over time in per worker terms. Their equilibrium per-worker levels can be derived as functions of various model parameters, including the savings rates for each type of capital. These can then be used to compute output per worker (or productivity).

As is well known, the steady-state ***growth rate*** of output per worker is determined by an exogenous model parameter; namely the rate of technological progress. Since the neoclassical model does not explain technical progress, it does not provide a satisfactory explanation of per-worker output growth. In particular, health does not affect productivity growth in the augmented neoclassical model.

The level of per-worker output in a given period, however, is an increasing function of the savings rates for each type of capital. If a country increases the annual proportion of its GDP it devotes to health investment, then its per-worker health stock will increase and lead to higher output per worker.

The model does not explain how savings rates are determined, but it does show how higher investment in health can lead to higher steady-state productivity levels. The model predicts that countries with high savings rates for investment in health (and in physical capital, education, and any other stocks included in the model) will converge to high-productivity equilibria, and vice versa.

Using cross-country regression analysis, Knowles and Owen (1995) show that the health-augmented neoclassical model explains more of the cross-country variation in per-worker income than does the neoclassical model augmented with only education (Mankiw *et al.* (1992). When health (measured using life expectancy as a proxy) is included in the regressions, education loses its significance as a predictor of per - worker GDP growth.

As mentioned earlier, the second way to augment the neoclassical growth model to account for health is to explicitly model health as the part of labor –improving technology. Knowles and Owen (1997) assume that labor-improving technology comprises education, health, and a catch-all term that captures everything else (experience, innate ability, etc.). Each of these three variables is assumed to grow at a constant exogenous rate. This differentiates the health-as-technology approach from the health-as-input approach of Knowles and Owen (1995), in which health was a stock whose growth could be influenced by investment.

Bloom et al. (2004) have estimated a production function model of aggregate economic growth including two variables that micro economists have identified as fundamental components of human capital: work experience and health. They find that good health has a positive, sizable, and statistically significant effect on aggregate output even when they control for experience of the workforce. They estimate that a one-year improvement in a population's life expectancy contributes to an increase of 4% in output. This is a relatively large effect, indicating that increased expenditures on improving health might be justified purely on the grounds of their impact on labor productivity, quite apart from the direct effect of improved health on welfare.

Bloom and Canning (2000) have compared two countries that are identical in all respects, except one has a 5-year advantage in life expectancy. They find that real income per capita in the healthier country will grow 0.3 to 0.5% per year faster than in its less healthy counterpart.

The Commission on Macroeconomics and Health (2001) has examined the links between health and poverty and demonstrated whether health investment can accelerate economic growth. The Commission is focused its work on the world's poorest people in the poorest countries. The Commission's report have shown that in the poorest grouping (GDP less than $750 per person per year in purchasing power parity adjusted 1990 US dollars) countries with an infant mortality rate (IMR) between 50 and 100 per 1,000 live births enjoyed annual average growth of 3.7 percent per year, whereas similarly poor countries with IMR greater than 150 had average growth of only 0.1 percent per year. The report has estimated that each 10 percent improvement in life expectancy at birth (LEB) is associated with a rise in economic growth of at least 0.3 to 0.4 percentage points per year, holding growth factors constant.

Using time series data for economic growth in Pakistan from 1971 to 2008 Naeem and Jangraiz (2010) have investigated whether health accelerates economic growth in Pakistan.

Using Ordinary Least Squares (OLS) method they have estimated the regression of GDP per capita (Y) on gross fixed capital formation (X_1), health (X_2), total labor force(X_3) and, Research and Development(X_4). The estimated regression is given below:

$$Y = -18.9 + 0.102 \ln X_1 + 2.64 \ln X_2 + 0.91 \ln X_3 + 0.12 \ln X_4$$

$$(t= -4.66)^{*} \quad (t= 1.67) \quad (t= 3.11)^{*} \quad (t= 3.32)^{*} \quad (t= 2.81)^{*}$$

R^2 =0.937462 DW Statistic 1.81 F-statistic 123.67 Prob (F-statistic) 0.0000

*Shows 1% level of significance

The above result indicates health as the significant determinants of economic growth in Pakistan.

Finally, It can be noted that the augmented neoclassical growth model – especially when it is augmented using the health-as-technology approach – is consistent with the direct impact on labor quality mechanism identified by Bloom and Canning (2000).

3.3.3 Investment in Health and its Relationship with Education

The relationship between health and education is doubtless a close one. In particular, the public health literature has widely documented the correlation between these two dimensions of human capital in both developing and industrialized countries. A causal effect running from education to health: a better education leads to better health; similarly a better health leads to better education (Suhrcke M and Paz Nieves, 2011).

Grossman (1972) provides the standard theoretical model of demand for health and health-improving goods and services. In the Grossman model, health delivers two benefits for the consumer: it generates utility directly, and it provides healthy time that can be used to perform various productive activities that ultimately lead to consumption and utility. Thus, health has properties of both consumption goods and capital goods.

The consumer has a stock of health that changes over time according to his or her investment decisions. Health is assumed to depreciate at a rate that increases with age, but the consumer can offset this by investing in health-promoting activities (medical care, healthy behaviours, etc.).

Health increases the quantity of healthy time available for production. It can also affect the quality or quantity of the work that can be done over a given span of time. In productivity terms, health improvements can increase output per person by allowing the person to work more hours and output per hour worked.

The model also implies a positive relationship between health and education, with higher education causing improved efficiency in health investment. Education increases productivity in per-hour terms and thereby increases the efficiency of all types of activities, including health investment. This is important because education is a key driver of productivity growth. The positive relationship between health and education is substantiated by the empirical literature (Grossman and Kaestner, 1997).

Wim Groot (2007) examines a relationship between two important aspects of human capital: education and health by using data from a large survey of Netherlands, the 1999 Supplementary Provision Surveys (SPS) of the Dutch Social and Cultural Planning bureau. The study finds that the QALY weights for education are 0.006 for men and 0.003 for women. The estimation of QALY weights imply that taking the quality of health on a 0-1 scale, where 0 is the worst possible health state (near death) and 1 is the best possible (perfect health), a year of education improves the health state of men by 0.6% and for women by 0.3%.He also points out that depending on the value of a statistical life year, the monetary value of the health gain of a year of education is Euro 600 –1380 for men and Euro 300 –690 for women. At the average value of the GDP per capita, he finds a 1.3% –5.8% health returns to education.

Bloom and Canning (2000) find that countries whose citizens enjoy good health tend to be better educated, have higher incomes and greater wealth.

Bobonis et al. (2006), find that iron supplementation increases pre-school attendance in India, and Field et al. (2007) find that iodine supplementation in utero increases educational attainment in Tanzania.

Hoddinott et al., (2008) have reported that nutritional supplements before the age of 3 increased education and earnings in adulthood.

Jayachandran and Lleras-Muney (2010) examine a sudden drop in maternal mortality in Sri Lanka between 1946 and 1953, which sharply increased the life expectancy of girls. They assess whether girls' education relative to boys' increases more in areas with larger maternal mortality declines. The study finds that for every extra year of life expectancy, literacy increases by 0.7 percentage and years of education increase by 0.11 years.

Aizer and Straud (2010) provide compelling evidence that education affects the degree to which people respond to information that is important to their health. They show that pregnant women with relatively high levels of education reduced their smoking immediately following the release of the report, while less well-educated women did not. Education exerted an additional influence through peer effects; women who were surrounded by well-educated women were more likely to reduce their smoking than women surrounded by less well educated women. These behavioral changes led to improvements in the health status of the well-educated women's children, relative to the children of the less educated women.

The findings of Aizer and Straud (2010) also suggest that improvements in the general public's health-related knowledge may exacerbate inequalities in health status (at least in the short run), since the relatively well-educated are more likely than the relatively less educated to change their behaviour in response to new health-related information.

Kalemli-Ozcan (2002, 2008) and Soares (2005) show that uncertainty about the survival rates of children causes parents to have more children as a hedge against the likelihood of deaths. When mortality rates fall (through health improvements),precautionary childbearing also declines and parents divert their resources toward investment in the human capital of their children.

There is a great deal of empirical evidence to suggest that health in early childhood is associated with subsequent educational achievement. Low birth weight (a proxy for infant health) is associated with lower achievement in terms of high school graduation, post-secondary enrolment, standardized test scores, and IQ test scores (Currie and Hyson, 1999; Conley and Bennett, 2000; Hack *et al*, 2002).

Currie (2005) shows that indicators of poor health are associated with low school readiness among American toddlers. Currie *et al.* (2009) find that air pollution in Texas school districts causes increased school absences through its impact on health. Currie and Stabile (2006), and Fletcher and Wolfe (2008) examine mental health among American and Canadian children and show that attention deficit hyperactivity disorder (ADHD) increases the probability of repeating grades in school and decreases scores on math tests.

Evidence on the effects of obesity on education is mixed. Okunade *et al.* (2009) and Cho (2009) find that overweight students perform relatively poorly in school, while Kaestner and Grossman (2008) and Kaestner *et al.* (2009) find that their performance is the same as that of students of average weight.

There exists some evidence that runs contrary to these findings. Gorman (2002) finds no statistically significant relationship between low birth weight and subsequent cognitive development as measured by scores on tests of verbal ability. Kaestner and Corman (1995) find only weak relationships between reading and math scores and various health measures including birth weight, shortness of height, very low BMI, and the presence of illnesses (e.g. asthma, heart trouble, or a chronic nervous disorder).

However, the balance of the evidence suggests that children's health does affect their cognitive and educational outcomes. This is important because the accumulation of human capital is a key determinant of productivity at both the individual and aggregate levels.

3.3.4 Absenteeism and Presenteeism Due to ill Health and Productivity

A key impact of health on production at the firm level is that unhealthy workers may frequently miss work (absenteeism) or come to work in spite of illness and operate at below-normal productivity (presenteeism).

Absenteeism reduces productivity in per worker terms, since the absent worker produces no output but is still counted as a worker. It may reduce per-hour output if the absence of one worker reduces the productivity of other workers. Presenteeism reduces productivity in both per-worker and per-hour terms, since the worker is still working normal hours but is producing abnormally low output per hour.

Most studies of the impact of absenteeism assume that the cost (in terms of lost output) of a worker's absence from work is equal to the daily wage rate, with the wage assumed to be equal to the worker's marginal productivity (e.g Rice and Miller, 1993; Greenberg *et al.*, 1993).

Pauly *et al.* (2002) construct a model to show that the true costs of worker absence can actually be much greater than the wage rate. In particular, the wage understates the value of lost output if the production process is team-based and a perfect substitute for a missing worker is not available. In the extreme case illustrated by Pauly *et al.*, two types of workers must be used along with capital in fixed proportions in order to produce output. If one worker is absent and cannot be replaced, then some of the other workers and capital must sit idle that day (since they cannot operate without the missing worker). The reduction in output therefore reflects the lost output of the entire team, which is necessarily greater than the wage of the missing worker. In productivity terms, absenteeism in the context of team production reduces both per-hour and per-worker output.

Nicholson *et al.* (2006) summarize the results of the Pauly et al. (2002) model in terms of three necessary conditions for the productivity loss from absenteeism to exceed the wage rate of the absent worker as follows:

1. The employer must not be able to find a close substitute for the missing worker;

2. Production must be team-based in the sense that one worker's absence affects the productivity of other workers in the team; and

3. The firm's demand for worker must be time-sensitive in the sense that revenue will fall if production is postponed.

Using survey data on 810 American firms, Nicholson *et al.* show that the cost associated with absenteeism varies across jobs according to the degree to which these three conditions are satisfied. The negative impact of a two-week worker absence (as subjectively assessed by firm managers) is larger for jobs that satisfy the three conditions than for those that do not. Across all jobs and firms, the median ratio of the two-week absence-induced output loss to the annual wage of the worker is 1.28.

Pauly *et al.* (2008) use the same data as used by Pauly *et al.* in 2002 to examine the productivity impact of presenteeism. They find that jobs with low worker substitutability, substantial team production and time-sensitive demand are associated with larger productivity losses from presenteeism than jobs without those characteristics. This shows that the Pauly *et al.* (2002) model can account not only for the effects of absenteeism, but also for presenteeism. Indeed, Tompa (2002) points out that the model can be generalized to account for any health-related productivity changes.

There is a substantial empirical literature on worker absence, but the role of health as a determinant of absence has received surprisingly little attention. There are many reasons that a person may be absent from work that are unrelated to health. For example, workers with greater perceived job security experience more sickness absences (Khan and Rehnberg, 2009; Olsson, 2009), as do workers whose spouses have retired (Hesselius, 2009).

Tucker and Friedman (1998) have found that obese employees experience higher levels of absenteeism due to illness than normal weight employees. More specifically they estimated that normal-weight men miss an average of 3.0 days each year due to illness or injury. In comparison, overweight and obese men (BMI 25-35), miss approximately 2 more work days per year than normal-weight men, a 56% increase in missed days. On the other hand, normal-weight women miss an average of 3.4 days each year due to illness or injury. In comparison, overweight women miss 3.9 days, a 15% increase in missed days than the normal weight women.

Barmby and Larguem (2009) showed that manufacturing workers are more likely to miss work due to illness when many of their coworkers are also missing work due to illness. This suggests that the transmission of illnesses between coworkers is a driver of absenteeism.

Evidence from the Whitehall II study in the United Kingdom indicates that persons with average' or worse health over the year prior to the survey experienced high levels of sickness absence relative to respondents in better health (Marmot *et al.*, 1995; North *et al.*, 1993).

A mental illness such as depression might also have an impact, but depression rates have fallen throughout the post-2000 period of low productivity growth in Canada and were no higher in 2008 than they had been in 1994. Presenteeism is also likely to be an issue when a worker suffers from an acute, temporary illness, such as flu or a bad case of the common cold that reduces productivity for a short time but is not bad enough to prevent the worker from attending work.

A literature review by Tompa (2002) finds that mental health problems such as depression and anxiety are commonly cited reasons for worker absence.

Presenteeism is less well-researched than absenteeism. Theoretical work by Chatterji and Tilley (2002), and Brown and Sessions (2004) showed that presenteeism provides an incentive for firms to provide more generous sickness benefits than they otherwise might. Workers who come to work sick may infect coworkers and precipitate increased absenteeism in the future.

Empirical evidence suggests that the spread of disease among workers is a significant cause of worker absence (Barmby and Larguem, 2009). In addition, persons who report to work in spite of illness place their own health at risk and may cause greater productivity losses down the road (Bergstrom *et al.*, 2009).

Loeppke *et al.* (2007; 2009) provide empirical evidence to suggest that the productivity costs of absenteeism and presenteeism are substantial. The authors collect data on almost 50,000 workers from nine firms in the United States. The data include workers' self-reported chronic health conditions, self-reported sickness absences over a one-month period, and self-assessed on-the-job performance during work days over a one-month period. The results indicate that the productivity losses associated with health related absenteeism and presenteeism are, on average, 2.3 times greater than the direct medical and pharmacy costs faced by firms. The most important illnesses in terms of total workplace costs are depression, obesity, arthritis, back or neck pain, and anxiety.

Schultz and Edington, (2007) shows that health problems with subsequent functional limitations may also cause a decreased productivity while at work.

Statistics Canada (2012) have found that in case of manufacturing industries in Canada, the workers' average absenteeism rate is 5.6 % , missed work days or inactivity rate is 3.0%, and the yearly lost workdays per worker is 7.5 days due to illness or disability.

Meerding et al.2005, have shown that reduced work productivity at work due to health problems was prevalent among 5–12% of construction and industrial workers, with an estimated mean loss of 12–28% in productivity.

Among computer workers with musculoskeletal complaints while at work, productivity losses of 15% have been reported, whereby this reduced productivity exceeded the productivity loss due to sickness absence (Hagberg et al., 2002).

Brouwer et al.(1999) found that 7% of the workers in a trade company had health problems that reduced their productivity at work, resulting in an overall loss of 1% of all working hours during regular workdays. These findings indicate that the economic consequences of the occurrence of illness and disease are not limited to health care costs and sickness absence, but should also encompass the reduced productivity at work due to health complaints.

3.4 Regression Result on the Relationship between Health and Productivity of SMIE Workers in Bangladesh

The study estimates the regression of productivity (average monthly productivity) on workers' health condition by using Ordinary Least Square (OLS) method[2]. Individual health is defined by number of absent days due to illness or by the BMI. The regression of productivity of worker (Y) is estimated on workers' age in years (X_1), years of education (X_2), absent days due to illness (X_3) and BMI (X_4). BMI (X_4) is defined as BMI =0 means ill health (whose BMI less than 18.5 and above 24.9) and BMI=1 means good health (whose BMI ranges 18.5 to 24.9). The dependent variable, productivity (Y) in measured in terms of taka.

Therefore, the estimated regression using productivity as dependent variable gives the following result:

$$Y=5307.21 + 80.69\, X1+ 400.13\, X_2-94.52\, X_3+ 318.16\, X_4 \text{..........} (3.1)$$

$$(t= 6.521)^{*} \quad (t= 3.040)^{*} \quad (t= 8.717)^{*} \quad (t= -0.673) \quad (t= 0.899)$$

R^2 =0.277 DW Statistic 1.752 F-statistic 24.362 Prob (F-statistic) 0.000

*Shows 1% level of significance

The estimation suggests the significance of overall relation between the dependent and independent variables. All independent variables are found in equation 3.1 with expected sign and all are statistically significant except two variables, absent days due to illness and BMI. A strong negative association is found between the number of absent days due to illness and the productivity of workers. It suggests that a 1 unit increase in absent day due to illness decreases the worker's productivity by 94. 52 units and 1 unit increase in BMI (ill health to good health) increases worker's productivity by 318.16 units. It also finds that for 1 unit increase in workers' age, productivity of worker is increased by 80.69 units and for 1 unit increase in years of education

[2] All independents variables in this regression estimation are selected following the study of Ghatak A. and Madheswaran S. (2013)

increases the worker's productivity by 400.13 units. Therefore, the regression result strongly suggests that illness of SMIE worker reduces their productivity signifying that a good health has a positive impact on productivity of SMIE worker.

3.5 Conclusion

Theoretical literature, empirical evidences and regression result suggest that health is an important underlying determinant of productivity at the both micro- and macroeconomic levels. Good health allows individuals to lead longer life free from excessive pain and discomfort, while dynamic productivity growth is the long -run driver of increased access to material goods and services. In addition to their independent effects on quality of life, health and productivity are interrelated in ways that have important implications for living standards and public policy.

At the microeconomic level, empirical studies use a broad variety of health measures and usually use labor market outcomes (wages, employment, etc.) as the outcome variables. Health tends to have more significant effects on labour time (i.e. employment, hours worked, etc.) than on per-hour wages, but some studies do find that health affects wages. Ill health reduces workers healthy time available to work. At the firm level, unhealthy workers may frequently miss work (absenteeism) or come to the work and operate at below normal productivity (presenteeism). Absenteeism of the worker reduces output per worker and the presenteeism reduces output per worker and per hour. Eventually both absenteeism and presenteeism reduces productivity of the worker which decrease the GDP of a country (Exhibit 2).

Macroeconomic studies tend to emphasize on population health issue such, as morbidity and mortality, life expectancy which may be more relevant to developing countries than to developed ones. At the macro level, ill health increases morbidity and mortality rate. Increased mortality rate induces more health expenditure for bearing and rearing child and less saving. Due to lower saving, investment in human capital (health, education) is insufficient. Inadequate investment in health and education reduces per worker health stock and human skills. Reduced health stock and human skills of the worker diminishes labor force participation, life expectancy and ultimately output per worker and hence reduces productivity which decreases over all GDP of a country (Exhibit 2).

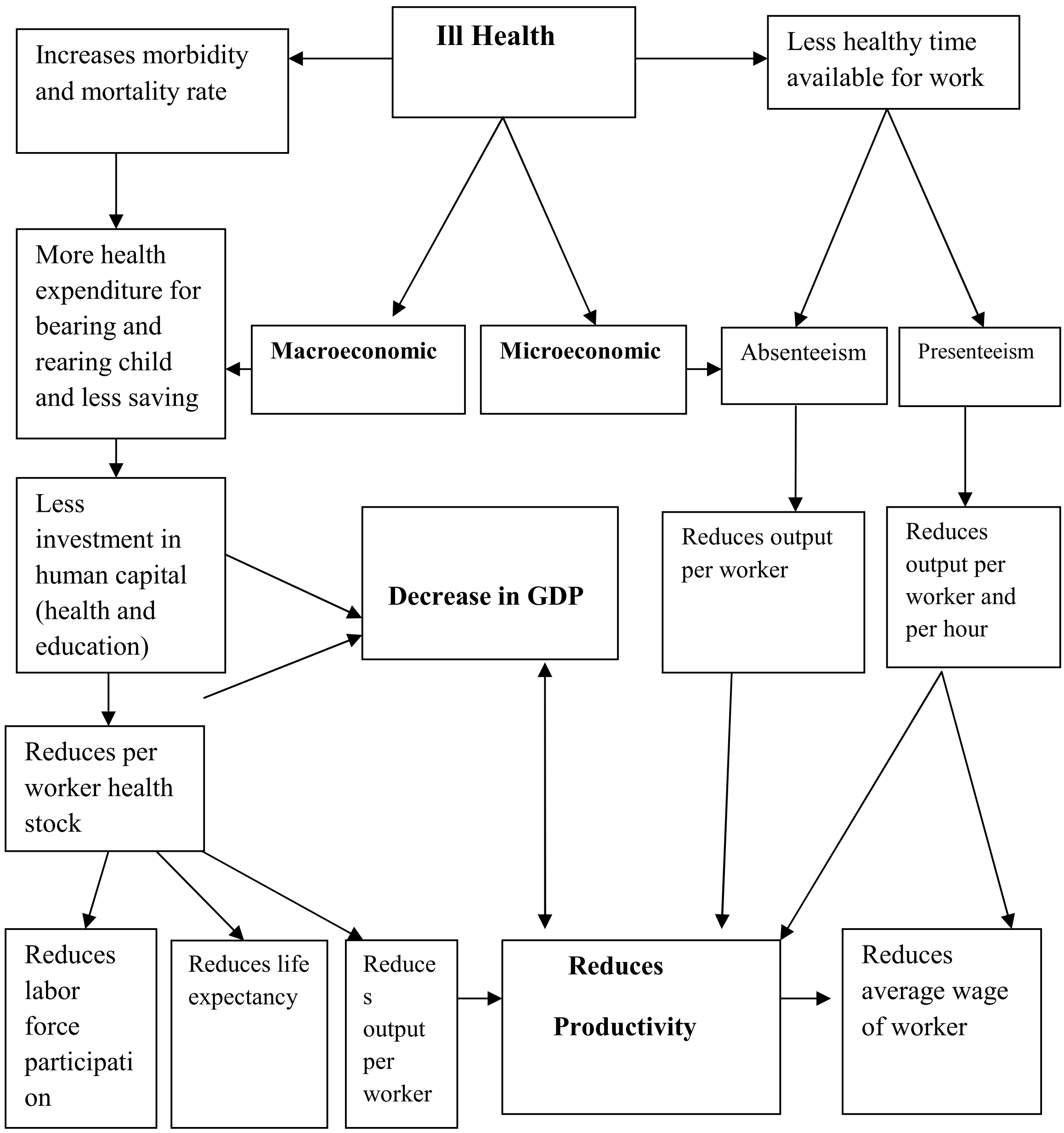


Exhibit 2: Relationship between health and productivity of workers

CHAPTER FOUR

WAGES AND PRODUCTIVITY

4.0 Introduction

One of the major objectives of the study is to find out the association between wages and productivity of SMIE workers. To accomplish it this chapter is designed under two sections. First section discusses different theories on wages, second section talks about whether the wage is related to labor productivity in practice describing different models and empirical findings that connects wage-productivity relationship and finally it concludes the chapter.

4.1 Wage Theories

The term 'wages' means payments made for the services of labor. According to Benham, ‘a wage may be defined as a sum of money paid under contract by an employer to a worker for services rendered’. A wage payment is essentially a price paid for a particular commodity, viz., labor services.

This section briefly discusses the different theories on wages and the wage determination techniques as forwarded by different economists in different times.

4.1.1 Different Theories on Wages

There are various theories of wages which have been put forward by different economists from time to time but none of them is free from criticism. The most important theories of wages determination are:

(a) Subsistence theory of wages

(b) Wage fund theory

(c) Residual claimant theory

(d) Marginal productivity theory, and

(e) Modern theory of supply and demand

These theories are briefly discussed below:

(a) Subsistence Theory

This theory was originated with the Physiocratic School of the French economists and was developed by Adam Smith. The German economist Lassalle called it the Iron Law of Wages or the Brazen Law of Wages. Karl Marx made it the basis of his theory of exploitation.

According to this theory, wages tend to settle at the level just sufficient to maintain the worker and his family at the minimum subsistence level. If wages rise above the subsistence level, the workers are encouraged to marry and to have large families. The large supply of labor brings wages down to the subsistence level. If wages fall below this level, marriages and births are discouraged and under-nourishment increases death rate. Ultimately, labor supply is decreased, until wages rise again to the subsistence level. It is supposed that the labor supply is infinitely elastic, that is, its supply would increase if the price (i.e. wage) offered rises.

(b) Wages Fund Theory

This theory is associated with the name of J.S. Mill. According to this theory wages depend upon two quantities, i.e.

(i) The wage fund or the circulating capital set aside for the purchase of labor, and

(ii) The number of laborers seeking employment.

Since, the theory takes the wage fund as fixed, wages could rise only by a reduction in the number of workers. According to this theory, the efforts of trade unions to raise wages are futile. If they succeeded in raising wages in one trade, it can only be at the expense of another, since the wage fund is fixed and the trade unions have no control over population. According to this theory, therefore, trade unions cannot raise wages for the labor class as a whole.

(c) Residual Claimant Theory

The Residual Claimant Theory has been advanced by an American economist Walker. According to Walker, wages are the residue left over, after the other facts of production have been paid. Walker says that rent and interest are governed by contracts but profit is determined by definite principles. There are no similar principles as regards wages. According to this theory, after rent, interest and profit have been paid; the remainder of the total output goes to the workers as wages.

This theory admits the possibility of increase in wages through greater efficiency of employees. In this sense, it is an optimistic theory; the subsistence theory and wages fund theory were pessimistic theories though this theory has been rejected by most economists on several bases.

(d) Marginal Productivity Theory of Wages

The first verbal exposition of the marginal productivity hypothesis is due to John Bates Clark (1889), which was followed up in Clark (1890, 1899) and, independently, Hobson (1891). Largely unaware of Clark, Philip H. Wicksteed (1894) presented the same theory and proved it mathematically, although, it was A.W. Flux (1894) who noted the equivalence between Wicksteed's mathematical statement and Euler's Theorem. Other Economists like Marshall, Wood, Walrus and others had important contribution to develop this theory.

The marginal productivity theory or marginal revenue productivity theory sometimes referred to as marginal productivity theory of wages state that, under the condition of perfect competition, every worker of same skill and efficiency in a given category will receive a wage equal to the value of the marginal product of that type of labor. If we multiply the marginal product or marginal physical product of labour (MPP_L) at each level of employment by the price of the output (P), we obtain the value of the marginal product of labour (VMP_L).

A firm, being a profit maximizer, will hire a factor as long as it adds more to total revenue than to total cost. Thus, a firm will hire a resource up to the level where the last unit contributes as much to total cost as to total revenue, because total profit cannot be further increased. In other words, the condition of equilibrium can be expressed as

$$MC_L=VMP_L \qquad [MPP_L * P= VMP_L]$$

$$\text{Given that, } MC_L=\text{Wage (W), then, } \quad W= VMP_L$$

In the following figure-1, the equilibrium of a firm is denoted by point E. At the market wage rate ‘w’ the firm will maximize its profit hiring L^* units of labor. This is because to the left of L^*, each unit of labor cost is less than the value of its product (VMP_L>w).Hence the profit of the firm will be increased by hiring more workers. Conversely to the right of L^* the VMP_L<w, and hence profits are reduced. It follows that profits are at a maximum level when VMP_L=w.

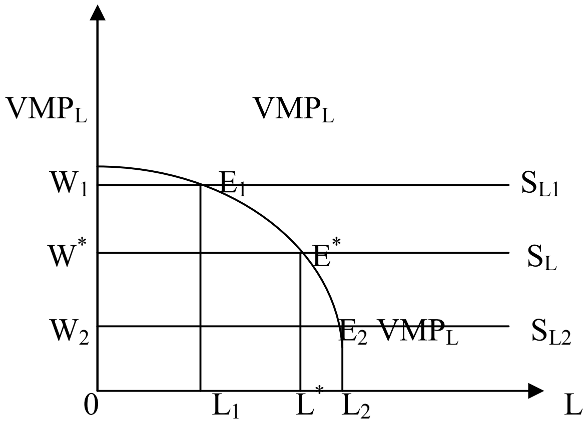


Figure 4.1: Equilibrium of a firm

If the market wage is raised to w_1, the firm will reduce its demand for labor to L_1 in order to maximize its profit (at E1, w_1= VMP).Similarly, if it falls to W_2, the firm will maximize its profit by increasing its employment to L_2.It follows that the demand curve of a firm for a single variable factor is its value of marginal product curve.

Limitations of marginal productivity theory

Marginal productivity theory was criticized by various economists basically on the following grounds:

1) Unrealistic assumptions:

The theory is founded on certain unrealistic assumptions like prevalence of perfect competition and perfectly mobility of workers. In reality these assumptions are not found.

2) Difficulty in the measurement of MRP

It is difficult to measure marginal revenue productivity of a factor. Marginal revenue productivity is the addition made to total revenue by employing an additional unit of a factor. But actually it is difficult to get it. In a large-scale industry if the work of a laborer is decreased, it will have no fall in total production.

3) Factors are not perfectly identical

In reality, different units of a factor are not identical. They are heterogeneous and hence cannot be substituted by one another. Land and capital cannot be substituted for each other. All labor is not equally productive.

4) Reward determines productivity

The reward of a factor is determined by the factor's marginal productivity. Hence MRP is the cause and reward is the effect. When a laborer is given higher wages, his living standard will develop and his health and efficiency will increase. Hence reward is the cause and not the wage.

The modern economists criticized the marginal productivity theory on the following two grounds:

Firstly, it ignores the supply side of a factor of production.

Secondly, it does not explain the price determination of a factor of production.

(e) **Taussig's Theory of Wages**

The American economist Taussig gives a modified version of the Marginal Productivity Theory of Wages. According to him, wages represent the marginal discounted product of labor. According to Taussig, the laborer cannot get the full amount of the marginal output. This is because production takes time and the final product of labor cannot be obtained immediately. But the laborer has to be supported in the meantime. This is done by the capitalist employer. The employer does not pay the full amount of the expected marginal product of labor. He deducts a certain percentage from the final output in order to compensate himself for the risk he takes in making an advance payment. This deduction, according to Taussig, is made at the current rate of interest.

(f) Modern theory of wages

The modern theory of wages is also known as the demand and supply theory of wages. According to the modern economists, wages are determined by the interaction of demand for and supply of labor as in the case of a market equilibrium of a normal commodity.

Demand For Labor

According to the modern theory of wages, the demand for labor reflects partly laborer's productivity and partly the market value of the product at different levels of production. The factors that determine the demand for labor are mainly derived demand, elasticity of demand for labor, price and quantities of co-operating factors, and technical progress.

Demand For Labor Under Perfect Competition

Under perfect competition, each firm constitutes a very small portion of the entire industry that it cannot influence wages appreciably by employing more or less of labor. The supply curve of labor confronting each employer is perfectly elastic, i.e., horizontal straight line at the level of the market wage rate. The individual demand curve is determined by marginal productivity. The individual employer hires as many laborers as will equate the marginal productivity of labor with the rate of wages in the market. Hence, the MRP curve is the demand curve for the labor of an individual firm. The following figure 4.2 shows the demand for labor of an individual firm and figure 4.3 represents the demand for labor of the industry. It is necessary to point out that the demand for labor of the industry determines the wages in the industry. The individual firm has to accept the market rate of wages and adjust its own demand for labor accordingly.

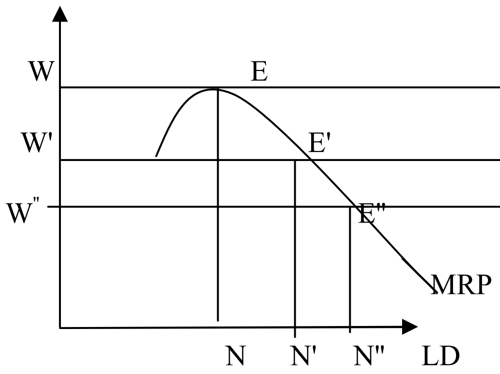


Figure 4.2: Demand for labor of a firm

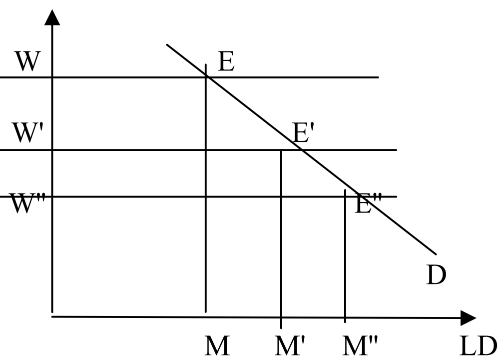


Figure 4.3: Demand for labor of an industry

Supply of Labor

The supply of labor depends on:

(a) The number of workers of a given type of labor which would offer themselves for employment at various wage rates, and

(b) The number of hours per day or the number of days per week they are prepared to work,

The labor may be supplied to three destinations:

Supply of Labor to a Firm

To a given firm, the supply of labor is perfectly elastic because at the current wage rate, it can engage as many workers as it wants. Its own demand constitutes only a very small fraction of the total supply of labor. Hence the supply curve of labor for a firm is a vertical straight line (figure 4.4).

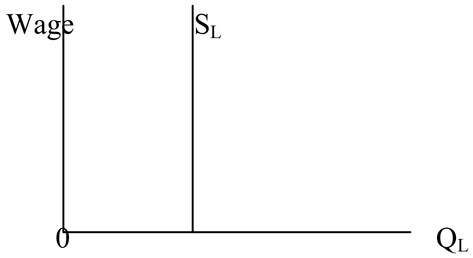


Figure 4.4: Labor supply curve of a firm

Supply of Labor to an Industry

For the industry as a whole, the supply of labor is not infinitely elastic. If the industry wants more labor it has to attract it from other industries, by offering higher wage rates. The supply of labor for the industry is subject to the law of supply, viz., supply varies directly with price, which means low wage small supply and high wage large supply. Hence the supply curve of labor for an industry slopes upwards from left to the right (Figure 4.5).

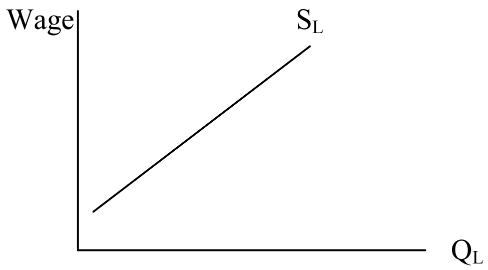


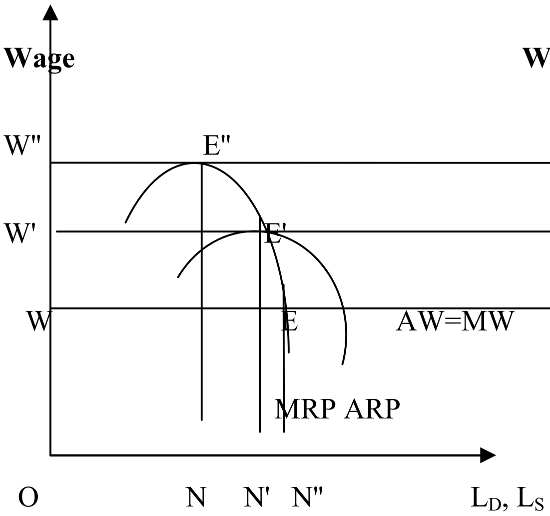
Figure 4.5: Labor supply curve of an industry

Supply of Labor to an Economy

The supply of labor for the entire economy depends on economic, social and political factors or institutional factors, e.g., attitude of women towards work, working age, school and college age and possibilities of part-time employment for students, size and composition of the population and sex distribution, attitude towards marriage, size of the family, birth control, etc.

Wage Determination: Interaction of Demand and Supply

The following figures, figure 4.6 and figure 4.7 represent the wage determination process of a firm and an industry respectively in a competitive labor market.



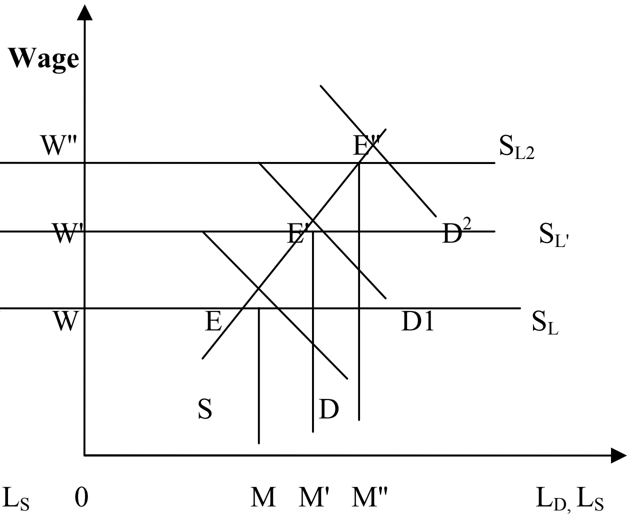


Figure 4.6: Wage determination of a firm

Figure 4.7: Wage determination of an industry

A firm in a competitive market takes the market wage rate of labor as given. So the supply curve of labor which it faces is perfectly elastic i.e. a horizontal line. In figure 4.6, W-AW is an extended line (wage curve) that cuts the MRP (marginal revenue product) curve at point E. At this level, the ARP (average revenue product) is MR (marginal revenue) which is greater than the wage, OW. Hence, all firms are making supernormal profit at this wage level. This will lead to entry for new firms in the industry; the demand for labor will increase (from D to D_1) and the wage level will go up (from OW to OW').

Thus, supernormal profits will be competed away in the long run by the entry of new firms. The new demand curve D1 cuts the supply curve S in figure 4.7 at point E'. The wage level in this situation will be OW' which is higher than the original wage level OW. When the wage is OW, the firm is in equilibrium at E and when the wage rises to OW', the equilibrium is at E'. At this point, average revenue product (ARP) and marginal revenue product (MRP) are equal, and the average wage OW' is equal to both of them. It means the individual firms are earning normal profits. Similarly, at point E" the firms are suffering from losses. This is how the interaction of demand and supply determines the wage.

Under perfect competition, in the long run, wages are equal to the marginal as well as to the average productivity of labor. If marginal productivity is greater than average productivity, it will be worthwhile to employ more labor till marginal productivity falls to the level of average productivity. On the other hand, if marginal productivity is less than average productivity, less labor will be employed and the marginal productivity will rise to the level of average productivity. Marginal productivity and average productivity thus tend to be equalized. Since wages are equal to marginal productivity, they are also equal to average productivity in the long run i.e. at equilibrium: Wage = $MP_L = AP_L$. This is shown in the following diagram (figure 4.8):

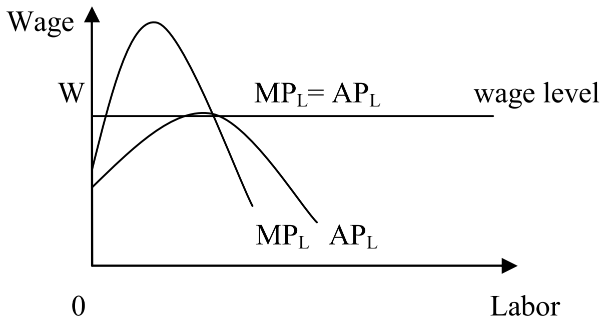


Figure 4.8: Long run wages of a firm

4.2 Is Wage Related to Labor Productivity in Practice?

There is always a great focus on labor productivity for the development of any economy by the planners and policy makers. Productivity is a measure of the ability to create goods and services from a given amount of labor, capital, materials, land, knowledge, time, or any combination of these. In any National Income Accounting, to improve the Gross Domestic Product (GDP) or the (GNP), it is more important to enhance the productivity and efficiency of the factors of production rather than the investment and public expenditure. Among all the factors of production, human capital (i.e. labor) are one of the most important factors that imposes effects on productivity especially on labor productivity.

However, an employer (producer) always wants to maximize his profit with the increase in productivity (especially labor productivity) but the employee (labor) always tries to maximize its satisfaction level (i.e. improved cost of living and better financial background) through the increase of wage rate. Despite a number of controversies to which the marginal productivity theory has been subjected, most of economic thinkers are more or less agreed upon the idea that wages and productivity should be positively related.

To clarify whether difference in productivity is reflected by the difference in wages or wages determine the productivity, this section explains both theoretical and empirical literature on the relationship between wage and productivity. Firstly, it illustrates theoretical arguments supporting the links between labor productivity and wages, secondly it discusses the models that connects wage –productivity relationship, and finally it describes the empirical findings on the linkage between wage and productivity.

4.2.1 Theoretical Arguments Supporting the Links between Wages and Labor Productivity

It seems simple and intuitive that wages would rise with productivity. But in order to understand how productivity growth affects wages it is plausible to consider the behavior of an individual firm.

A single firm in a competitive economy has little influence on market conditions and sells its goods at prevailing prices and hires workers at prevailing wages. Most economic models make the assumption that each additional worker hired is less productive than those hired before. In the terms of economics, this is referred to as "diminishing marginal productivity."

There are at least two reasons behind that assumption.

One, it is in the best interest of a firm to hire the most able workers first, meaning that each additional worker is less productive, and

Two, without additional investment each new labor hire reduces the amount of capital per worker.

As long as the contribution to output produced by the last worker hired (i.e., the price of the good times the quantity produced) exceeds the cost of his labor (i.e., the wage rate times hours worked), a profit-maximizing firm will continue to add to its labor force. If the productivity of each successive worker hired declines, then the value of the additional production also falls. At some point the value of the output of the last worker hired will equal the cost of the additional labor. At that point, the profit maximizing firm will stop adding to its labor force. This is shown in the following figure 4.9.

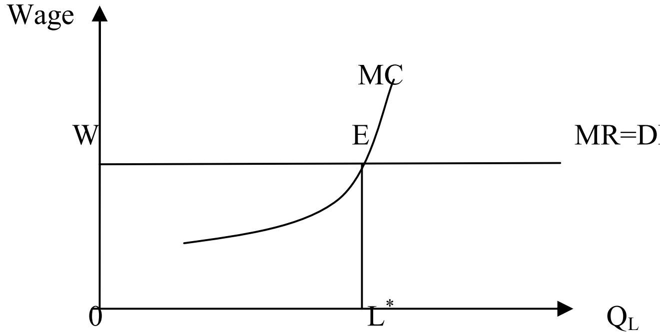


Figure 4.9: Short run equilibrium of a firm in the labor market

Now suppose that some event, a technological innovation for example, raises the productivity of all the workers at the firm. If each worker is now able to produce more than before, that will raise the total value of the output each worker can produce. In that case the last worker hired, instead of producing just enough to cover the cost of his labor is now producing more than that.

If the firm is willing to continue hiring as long as the value produced by each additional worker is greater than the additional labor cost, the increase in productivity also will increase the firm’s demand for labor. Hiring more labor is again profitable to the firm. Other things being equal, an increase in the demand for labor will tend to push up the wage rate. In this way, increases in labor productivity increase labor income. When the firm again reaches the point where the cost of additional labor is more than the value of goods one more worker can produce, it will stop hiring. This is shown in the following figure 4.10:

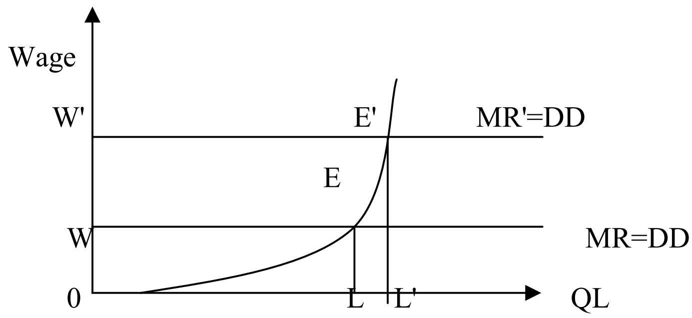


Figure 4.10: Equilibrium of a firm with increased labor productivity

There are circumstances where an increase in productivity might not necessarily lead to an increase in employment. Suppose, for example, that worker productivity rises faster than does demand for the goods those workers produce. Because the supply of the good being produced rises relative to the demand for it, the price of the good will tend to fall. The fall in the price of the good will offset the effect of higher productivity on the value of goods produced by workers. If the drop in price exactly offsets the increase in productivity, there will be no change in the value of each worker's production to the firm, and there will be no increase in the firm's demand for labor. In that case the firm will neither hire more workers nor will wages increase. In this case, all of the benefits of higher productivity will accrue to consumers. Because consumers can now buy the same quantity of the good with less of their income, they have more to spend on all of the other goods (and services) they want. That increase in demand will tend to push up the price of those other goods. When those prices rise, the demand for labor at firms producing those goods will increase. That will tend to push up both employment and wages at those firms.

There is also the possibility that an increase in productivity will simply increase the profits of the firm. If there is no possibility for the firm to increase sales, and if wages are inflexible, the firm may reduce the number of workers it employs and thus reduce its overall labor costs. In that case, higher productivity will increase the profitability of the firm.

In the short run, prices and wages may be somewhat "sticky" or inflexible. More so in some markets than in others, but to the extent that they are, one group may benefit more from increases in productivity than others. To the extent that prices fall, consumers will benefit. To the extent that wages rise, workers will benefit. To the extent that neither changes, profits will rise. Over the long run, however, prices and wages do tend to respond to changes in supply and demand and the benefits will be shared.

This discussion has considered only the contribution of labor to the production of goods and services. Two other factors of production also contribute to the production of goods and services and they also share in the income yielded by sales of the goods and services.

Demand for both land and capital are determined in the same way that demand for labor is. Firms will continue to add capital as long as each new investment yields more in revenue than it costs the firm to use. The same holds for land. Suppose there is an innovation that raises the productivity of a firm's capital equipment. Just as in the case of an improvement in the productivity of workers, the value produced by that equipment rises and so it becomes profitable for the firm to invest in more equipment. The income of each of the three factors of production is based on the value of their contribution to the total value of the goods and services produced. But they are interdependent. An increase in the amount of capital equipment available to the existing workforce is likely to increase their productivity as well. That would tend to increase the firm's demand for labor and push up wages.

4.2.2 Models Supporting the Link between Wage and Productivity

Efficiency Wage Model (EWM)

The term "efficiency-wages" has been introduced by Alfred Marshall to denote the wage per efficiency unit of labor. Marshallian efficiency wages would make employers pay different wages to workers who are of different efficiency, such that the employer would be indifferent between more efficient workers and less efficient workers. The modern use of the term is quite different. The essential feature of efficiency wage model (EWM) is the hypothesis that worker's productivity is a positive function of wages, at least over some relevant range.

This model postulates that firms pay their employees more than market clearing wages in order to increase their employees' productivity or efficiency. High wage workers are less likely to quit. Thus firms can retain more experienced and productive workers than newly hired workers who may not be as productive as experienced workers. For example, it has been argued that raising pay can stimulate worker effort and strengthen long-term employment relationships. Akerlof (1982) had proposed that when firms raise pay, workers put forth greater efforts out of a sense of loyalty to those employers. Therefore, firms may be reluctant to reduce wages in the face of excess supply, since the associated decrease in productivity may result in an increase in labor costs.

In its simplest form, the efficiency wage hypothesis can be summarized by a production function of the form:

$$Q = f\,[e\,(w)\,L], \qquad \frac{\delta Q}{\delta e} > 0$$

Where, L is the number of workers, w is the real wage and e is the effort per worker, or more general, worker productivity.

The Solow Model

Solow (1979) was one of the first to formulate an efficiency wage model that would imply wage rigidity and therefore involuntary unemployment. The key element of the model is the assumption that higher wages induce higher effort on worker's part. Assuming that effort enters the production function, the firm will maximize profits by choosing that wage, where the elasticity of effort with respect to the wage equals to 1 (Romer, 2000).

Fair Wage Model

This model was developed by Akerlof and Yellen(1990) . This model implies that workers have some fair-reference wage, and firms have an incentive to pay wages that are closer to worker's fair reference wage. Firms which pay less than the fair wage create dissatisfaction, low morale, high quit rates, shirking and absenteeism on the job, as therefore receive less productivity from their workers.

Nutrition -Based Efficiency Wage Model

Nutrition -based efficiency wage model is one of the most prominent micro foundations of the efficiency wage theory. The hypothesis was first advanced in the context of less developed countries (LDCs). Why labor productivity should depend on real wage paid by farms in less developed countries' was the basic inquiry that paved the path for bringing the issues of health and illness in the wage-productivity linkage (Ghatak, 2010). The study on the theory of labor productivity, health and wages through the efficiency wage hypothesis is pioneered by Leibenstein (1957). It has been formalized and extended later by many others like Mirrlees (1975), Rodgers (1975), Stiglitz (1976, 1982), Bliss and Stern (1978a).

The idea of nutrition -based efficiency wage was based on the relationship between wages and productivity, i.e., in poor economies where wages determine workers' consumption level, the amount of workers' effort would depend positively on their nutrition and health status, and thus on wages. The amount of work that a laborer can be expected to perform depends on his energy level, his health and his vitality, which in turn depend on his consumption level and on the nutritive value of his food intake. Harvey Leibenstein (1957) hypothesized that relative to poorly nourished workers, those who consume more calories are more productive, and that at very low levels of intake, better nutrition is associated with increasingly higher productivity (Ghatak, 2010).

The Gift Exchange Model

Partial gift exchange hypothesis by Akerlof (1984) is efficiency wage theory based on sociological factors. He interprets when firms pay higher wages in excess of the competitive wage; the workers feel obliged and reciprocate with repaying in the form of the gift of higher effort level. According to the basic idea of the "labor market as partial gift exchange", the loyalty of workers is exchanged for high wages, and this loyalty results in high productivity of the firm.

The Adverse Selection Model

The adverse selection model is based on four assumptions: first, workers are heterogeneous in ability; second, job performance depends on worker ability; third, the firm has imperfect information on worker characteristics (ability); and last, ability and worker reservation wages are positively correlated. The model is set up under the assumption that better workers have better alternative offers, where a relevant option is self-employment (Weiss, 1980).

The firm that offers higher wages attracts a better pool of applicants, and the quality mix of those who quit their jobs is a function of relative wages. Thus, firms that pay higher wages will be able to achieve higher levels of productivity.

The Shirking Model

The shirking model is the one that has been most extensively developed in the literature by Shapiro and Stiglitz (1984), Bowles (1985), Fehr (1986) and others. The model assumes that workers have some discretion concerning their work performance and that there are costs associated with monitoring, or that monitoring is imperfect. In order to induce workers' good behavior and discourage shirking, a firm needs to pay above the market clearing wage, to a point where the wage premium raises the cost of being laid off.

The shirking model predicts that firms that pay high wages are those with high monitoring costs, significant possibilities for workers to vary their effort inputs, and high costs from shirking, such as expensive broken machinery (Shapiro and Stiglitz, 1984). Another hypothesis derived from this model is that a firm should pay a higher "premium" to occupations in which poor worker performance can cause larger damage to the firm.

4.2.3 Empirical Literature on the Relationship between Wage and Labor Productivity

Ho and Yap (2001) have conducted a study on the both long-run and short-run dynamics of wage formation in the Malayian Malaysian manufacturing industry as a whole and also for 13 selected sub-sectors of the industry using the Engle-Granger test. The study finds a positive long run relationship between labor productivity and real wage and the coefficient was greater than 1. The study suggests that for every 1 per cent change in labor productivity, real wage increases by 1.96 percent in the manufacturing industry holding all other variables constant; this implies that the increase in real wage exceeds the increase in labor productivity causing an increase in unit labor cost. The short-run dynamic model reveals a negative relationship between real wages and labor productivity suggesting that labor productivity gains do not bring about higher wages in the short run. Nevertheless, there were several draw backs in the methodology of their study.

Goh S.K. (2009) has tried to investigate the relationship between real wages, labor productivity and unemployment in Malaysia at the macroeconomic level using annual time series data from 1970 to 2005. He defines real wages by average real wages; labor productivity by average labor productivity; and the unemployment rate by using broad definition that is, desiring work but not looking for a job. Taking log into all three variables, he has estimated the regression of average real wage (Y) on average labor productivity (X_1) and unemployment rate (X_2), which gives the following results:

$$LY = -1.139 + 1.280\, LX_1 + 0.067\, LX_2$$

$$(0.215)^{*} \quad (0.054)^{*} \quad (0.051)$$

$R^2 = 0.977$ DW Statistic = 1.731 F-statistic = 717.265 Prob (F-statistic) 0.0000

*Shows 1% level of significance, Parenthesis indicates standard errors.

The coefficient of labor productivity has a standard error of 0.054 and is therefore significant at 1 percent, while the coefficient of unemployment rate has a standard error of 0.051 and is clearly insignificant. Hence, the evidence suggests that unemployment rate is not part of the long-term relationship.

He further does a co integration test for the bivariate relationship between real wages (Y) and labor productivity(X). The estimated regression gives the following results:

$$Y = -0.882 + 1.223X$$

$$(0.088)^{*} \quad (0.033)^{*}$$

$R^2 = 0.976$ DW Statistic = 1.610 F-statistic = 1403.4 Prob (F-statistic) 0.0000

*Shows 1% level of significance

The standard error on the coefficient of labor productivity is 0.033 implying a high degree of significance. It suggests that in the long run, for every 1 percent rise in productivity, real wage rises by 1.223 percent. Hence, Goh concludes that in the long run there exists a positive relationship between real wage and labor productivity.

Nayak and Patra (2013) have conducted a study using a time series data of 1998-99 to 2008-09 from Odisha (in India) manufacturing sector to describe the wage - labor productivity relationship by statistical tool, coefficient correlation. The study finds a positive relationship between wage and labor productivity with correlation co-efficient value 0.883 (r = 0.883).

Ahmad and Khalid (2010) observe a positive relationship between productivity and real wages. Similarly, the wage premium is found to increase with the years of schooling, and higher education was shown to yield higher productivity.

Rath and Madheswaran (2008) have investigated the relationship between labor productivity, real wages, employment and prices in Indian manufacturing sector using the annual data from 1960-61 to 2001-02. The study defined labor productivity as average labor productivity (real output per employee), wage as average wage, employment as total employees of an industry, and price level as wholesale price index of the manufacturing products base 1993-94=100. They estimated the regression (taking logged form) of labor productivity (Y) on real wages (X_1), employment (X_2) and price (X_3) which gives the following co integration relation:

$$\log Y = 4.197 \log X_1 + 3.535 \log X_2 - 1.60 \log X_3$$

$$(t=7.05)^{*} \quad (t=4.88)^{*} \quad (t=4.98)^{*}$$

*Shows 1% level of significance

The estimated regression suggests that a 1 percent increase in real wage is associated with a 4.2 percent rise in labor productivity in the Indian manufacturing sector in the long run.

Lentz and Mortensen (2003) argued that productivity differences between firms are closely linked to wage dispersion, and the association between measured labor productivity and individual wages is well documented.

Gupta (1975) in his study of labour incentive in Indian Iron and Steel Industry found that monetary incentives are best motivators which lead to better motivation and a higher labor productivity.

Guiwen and Yanjuan (2010) have tried to examine the long-run equilibrium relationship between wages and labour productivity in the construction industry in Guangdong province, China using the time series data from 1979 to 2010. To check the relationship between labor remuneration and labor productivity, the study has selected the variables labor productivity (LS), labor remuneration (LB), the stock of physical capital (WZ), and the total funding of scientific and technological activities (KF).The labor productivity is indicated by average labor productivity; labor remuneration, based on consumer price, is adjusted into comparable remuneration; the stock of physical capital and the total funding of scientific and technological activities are converted into the actual value according to the consumer price index. They did a co-integration test by making first-order difference sequence of the variables. The estimated regression of labor productivity(Y) on labor remuneration (X_1), the stock of physical capital (X_2), total funding of scientific and technological activities (X_3) gives the following results:

$$Y= 259.4675 +0.251764\, X_1+0.270933\, X_2-0.0000254\, X_3$$

$$(t=4.549)^{*} \quad (t=1.919)^{*} \quad (t=1.717)^{*} \quad (t=-0.198)^{*}$$

*Shows 5% level of significance

The estimated regression suggests that a 1 unit increase in labor remuneration increases the labor productivity by 0.25 units which reveals a significant long run relationship between wages and labor productivity in the construction industry in Guangdong province, China.

Klein (2012) examines the long run relationship between non- agricultural labor productivity and real wages using South African Reserve Bank's data from 1971 to

2011. He calculates the labor productivity by dividing the value added output by total employment. The analysis uses two measures for the real wage: the remuneration per employee (i.e. average real wage), which is deflated by the GDP prices to reflect the employers' considerations related to the production costs, and the remuneration per employee that is deflated by the CPI to reflect the workers' purchasing power consideration in the bargaining process. Adjusting and expressing the variables in natural logarithm, he estimated the regression of real wages on labor productivity.

The estimated regression is given below:

$$\text{Ln } W = -1.747 + 0.446 \text{ Ln } X$$
$$(P{=}0.000)^{*} \quad (P{=}0.000)^{*}$$
$$R^2 = 0.916$$

And

$$\text{Ln } W' = 2.545 + 0.440 \text{ Ln } X$$
$$(P{=}0.000)^{*} \quad (P{=}0.000)^{*}$$
$$R^2 = 0.918$$

*Shows 1% level of significance

Where, W= average real wage which is deflated by the GDP prices, and

W'= average real wage which is deflated by the CPI

X= labor productivity

The estimated results show that there is a long-term link between non-agricultural labor productivity and real remuneration per worker. The coefficient of productivity in both cases is significant with the expected sign and it suggests that a 1 percent increase in labor productivity increases the real wages by 0.44 percent.

Based on annual data for 1996–2009, Klein has done a cross-country analysis to examine the link between the real wage growth and the change in labor productivity in selected nineteen emerging and advanced economies that are considered South Africa's peer group. The cross-country comparison shows that overall the correlation between real wage growth and labor productivity growth are generally positive, although in some countries, such as Peru, China, and the Philippines, it is negative.

4.3. Conclusion

In practice, labor productivity and wages are positively related. Sometimes higher productivity determines higher wages and sometimes higher wages leads to higher productivity. Linking labor productivity with wages has a positive effect on the economy. It provides an incentive for the workers to increase the output. An increase in productivity leads to a greater supply of output in the market. This would result in lower prices. Hence, it would affect the consumers' welfare as well. Increase in productivity would lead to increase in exports. This would also maintain the labor supply. Thus, increased productivity would be beneficiary to the economy.

The empirical findings on the association between wage and productivity of SMIE workers are analyzed in chapter seven.

CHAPTER FIVE

Diseases Pattern and Health Care Seeking Behavior of the SMIE Workers

5.0 Introduction

Two major objectives of the study are to examine the income and expenditure pattern of the SMIE workers in Bangladesh, and to examine their diseases pattern and health care seeking behavior. To fulfill these objectives, this chapter is designed under five sections. First section discusses the health systems of Bangladesh; second section reviews the existing theoretical and empirical literature on disease pattern and health care seeking behavior of workers. Section three examines the background characteristics of the SMIE workers including their income pattern based on study data. Section four and five examine the disease pattern and the health care seeking behavior of the SMIE workers respectively, and finally it concludes the chapter.

5.1 Health Systems in Bangladesh

A health system consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health. In other words, it is the infrastructure through which the desired services to the intended population are delivered (WHO, 2010).

Bangladesh has a health system which is dominated by the public sector and the private sector is run by local entrepreneurs, different NGOs and international organizations. The Ministry of Health and Family Welfare (MoHFW) is the leading organization for policy formulating, planning, decision making and management of curative, preventive as well as promotive health services to the population at macro and micro level. Under MoHFW four Directorates e.g. Directorate General of Health Services, Directorate General of Family Planning, Directorate of Nursing Services and Directorate General of Drug Administration are providing health services to the citizens of the country.

The MoHFW provides health care services by three tiers of health care centers: primary, secondary, and tertiary level. The hospitals and health facilities which are located in the upazila level and below are in general termed as primary health care centers. The upazila health complex (UHC) at the sub-district level serves as the nerve-centre of the primary healthcare system. With 31 to 50 beds, each complex has qualified physicians, nurses and other allied health workers. The union health and family welfare centers at the union level (each union with six to eight villages and a combined population of about 20,000 to 30,000) provide limited curative or rehabilitative care. At the village level, community clinics were designed to provide the most basic preventative and promotional health care services to the village population (4,000 to 6,000 people). However, many of the upazila health complexes have clinical specialists who provide specialty care to the patients. The district hospitals are usually termed secondary hospitals as these have fewer specialty cares unlike many present in the medical college hospitals. There are also different types of special care centers, such as, infectious disease hospitals, tuberculosis hospitals, leprosy hospitals, which fall under secondary care health facilities. The medical college hospitals are located in the regional level, one for several districts, which are affiliated with medical colleges, and provide specialty care in many disciplines. These hospitals are called tertiary hospitals. Tertiary hospitals also include the national level super specialty hospitals or centers which provide high end medical care services for only one field (GOB, 2013 and http://nasmis.dghs.gov.bd).

However, in urban areas, delivery of health services including Primary Health Care (PHC) services is virtually provided by the Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&C) through the City Corporations and Municipalities. These local bodies run a number of small to medium hospitals and outdoor facilities. The Ministry of Health & Family Welfare contributes to urban primary health care through the outpatient services distributed through its secondary, tertiary and specialized hospitals located in the urban settings. Besides, there are some urban dispensaries and school health clinics in some of the bigger cities and municipalities to provide health facilities (GOB, 2013 & WHO, 2010).

In addition to Government agencies, health services are provided by the private sector consisting of not-for-profit NGOs (often donor-supported) and for-profit clinics and dispensaries in the urban settings. In the rural areas, there are traditional healers, a few homoeopathic practitioners, village doctors (Palli Chikitsok,who have had 3 months training in diagnosing and treating common ailments, mostly from private institutions of questionable quality) and drugstores in village markets that sell allopathic medicine on demand. By far the single largest group of ‘unqualified practitioners’ is the ‘unqualified allopaths’ who are the untrained pharmacists, market sellers, and road-side “quacks" with little or no professional training (Ahmad, 2007).

5.1.1 Occupational Health and Safety (OHS) Services in Bangladesh

Occupational health and safety (OHS) primarily seeks to maintain the working ability of the labor force as well as to identify, assess and prevent hazards within the working environment (Ahasan, 2002). The main laws related to occupational health & safety in Bangladesh is the Factory Act 1965 and the Factory Rule of 1979. This act is generally applicable to any `factory'. `Factory' means any premises including the precincts thereof whereon 10 or more workers are working or were working on any day of the preceding twelve months. This act defines worker as a person employed in any manufacturing process or in cleaning any part of the machinery or premises used for a manufacturing process, or in any other kind of work incidental to or connected with, the manufacturing process. It does not include any person solely employed in clerical capacity in any room or place where no manufacturing process is carried on. There are a number of other laws and regulations that are also have some provisions related to occupational health and safety. These laws have provisions on occupational hygiene, occupational diseases, industrial accidents, protection of women and young persons in dangerous occupations and also cover conditions of work, working hours, welfare facilities, holidays, leave etc. But most of the laws are lacking in standard values and not specific rather general in nature. Different ministries such as railway, port and shipping, jute, textile etc. operate the occupational health care program through various departments and directorates. It is the legal obligation of the employers to provide medical care in case deterioration of health or injuries results in from exposure to agents related to work situation. Medical officers have been employed by various agencies in accordance with section 44 of Factories Act 1965, which is obligatory for those factories having 500 or more workers (ILO, 2002). Moreover, Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) set standards for compliance like factories must have alternative stairs, basic fire equipment, approved layout plan from concerned authority for ensuring safe building construction, group insurance for workers, hygienic sanitation facility and first aid appliance, as well as ensuring minimum wages and flexible jobs for the workers. The formal sector industries usually follow the industrial compliance. As a result, the workers of large scale industries both in manufacturing and non-manufacturing sector work with safe and healthy environment and thereby, they used to miss less work days due to their illness. On the other hand, due to non-compulsory employment of medical officer in

SMEs and inability of big investments in compliance issues, most of the workers of SMIEs work with unhygienic and unhealthy work environment. Hence, the workers' are exposed to illness and disability.

5.2 Review of Literature: Theoretical and Empirical

Health reflecting the soundness of physical condition essentially measures the quality of human life. It is considered as an essential force for promoting socioeconomic progress in a society (Rahman and Rahman, 2013). Information on the existing disease pattern and health seeking behavior of the SMIE worker is essential to provide need based health care delivery to any population. But this information is rarely available. The high incidence of diseases cuts the workers' household budget both ways i.e. by spending large amount of resources on medical care and unable to earn income due to illness during this period. So, it is very important to know their disease pattern and to plan according to solve the problem of treatment seeking behavior.

Health seeking behavior refers to the sequences of remedial actions that individuals undertake to rectify perceived ill health. Various factors affect the health seeking behavior. The major factors include illness type and severity, opportunity costs, quality service, staff attitudes as well as the age, gender and social circumstances of the sick individual. The attitude of the health providers and patients' satisfaction with the treatment play a role in health care seeking behavior.

No study is available to examine the health care seeking behavior of the SMIE workers directly. Nevertheless, there are some studies which observe the health seeking behavior of disadvantaged group people, garments workers, female factory workers, ethnic people etc.

In a study, Zaman S. et al. (2000) have examined the disease prevalence, health-seeking behaviour, and scope for preventive and curative treatment of female factory workers in Bangladesh. The study has found that the majority (54%) of the female worker did not seek any treatment. Only 3% sought treatment from the factory doctor. Other sources of treatment included pharmacies, local doctors, or traditional healers. Fifty percent, who were ill did not take leave, because of the fear that their wage could be forfeited.

Rahman and Rahman (2013) have conducted a study on Sickness and Treatment among Garments Workers in Bangladesh. They have found that (79%) workers are suffering from illness. About (42%) respondents were suffering for 1-2 weeks and 28.8% were for less than 02 weeks. The study reveals that loose motion, cough and breathlessness were predominant sign/symptoms among the respondents. Among the sufferer, their mode of seeking treatment was different. Majority of them received treatment from LMAF (Local *medical* assistant and family planning training), Pharmacists& Kabiraj. About 11% respondents had no consultation for their illness.

Rahman et al. (2011) have conducted a study to determine the disease pattern and health seeking behavior in rural Bangladesh. They have found that fever; gastrointestinal diseases and respiratory diseases were the most reported complaints among the rural people in Bangladesh. They stated that there were no noticeable differences in the possibility of seeking traditional or any kind of care considering socio-demographic variables and prevailing disease types.

Paul-Majumder (2003) has found that 45% of the female garments worker did not go to any doctor while they were sick. In most cases workers sought their own treatment for diseases like fever, diarrhea, and urinary tract infections by buying over-the-counter medicines. Major reasons for not taking treatment are the high cost, time constraints and most importantly, not having onsite health facilities.

5.3 Background Characteristics of the SMIE Workers in Bangladesh

The study undertakes a survey on randomly selected 44 SMIEs in Bangladesh. It covers 10 categories of enterprises which are situated in three divisions; from each factory 6 workers were randomly selected who became ill during the last six months. Therefore, the study interviewed 259 SMIE workers from 44 SMIEs by using semi structured questionnaire. Based on this information, the followings are the basic characteristics of the SMIE workers in Bangladesh.

Age

Table 5.1 shows the age composition of the SMIE workers in Bangladesh. It is found that the mean age of the SMIE worker is 26 years. It is 25 years for the workers of Dhaka division, and 27 years for the workers of Chittagong and Khulna divisions (Table 5.2). Workers of Knitwear, spooling and thread ball factory, and RMG (woven) are lower aged (on average 24 years) compared with the workers of other categories of factories, say, bricks, rice milling, news paper etc (on average 28 years).

Most of the workers' (79%) age is in the range of 20 to 29 years in all categories of factories and in all divisions and the percentage of child labor in the SMIEs is negligible (1%).

Table 5.1: Distribution of workers by age

Age (Years)	Percentage of worker (%)
Up to 14	1
15-19	3
20-24	41
25-29	38
30-34	8
35-39	5
40 and above	4
Mean age (Years)	26
N	259

Table 5.2: Division wise distribution of workers by age

Division / Age (Years)	Dhaka (% of worker)	Chittagong (% of worker)	Khulna (% of worker)
Up to 14	1	0	0
15-19	6	1	3
20-24	47	41	23
25-29	32	38	53
30-34	6	8	15
35-39	4	8	2
40 and above	4	4	5
Mean age(Years)	25	27	27
N	149	70	40

Table 5.3: Factory category wise distribution of workers by age

Factory category / Age (Years)	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News Paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Up to 14	0	0	0	0	0	0	6	0	0	17
15-19	2	0	14	0	0	0	0	6	11	0
20-24	56	29	50	33	28	25	28	22	39	33
25-29	36	38	31	29	44	58	44	50	17	33
30-34	3	17	3	22	11	8	11	6	11	17
35-39	0	8	0	11	11	8	11	6	11	0
40 and above	2	8	3	6	6	0	0	11	11	0
Mean age (Years)	25	28	24	29	28	26	26	28	27	23
N	91	24	36	18	18	12	18	18	18	6

No significant age difference is observed between male and female SMIE workers (Table 5.4).

Table 5.4: Gender wise mean age of the workers		
Gender	Mean age (Years)	N
Male	26	159
Female	25	100
Total	26	259

Gender

Gender wise percentage distribution of SMIE workers is shown in table 5.5.It reveals around two third of the SMIE workers (61%) are male and one third (39%) are female. Proportion of female worker is higher in Chittagong and Dhaka division (43% and 40% respectively) compared with Khulna (27%) division (Table 5.6).

Considering factory category, it is apparent that RMG and knitwear factories are mainly female oriented factory and others like bidi factory, bricks, bakery products, printing of newspaper and spooling of thread ball factory are male oriented factory (Table 5.7).

Table 5.5: Distribution of workers by gender

Gender	Percentage of worker	N
Male	61	159
Female	39	100
Total	100	259

Table 5.6: Division wise distribution of workers by gender

Division / Gender	Dhaka	Chittagong	Khulna
Male (%)	60	57	73
Female (%)	40	43	27
N	149	70	40

Table 5.7: Factory category wise distribution of workers by gender

Factory category / Gender	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals(%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Male	41	71	42	83	72	58	95	100	78	100
Female	59	29	58	17	28	42	5	0	22	0
N	91	24	36	18	18	12	18	18	18	6

Religion

Table 5.8 depicts the percentage distribution of SMIE workers by their religious faith. It reveals that most of the SMIE workers (97%) are Muslim and a few of them are non Muslim (3%). No significant regional or factory category wise variation regarding religion is observed.

Marital Status

The percentage distribution of SMIE workers by their marital status is shown in table 5.9.It reveals that majority of the SMIE workers (80%) are married. Around 19% workers are single and only 1% is widow.

Table 5.8: Distribution of workers by religion

Religion	Percentage of worker
Muslim	97
Non Muslim	3
N	259

Table 5.9: Distribution of workers by marital status

Marital status	Percentage of worker
Married	80
Single	19
Widowed	1
N	259

Table 5.10: Location wise distribution of workers by marital status

Division / Marital status	Dhaka (% of worker)	Chittagong (% of worker)	Khulna (% of worker)
Married	75	91	78
Single	24	9	22
Widowed	1	0	0
N	159	70	40

Table 5.11: Factory category wise distribution of workers by marital status

Factory Categories	Married (% of worker)	Single (% of worker)	Widowed (% of worker)	N
RMG	92	8	0	91
Cotton tex.	83	17	0	24
Knitwear	64	36	0	36
Bricks	78	22	0	18
Rice Milling	89	11	0	18
Pharmaceuticals	67	33	0	12
Bakery products	72	28	0	18
newspaper	61	39	0	18
Bidi factory	79	17	0	18
spooling and thread ball	83	17	0	6

The percentage of single workers is higher in Dhaka (24%) and Khulna (22%) division compared with Chittagong (9%) division (Table 5.10).

The proportion of married workers is found more in the factories like RMG (92%), rice milling (89%), and cotton textile (83%) compared with other categories of factories (Table 5.11).

Education

The percentage distribution of the SMIE workers by their educational status in shown in table 5.12. It reveals that two third (66%) of the workers' educational status is primary and lower secondary level; only 5% workers' educational status is HSC and above (Figure 5.1).

Illiterate as well as HSC and above level education is found more among the workers of Khulna (8% and 12% respectively) division compared with Dhaka (1% for both) and Chittagong (3% and 10% respectively) division (Table 5.13 and figure 5.2).

Table 5.12: Distribution of workers by education

Level of Education	Percentage of worker
Illiterate	2
Signature	19
Primary	42
Lower secondary	24
SSC	8
HSC and above	5
N	259

Table 5.13: Division wise distribution of workers by education

Division / Level of Education	Dhaka (%)	Chittagong (%)	Khulna (%)
Illiterate	1	3	8
Signature	19	14	25
Primary	49	39	20
Lower secondary	24	26	23
SSC	7	9	12
HSC and above	1	10	12
N	149	70	40

It is found that workers of bidi factory, bricks and tiles factory, and rice milling factory are less educated compared with workers worked in newspaper and pharmaceuticals industries in Bangladesh.

Table 5.14: Factory category wise distribution of workers by education

Factory category / Level of Education	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory(%)	Spooling and thread balls (%)
Illiterate	0	0	0	11	11	0	0	0	11	0
Signature	13	21	8	39	39	0	17	0	56	17
Primary	57	42	39	44	29	0	56	6	33	50
Lower secondary	26	25	44	6	22	0	17	33	0	33
SSC	3	8	8	0	0	50	11	28	0	0
HSC and above	1	4	0	0	0	50	0	33	0	0
N	91	24	36	18	18	12	18	18	18	6

Lower secondary level education is the maximum level education among the workers of bricks factory and rice milling factory while for the workers of bidi factory it is primary level education. The workers of RMG and apparel industry have mainly primary and lower secondary education (Table 5.14).

It is needed to mention here that though the government of Bangladesh has taken various initiatives to ensure education for all citizens, the educational status of most of the workers of some factory categories like bricks, rice milling and bidies are very low.

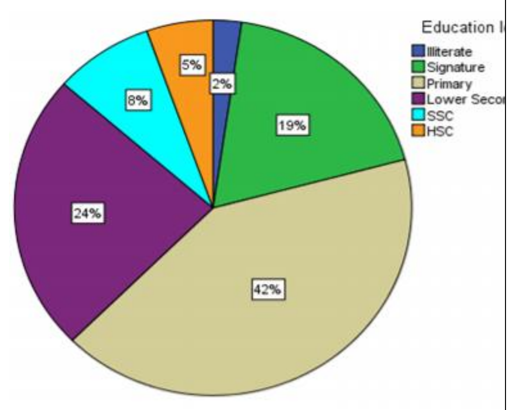


Figure 5.1: Distribution of workers by education level

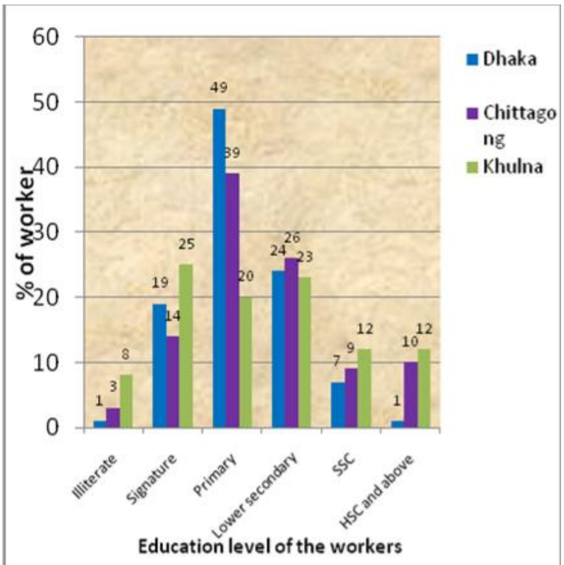


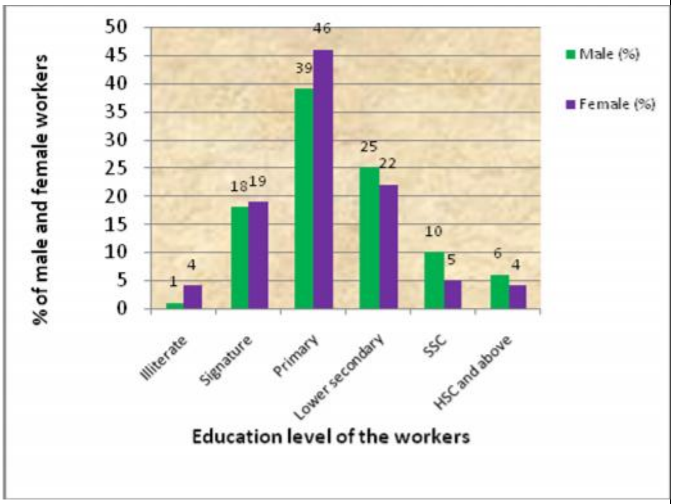
Figure 5.2: Division wise distribution of workers by education level

It is found that female workers have lower education than male workers. After the primary level education, the percentage of male workers is significantly higher than female workers (Table 5.15 and figure 5.6).

Table 5.15: Distribution of workers by gender wise education

Gender / Education	Male (%)	Female (%)
Illiterate	1	4
Signature	18	19
Primary	39	46
Lower secondary	25	22
SSC	10	5
HSC and above	6	4
N	159	100

Figure 5.3: Gender wise distribution of workers by education



BMI

Table 5.16 depicts the percentage distribution of SMIE workers by their BMI range. It informs that majority of the SMIE workers (80%) are in normal weight (BMI 18.5 to 24.9), severely underweight (BMI< 16.5) or obesity (BMI< 30 or above) is found among 1% workers only.

Overweight and obesity is evident among 29% of female workers and only 10% of male workers (Table 5.16).

It is found that workers of Chittagong (27%) and Khulna (20%) division are over weighted than the workers of Dhaka (10%) division (Table 5.17).

Considering categories of factory, it is evident that the workers of rice milling, RMG, cotton textile, and bricks factory were over weighted compared with the workers of other factories (Table 5.18).

Table 5.16: Distribution of workers by BMI

BMI \ Gender	Male (%)	Female (%)	Total (%)
less than 16.5	1	0	1
16.5 to 18.4	3	1	2
18.5 to 24.9	86	70	80
25 to 29.9	10	27	16
30 or greater	0	2	1
N	159	100	259

Table 5.17: Division wise distribution of workers by BMI

BMI \ Division	Dhaka (%)	Chittagong (%)	Khulna (%)
less than 16.5	1	0	0
16.5 to 18.4	3	3	0
18.5 to 24.9	85	70	80
25 to 29.9	10	27	20
30 or greater	1	0	0
N	149	70	40

Table 5.18: Factory category wise distribution of workers by BMI

BMI \ Factory category	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
less than 16.5	0	0	0	0	0	0	0	0	11	0
16.5 to 18.4	0	0	8	0	0	0	0	0	17	0
18.5 to 24.9	80	79	83	78	72	92	83	83	61	100
25 to 29.9	20	21	8	22	28	8	17	17	6	0
30 or greater	0	0	0	0	0	0	0	0	5	0
N	91	24	36	18	18	12	18	18	18	6

The following figure (Figure 5.4) indicates that female workers are more over weighted than the male workers.

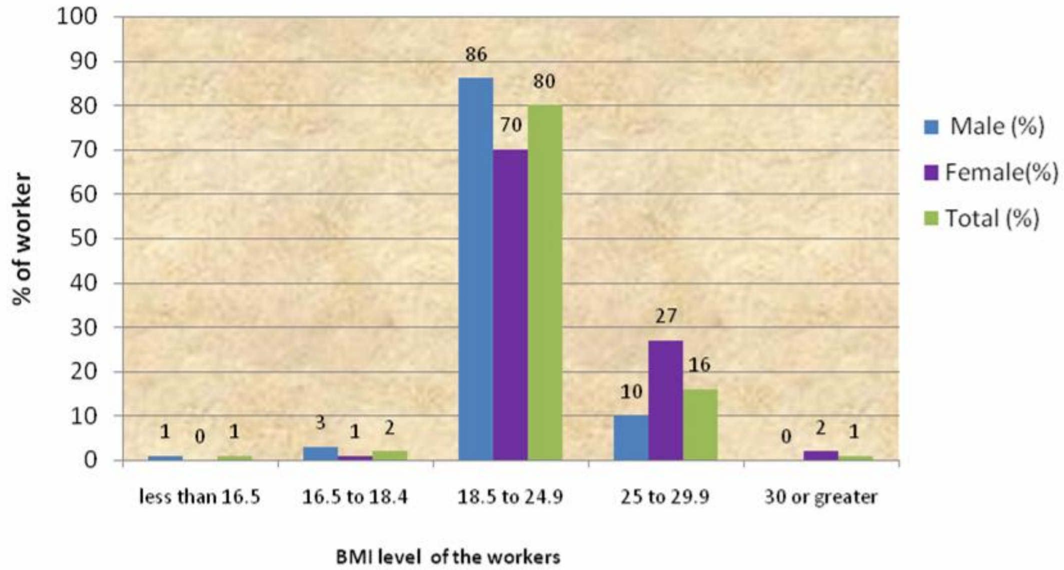


Figure 5.4: Distribution of workers by BMI

Working Tenure

The percentage distribution of SMIE workers' working tenure is given in table 5.19. It shows that about 60% SMIE workers working tenure in the same enterprise was up to 2 years and the rest of workers tenure was above 2 years. Working tenure more than 2 years in the same enterprise is evident more among the female (43%) workers than the male (39%) workers; among the workers of Dhaka (43%) division compared with Chittagong (40%) and Khulna (29%) division; and among the workers of bidi factory, rice milling, knitwear and RMG factory compared with other categories of factories (Table 5.20 and 5.21).

Table 5.19: Distribution of workers by working tenure in the factory

Tenure of work (Year)	Male (%)	Female (%)	Total (%)
Less than 1	16	14	15
1 to 2	45	43	45
Above 2	39	43	40
N	159	100	259

Table 5.20: Division wise distribution of workers by working tenure of the factory

Division / Work tenure (Yrs)	Dhaka (%)	Chittagong (%)	Khulna (%)
Less than 1	18	13	13
1 to 2	39	47	58
Above 2	43	40	29
N	149	70	400

Table 5.21: Factory category wise distribution of workers by working tenure of the factory

Factory category / Work Tenure (Yrs)	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Less than 1	14	13	22	0	22	8	22	0	22	50
1 to 2	42	46	33	67	28	58	44	67	22	50
Above 2	44	39	45	33	50	34	34	33	56	0
N	91	24	36	18	18	12	18	18	18	6

Previous Work Experience

Table 5.22 illustrates the percentage distribution of SMIE workers by their previous work experience. It is found that two third of the workers are working in the enterprise as a first job in the particular field. Female workers (42%) are more experienced than their male counterpart (30%). More work experience is found among the workers of Dhaka (37%) division compared with Chittagong (30%) and Khulna (33%) division. It is found more among the workers of RMG (51%) , pharmaceuticals (50%) and thread ball (50%) factory compared with other factory categories (Table 5.23 and 5.24).

Table 5.22 : Distribution of workers by work experience in any other enterprise

Work experience (Year)	Male (%)	Female (%)	Total (%)
Yes	30	42	34
No	70	58	66
N	159	100	259

Table 5.23 : Division wise distribution of workers by work experience in any other enterprise

Division / Work Experience (Yrs)	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes	37	30	33
No	63	70	67
N	149	70	40

Table 5.24: Factory category wise distribution of workers by work experience in any other enterprise

Factory category / Experience (Years)	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	51	21	31	17	17	50	22	22	22	50
No	49	79	69	83	83	50	78	78	78	50
N	91	24	36	18	18	12	18	18	18	6

Tenure of Previous Work Experience

The percentage distribution of SMIE workers' tenure of previous work experience is resented in table 5.25. It reveals that among the rest one third of workers (from table 5.22) who have work experience in other factory, majority (76%) of the worker's work experience is maximum 2 years. About one third (34%) of workers' work experience is more than 2 years. Male workers have more days of experience than he female workers (Table 5.25). It is found more among the workers of Dhaka division (29%) than the workers of Chittagong (10%) and Khulna (11%) division (Table 5.26).

Table 5.25 : Gender wise distribution of workers by tenure of work experience in other factory

Work experience (Year)	Male (%)	Female (%)	Total (%)
Up to 2	70	83	76
Above 2	30	17	24
N	159	100	259

Table 5.26 : Division wise distribution of workers by tenure of work experience in other factory

Division / Work Experience (Years)	Dhaka (%)	Chittagong (%)	Khulna (%)
Up to 2	69	90	89
Above 2	29	10	11
N	149	70	40

Majority of the workers of RMG, cotton textile, knitwear, and bricks factory have less work experience in other factory while the workers of rice milling, pharmaceuticals, and bakery products experienced more work days (Table 5.27).

Table 5.27: Factory category wise distribution of workers by tenure of work experience in other factory										
Factory Category / Experience (Years)	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Up to 2	80	75	91	100	33	50	50	75	67	76
Above 2	20	25	9	0	67	50	50	25	33	24
N	91	24	36	18	18	12	18	18	18	6

Source of Income

Service was identified as the main source of income for all SMIE workers (Appendix D, Table1).

5.3.1. Income Pattern of the SMIE Workers

5.3.1.1. Workers' Income (Based on workers' response)

By asking the worker the question "what is the amount of his or her monthly income", the data on monthly income was collected. Their answers are tabulated in table 5.28. It is found that monthly income of the SMIE workers varies from Tk 3500 to Tk 9500 and the monthly mean income is Tk 5451.

Table 5.28 : Distribution of monthly income of SMIE workers (Based on workers' response)					
	N	Minimum	Maximum	Mean	Std. Deviation
Monthly Income (TK)	259	3500	9500	5451.35	1308.776

It is prevalent slightly higher among male workers than the female workers but this difference is not statistically significant (Table 5.29). It is to some extent higher for the workers of Dhaka division (TK 5517) compared with the workers of Chittagong (TK 5369) and Khulna (TK 5352) division (Table 5.30).

Table 5.29: Gender wise distribution of monthly mean income of workers (Based on workers' response)

Gender	Monthly mean income (TK)	N
Male	5531	159
Female	5325	100
Mean difference	206	
P- value	0.746	

Table 5.30: Division wise distribution of monthly mean income of workers (Based on workers' response)

Division	Monthly mean income (TK)	N
Dhaka	5517	149
Chittagong	5369	70
Khulna	5352	40
Total	5451	259

Considering factory categories it is apparent that monthly mean income is the highest for the workers of pharmaceutical factory (Tk 7817) and the lowest for the bidi factory (TK 4072). I is found Tk 5495 for the workers RMG sector which contributes the lion share of our export earnings (Table 5.31).

Recently due to unrest and labor dispute in the RMG sector, Bangladesh Government raises the minimum wage level for the country's garment workers by 77 percent to 5,300 taka from the existing wage of Tk 3,000. Definitely, this increased wage rate with over time payment would increase the workers monthly income from the present level.

Table 5.31: Division and factory category wise distribution of monthly mean income of workers (Based on workers' response)

Factory category / Division	RMG	Cotton tex	Knit wear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread balls
Dhaka	5516	6000	5133	4800	4417	8450	5333	6333	4500	6333
Chittagong	5406	5541	5367	5117	4167	7500	4883	6917	3883	-
Khulna	-	-	5283	4667	5117	7500	4200	7583	3833	-
Total	5495	5771	5192	4861	4567	7817	4806	6944	4072	6333
N	91	24	36	18	18	12	18	18	18	6

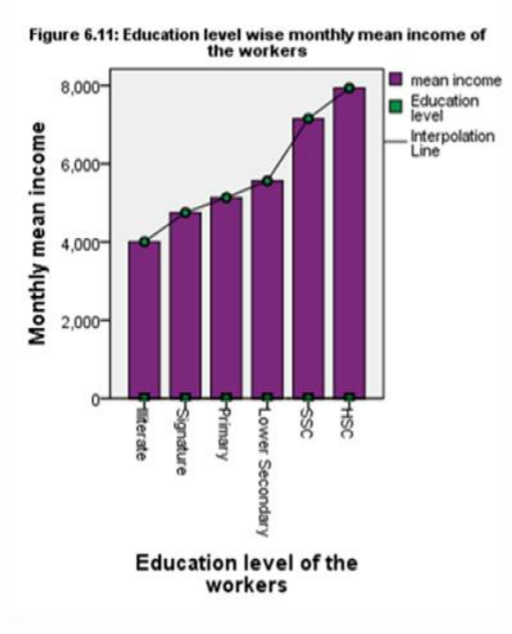
Considering both factory category and division, it is found that almost in all categories of factory, the monthly mean income is higher among the workers of Dhaka division than the workers of Chittagong and Khulna division except some factory categories like newspaper, and knitwear factory (Table 5.31).

It is interesting to mention here that there exists a significant positive association between education and income level of the workers; as the education level rises, the mean income of the workers rises (Table 5.32 and figure 5.5).

Table 5.32: Education level wise monthly mean income of workers (Based on workers' response)

Education level	Mean Income (Tk)	N
Illiterate	4000.00	6
Signature	4747.92	48
Primary	5131.48	108
Lower Secondary	5559.68	62
SSC	7147.62	21
HSC	7928.57	14
Total	5451.35	259

Figure 5.5: Education level wise monthly mean income of workers



5.3.1.2 Workers' income (from Managers' Response)

The owner or manager of each factory was asked to report their monthly total wage bill for workers and total number of workers. Based on this information, dividing monthly total wage bill by the total number of workers in that factory, average income (wage) per worker per month is estimated. The distribution of this estimation is shown in table 5.33.It reveals that monthly mean income (wage) of worker is Tk 5035. It is found slightly higher among the workers of Dhaka division (Tk 5203) and lower among the workers of Khulna (Tk 4682) division.

Table 5.33: Division wise distribution of monthly mean income of workers(from managers' response)

Division	Monthly mean income (TK)	N
Dhaka	5203	25
Chittagong	4891	12
Khulna	4682	7
Total	5035	44

In this respect, factory category wise variation is observed but this variation was not statistically significant (Table 5.34).

Table 5.34: Factory category wise distribution of monthly mean income of SMIE workers(from managers' response)

Factory category / Monthly Income	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Biri factory	Spooling and thread balls
Mean (Tk)	5062	5030	5291	5572	4646	4137	5332	4765	4832	5882
N	15	4	6	3	3	3	3	3	3	1

Hence, it is evident that there exists a gap (Tk 416) between the monthly mean wages reported by workers and managers of selected SMIEs in Bangladesh. But this gap is not statistically significant.

The following figure shows the monthly mean income of SMIE workers based on both workers and managers responses (Figure 5.6)

Figure 5.6: Monthly mean income of SMIE workers based on both workers and managers responses

5.4 Diseases Pattern of SMIE Workers in Bangladesh

5.4.1 Diseases Pattern of SMIE Workers Based on Workers' Response

This section examines the diseases pattern of the SMIE workers in Bangladesh using the study data.

Sufferings from Illness during the Last Six Months

The SMIE workers were asked whether they were suffered from illness during the last six months. Their responses are recorded in table 5.35. It appears that almost all workers (96%) stated that they suffered from illness during the last six months. It was slightly higher among the female workers than the male workers.

Suffering from illness were found more among the workers of Dhaka division (98%) compared with the workers of Chittagong (94 %) and Khulna (90%) division (Table 5.36).

Almost all workers reported to have suffered from any diseases during the last six months except the workers of pharmaceutical (83%) factory (Table 5.37).

Table 5.35: Gender wise distribution of workers by sufferings of illness during the last six months

Gender	% of workers' suffering from illness	N
Male	95	159
Female	96	100
Total	96	259

Table 5.36: Division wise distribution of workers by sufferings of illness during the last six months

Division	% of workers' suffering from illness	N
Dhaka	98	149
Chittagong	94	70
Khulna	90	40
Total	96	259

Table 5.37: Factory category wise distribution of workers by sufferings of illness in the last six months

Factory category / Workers' sufferings of illness	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	100	100	100	100	100	17	100	100	100	100
No	100	100	100	100	100	83	100	100	100	100
N	91	24	36	18	18	2	18	18	18	6

Diseases Suffered during last Six Months

The SMIE workers were asked about their diseases pattern. Their answers are tabulated in table 5.38.it is found that pain (28%), respiratory (22%) diseases (pneumonia, asthma, lung diseases, bronchitis etc), and other diseases (23%) like appendicitis, dengue fever, conjunctive, peptic ulcer, gynecological problem, gall bladder stone, viral fever, heart disease, blood pressure and small pox were found as predominant diseases among the SMIE workers during the last six months. About 5% workers suffered from Typhoid and Jaundice separately (Figure 5.7). Among the respiratory diseases, one fourth of the respondent suffered from occupational asthma. Within pain, one third of workers suffered from low back pain.

Female workers suffered more from almost all kinds of diseases except pain than the male workers (Table 5.39).

Though respiratory diseases, pain, anemia, and other diseases were found as major diseases among the workers in all three divisions, workers of Dhaka division suffered more from respiratory diseases, and the workers of Chittagong and Khulna division suffered more from pain compared with other divisions. . The prevalence of diarrhea was high among the workers of Chittagong division, and the prevalence of typhoid and jaundice found more among the workers of Dhaka division than the workers of other divisions.(Table 5.40 and figure 5.8).

Table 5.38 Distribution of workers' by diseases suffered during the last six months

Diseases	Percentage of worker (%)	Frequency* (N)
Respiratory diseases	22	138
Pain	28	173
Diarrhea	7	40
Anemia	10	58
Typhoid	5	32
Jaundice	5	32
Other disease	23	140
Total	100	613

*Multiple responses are given here

Figure 5.7: Distribution of workers' by diseases suffered during the last six months

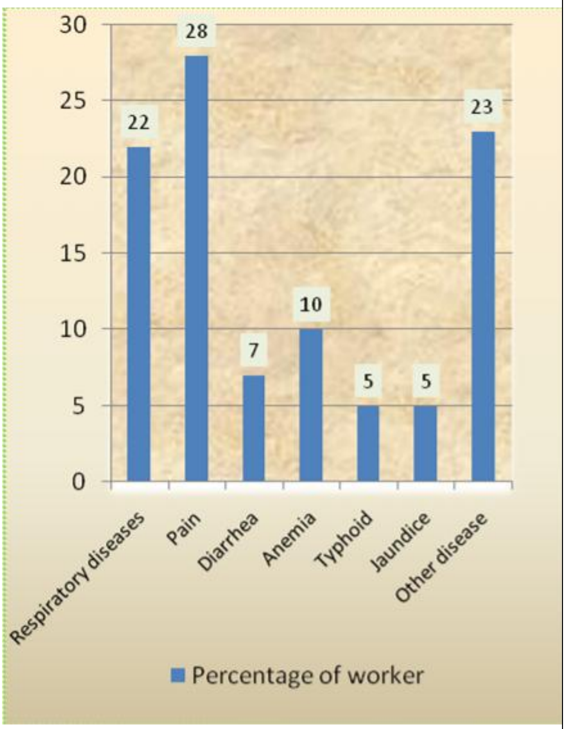


Table 5.39: Gender wise distribution of workers' by diseases suffered during the last six months

Sufferings from diseases	Male (%)	Female (%)	N
Respiratory	55	57	138
diseases	73	65	173
Pain	14	19	40
Diarrhea	23	24	58
Anemia	11	16	32
Typhoid	12	15	32
Jaundice	54	59	140
Other disease	5	7	12
N	153	96	249

Table 5.40: Division wise distribution of workers' by diseases suffered during the last six months

Sufferings from diseases	Dhaka (%)	Chittagong (%)	Khulna (%)	N
Respiratory	59	55	44	138
diseases	64	71	89	173
Pain	16	18	11	40
Diarrhea	20	32	22	58
Anemia	16	9	8	32
Typhoid	16	11	6	32
Jaundice	65	41	50	140
Other disease	8	7	7	12
N	147	66	36	613

Multiple responses are given here

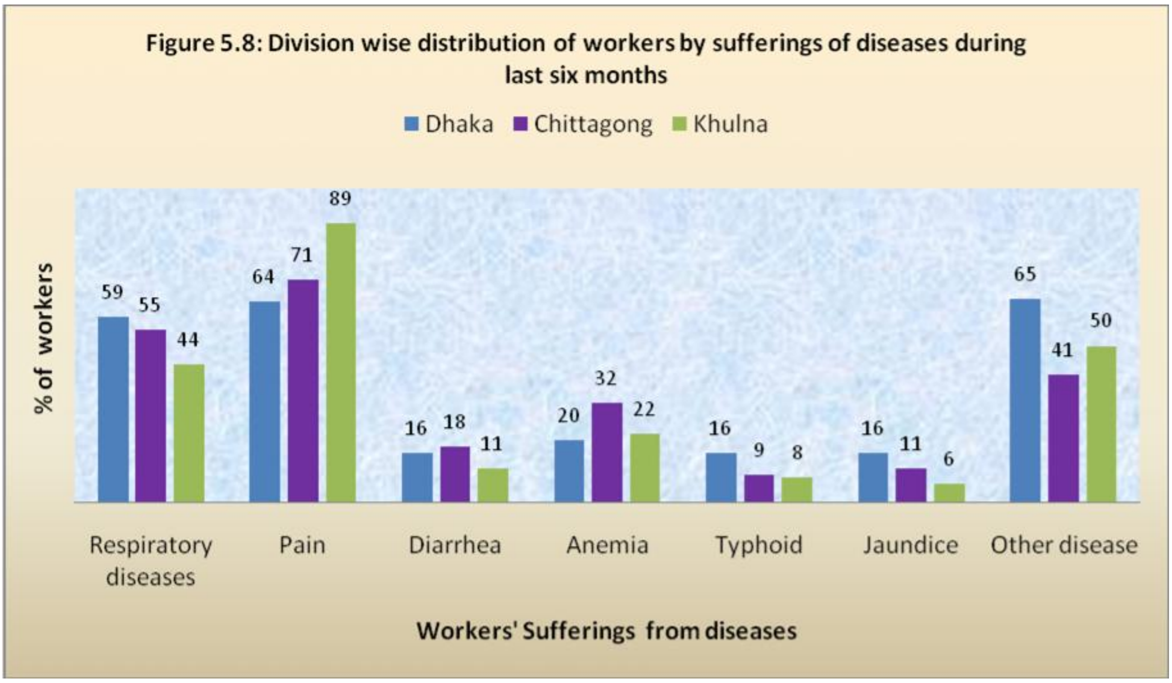


Figure 5.8: Division wise distribution of workers by sufferings of diseases during last six months

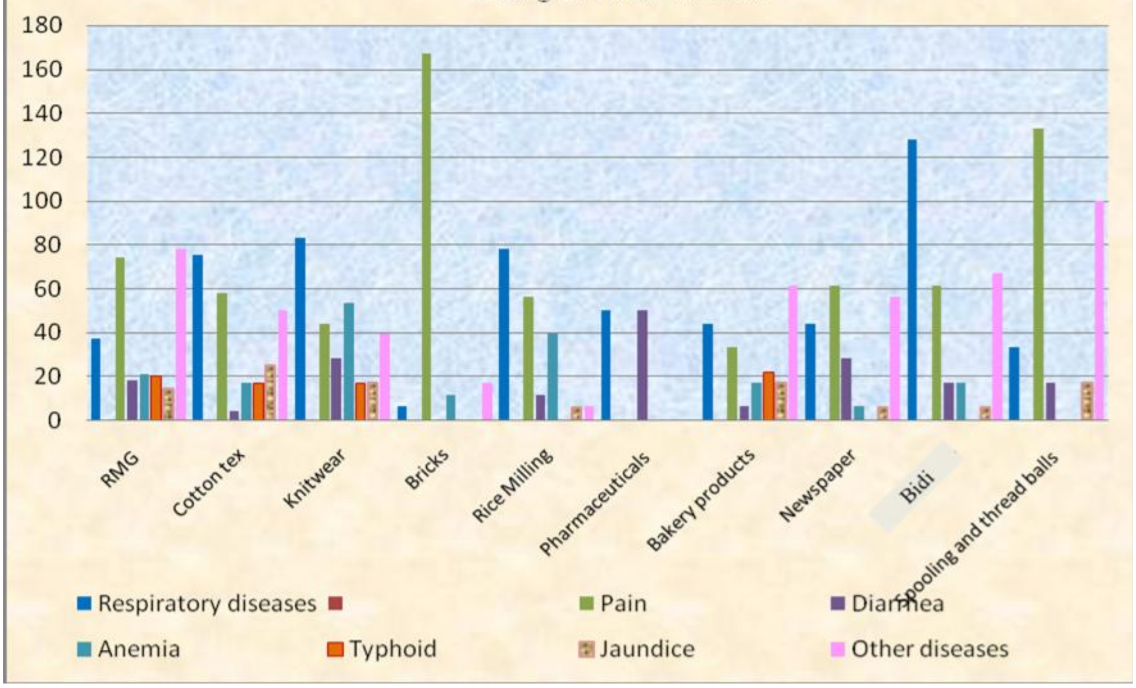
The workers of RMG, cotton textile, knitwear, and thread ball factory mainly suffered from different kinds of pain like back pain, joint pain; respiratory diseases like occupational asthma, bronchitis; anemia, jaundice, and other diseases like peptic ulcer, viral fever etc.

The workers of bidi and rice milling factory mostly suffered from respiratory diseases like asthma, and lung diseases (Table 5.41 and figure 5.9).

Table 5.41: Factory category wise distribution of workers' by diseases suffered during the last six months

Factory category / Diseases	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)	N
Respiratory diseases	37	75	83	6	78	50	44	44	89	33	138
Pain	74	58	44	93	56	0	33	61	61	63	173
Diarrhea	18	4	28	0	11	50	6	28	17	17	40
Anemia	21	17	53	11	39	0	17	6	17	0	58
Typhoid	20	17	17	0	0	0	22	0	0	0	32
Jaundice	14	25	17	0	6	0	17	6	6	17	32
Other diseases	78	50	39	17	6	0	61	56	67	100	140
N	91	24	36	18	18	2	18	18	18	6	613

Figure 5.9: Factory category wise distribution of workers by diseases suffered during the last six months



Continuous sitting, noise from machineries, inadequate ventilation, and nutrition deficiency are responsible for the diseases faced by the workers in the RMG and apparel industry. The bad smell of tobacco in the bidi factory, and entry of rodents, birds, or pests, improper disposal of solid wastes, particularly unused rice husk and bran in the rice milling factory are responsible for the respiratory diseases. Due to hyzine and environment friendly working conditions, the workers of pharmaceuticals factory didn't suffer from any noticeable diseases.

Sufferings from Diseases in the Last Month

The SMIE workers were asked whether they were suffered from illness during the last month. Their answers are recorded in table 5.42. It reveals that a vast majority of the workers (95%) stated that they suffered from diseases in the last month Suffering from illness was found less among the workers of Khulna division (88%) compared with the workers of Dhaka (96%) and Khulna (97%) division (Table 5.43). Almost all workers in all factory categories except pharmaceuticals suffered from any disease during the last month (Table 5.44).

The pattern of sufferings from diseases among the workers in the last month was similar with the pattern of sufferings during the last six months. The reason behind this is that the workers of different factory category suffered from distinct diseases, time period was not found as a considerable issue.

Table 5.42: Gender wise distribution of workers by sufferings of illness during the last month

Sufferings from illness	Male (%)	Female (%)	Total (%)
Yes	95	95	95
No	5	5	5
N	159	100	259

Table 5.43: Division wise distribution of workers by sufferings of illness in the last month

Sufferings from illness	Dhaka	Chittagong	Khulna
Yes	96	97	88
No	4	3	12
N	149	70	40

Table 5.44: Factory category distribution of workers by sufferings of illness during the last month

Factory Category / Sufferings of illness	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	99	100	100	100	95	33	100	89	94	100
No	1	0	0	0	5	67	0	11	6	0
N	91	24	36	18	18	2	18	18	18	6

Diseases Suffered in the Last Month

The workers were asked about their disease pattern during the last month. Their responses are tabulated in table 5.45. The majority of the workers stated that they mainly suffered from pain, respiratory diseases and other diseases like peptic ulcer, fever etc. Male workers suffered more from respiratory diseases and pain than the female workers whereas the female workers suffered more from anemia, typhoid and jaundice compared with male workers.

Pain was found as predominant disease among the workers of Khulna division, respiratory disease was found as major disease among the workers of Chittagong division, and typhoid was found more among the workers of Dhaka division than the workers of other divisions. (Table 5.46).

It is remarkable that typhoid, jaundice, anemia and different types of pain were the major diseases suffered by RMG and apparel factory's workers. Workers of bricks factory mainly suffered from different types of pain from leg injury, hand injury etc. Workers of bidi factory mostly suffered from respiratory diseases (Table 5.47 and figure 5.10).

Table 5.45: Gender wise distribution of workers by diseases suffered in the last month

Sufferings from diseases	Male (%)	Female (%)	N
Respiratory	63	52	123
diseases	60	47	145
Pain	15	20	25
Diarrhea	14	25	35
Anemia	7	13	23
Typhoid	5	18	25
Jaundice	35	45	45
Other disease			
N	153	93	421

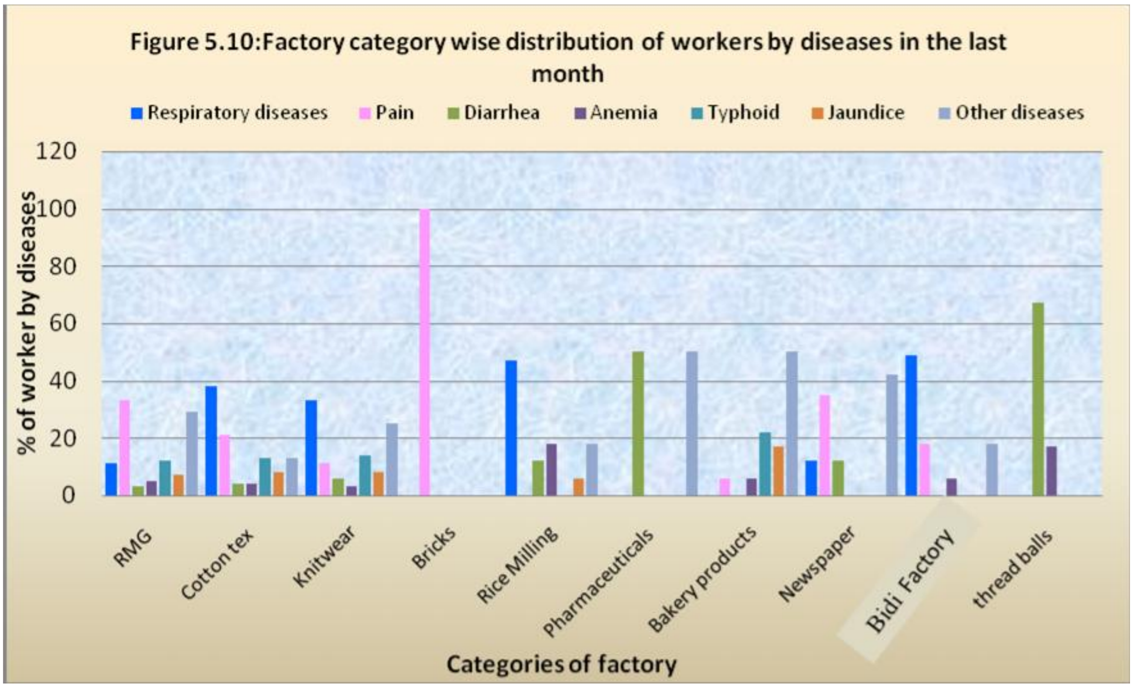
Table 5.46: Division wise distribution of workers by diseases suffered in the last month

Sufferings from diseases	Dhaka (%)	Chittagong (%)	Khulna (%)	N
Respiratory diseases	35	64	55	123
Pain	55	48	62	145
Diarrhea	14	18	13	25
Anemia	5	5	8	35
Typhoid	11	8	8	23
Jaundice	7	8	2	25
Other disease	46	41	48	45
N	143	67	36	421

Multiple responses are given here

Table 5.47: Factory category wise distribution of workers' by diseases during the last six months											
Factory category / Diseases	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)	N
Respiratory diseases	11	38	33	0	47	0	0	12	49	0	123
Pain	33	21	11	100	0	0	6	35	18	0	145
Diarrhea	3	4	6	0	12	50	0	12	0	67	25
Anemia	5	4	3	0	18	0	6	0	6	17	35
Typhoid	12	13	14	0	0	0	22	0	0	0	23
Jaundice	7	8	8	0	6	0	17	0	0	0	25
Other diseases	29	13	25	0	18	50	50	42	18	0	45
N	90	24	36	18	17	3	18	17	17	6	421

Multiple responses are given here



Days of Suffering

The SMIE workers were asked about their days of sufferings during the last month. Their responses are recorded in table 5.48. It shows that the mean days of sufferings from illness during the last month were found 2.9 days among the majority of the workers in all categories of factories and in all divisions.

It was found more among the female workers than the male workers (Table 5.48 and figure 5.11). 3 days suffering from illness was found among the 44% workers of Dhaka division, and 2 days was found among the 33% and 44% workers of Chittagong and Khulna division respectively (Table 5.49 and figure 5.12).

Table 5.48: Gender wise distribution of workers by days of sufferings due to illness during the last month

Days of sufferings from illness	Male	Female	Total
1	16	4	11
2	37	29	34
3	32	45	37
4	0	1	0
5	13	15	14
7	3	5	4
Mean days of suffering	2.7	3.2	2.9
N	153	93	246

Table 5.49: Division wise distribution of workers by days of sufferings due to illness during the last month

Days of sufferings from illness	Dhaka (%)	Chittagong (%)	Khulna (%)
1	5	15	31
2	32	33	44
3	44	31	19
4	0	0	0
5	13	18	6
7	6	3	0
Mean days of suffering	3	2.8	2
N	143	67	36

About one fourth of workers of RMG and apparel industry, and bakery product factory suffered from 5 days or more in the last month (Table 5.50).

Mean days of sufferings were found higher among the workers of RMG, cotton textile and knitwear, and lower in the pharmaceutical industry.

Table 5.50: Factory category wise distribution of workers by days of sufferings due to illness in the last month

Factory Category / Days of Sufferings	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
1	2	0	0	0	18	0	28	77	53	17
2	21	25	25	78	59	100	28	23	23	66
3	51	50	55	17	18	0	17	0	18	17
4	1	0	0	0	0	0	0	0	0	0
5	15	25	19	6	6	0	22	0	6	0
7	10	0	0	0	0	0	6	0	0	0
Mean days of suffering	3.5	3.2	3.1	2.3	2.1	1	2.8	1.2	2.1	2
N	90	24	36	18	17	3	18	17	17	6

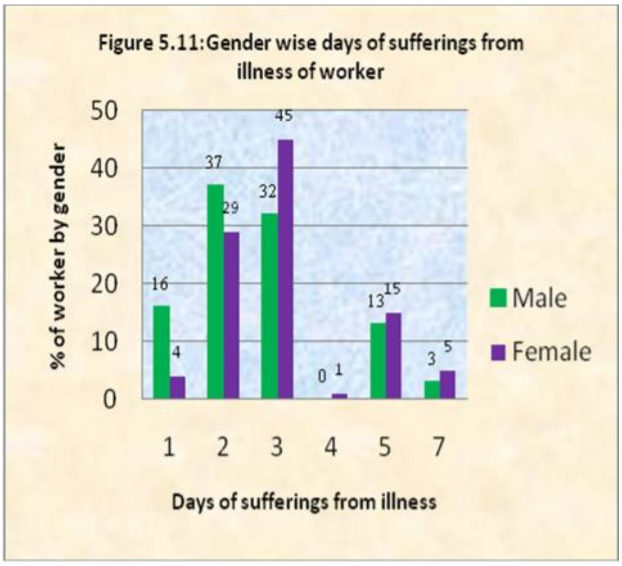


Figure 5.11:Gender wise days of sufferings from illness of worker

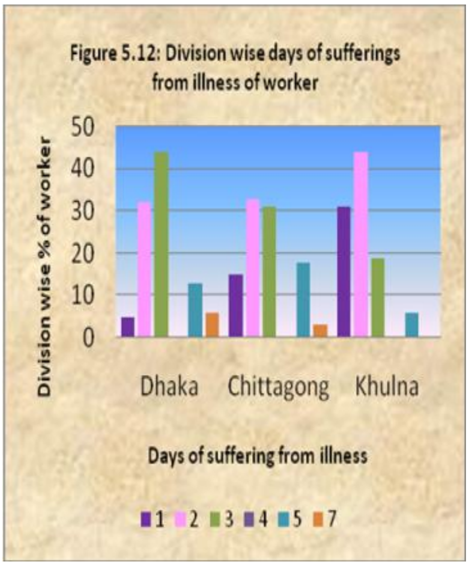


Figure 5.12: Division wise days of sufferings from illness of worker

5.4.2 Diseases Pattern of SMIE Workers Based on Managers' Response

We asked one owner/manager from each factory i.e.44 owners/ managers about the disease pattern of the workers of his factory. Their answers are tabulated in table 5.51. Based on this information we have examined the disease pattern of SMIE workers in Bangladesh.

It is found that allergic rhinitis, fever, diarrhea, headache and peptic ulcer were identified as major diseases suffered from the SMIE workers. Most of the SMIE managers reported that fever was found as leading disease among the workers of Dhaka and Khulna divisions whereas in Chittagong division it was found as allergic rhinitis (Table 5.51).

Based on mangers' report it is apparent that fever was found as major disease among the workers of bricks, bakery products, spooling and thread ball, and newspaper factories; asthma was identified as predominant disease among the workers of bidi, knitwear, RMG, and spooling of thread ball factories; and allergic rhinitis was found as leading disease among the workers of cotton textile factories (Table 5.52).

Table 5.51: Distribution of workers by division wise disease pattern from managers' response

Sufferings from diseases	Dhaka (%)	Chittagong (%)	Khulna (%)	Total (%)	N
Asthma	20	24	13	8	12
Cold/Allergic rhinitis	50	48	24	23	25
Diarrhea/Dysentery	14	18	8	25	15
Fever	75	35	48	45	30
Peptic ulcer	11	8	28	13	10
Headache	15	8	2	25	15
Other disease (pain, typhoid, jaundice etc)	26	21	32	24	25
N	53	43	32	132	132

Multiple responses are presented here

Based on both workers and managers responses it can be concluded that the workers of SMIEs are mainly suffered from occupational asthma, allergic rhinitis, fever, injury, typhoid, jaundice and diarrhea diseases.

Table 5.52: Factory category wise distribution of workers by diseases pattern from managers' response

Factory category / Diseases	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)	N
Asthma	35	22	32	0	56	0	0	0	76	35	12
Cold/Allergic rhinitis	24	46	33	0	34	0	0	0	0	0	25
Diarrhea/Dysentery	8	12	3	0	3	2	0	0	0	0	15
Fever	26	25	23	35	5	0	65	100	0	66	30
Peptic ulcer	5	0	0		0	0	0	0	0	0	10
Headache	10	2	0	0	0	0	13	0	0	0	15
Other diseases(pain, typhoid, injury,jaundice etc)	14	1	0	25	2	0	6	0	12	0	25
N	65	16	16	8	6	3	8	5	3	2	132

Multiple responses are presented here

5.5 Health Care Seeking Behavior of the SMIE Workers

This section examines the health care seeking behavior of the SMIE workers in Bangladesh based on study data.

Health Care Seeking Behavior

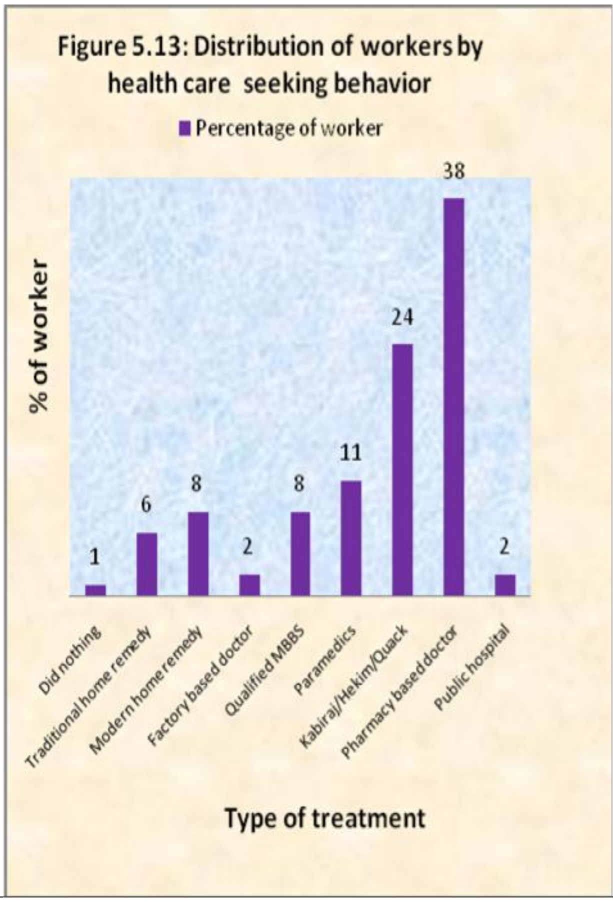
The information on health care seeking behavior of workers was collected by asking the workers the question "what did he do for treatment for illness during last month". Their responses are tabulated in table 5.53. It reveals that pharmacy based doctor, kabiraj/hekim/Quack and paramedics were identified as leading sources of treatment as reported by 38%, 24% and 11% of workers respectively. Other sources of treatment included qualified MBBS (private doctor), factory based doctor and public hospitals which were sought by 8% and 2% of workers respectively. About 15% workers did not seek any treatment when they became ill. Among this 15%, 8% workers took modern home remedy, 6% took traditional home remedy and 1% took nothing.

It is remarkable to mention here that only 2% of workers took treatment from public facilities though the Government of Bangladesh takes various initiatives to cover all people under public health facilities. (Table 5.53 and figure 5.13).

Table 5.53: Distribution of workers by health care seeking behavior during the last month

Type of treatment	Percent age of worker (%)	N
Did nothing	1	3
Traditional home remedy	6	23
Modern home remedy	8	34
Factory based doctor	2	11
Qualified MBBS	8	33
Paramedics	11	47
Kabiraj/Hekim/Quack	24	100
Pharmacy based doctor	38	155
Public hospital	2	8
Total	100	414

Multiple responses are presented here



No significant variation in health care seeking behavior among male and female workers was observed though female workers were more likely to seek healthcare than the male workers when they became. Two third and around 40-42 % of both male and female workers seek treatment from pharmacy based doctor and kabiraj/hekim/quack respectively (Table 5.54 and figure 5.14).

Table 5.54: Gender wise distribution of workers by health care seeking behavior

Type of treatment	Male (%)	Female (%)
Did nothing	1	1
Traditional home remedy	13	3
Modern home remedy	17	9
Factory based doctor	3	6
Qualified MBBS	11	12
Paramedics	18	20
Kabiraj/Hekim/Quack	40	42
Pharmacy based doctor	64	67
Public hospital	2	4
N	153	93

Table 5.55: Division wise distribution of workers by health care seeking behavior

Type of treatment	Dhaka (%)	Chittagong (%)	Khulna (%)
Did nothing	1	1	0
Traditional home remedy	12	3	11
Modern home remedy	15	14	6
Factory based doctor	7	0	3
Qualified MBBS	13	13	13
Paramedics	18	16	34
Kabiraj/Hekim/Quack	35	55	35
Pharmacy based doctor	57	71	7
Public hospital	4	1	3
Total	143	67	36

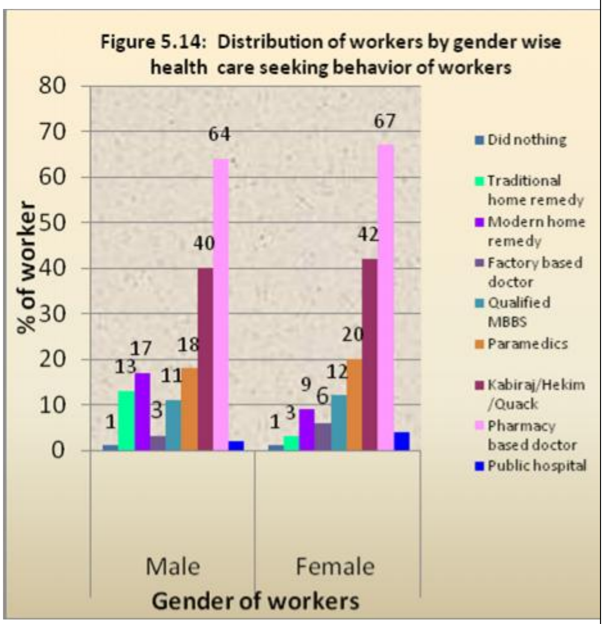


Figure 5.14: Distribution of workers by gender wise health care seeking behavior of workers

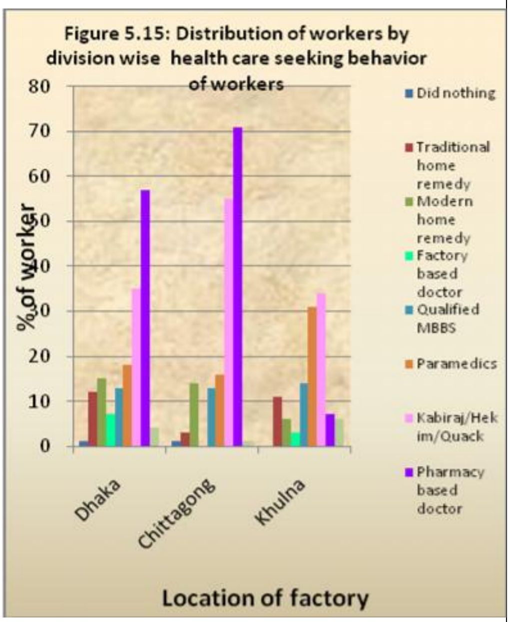


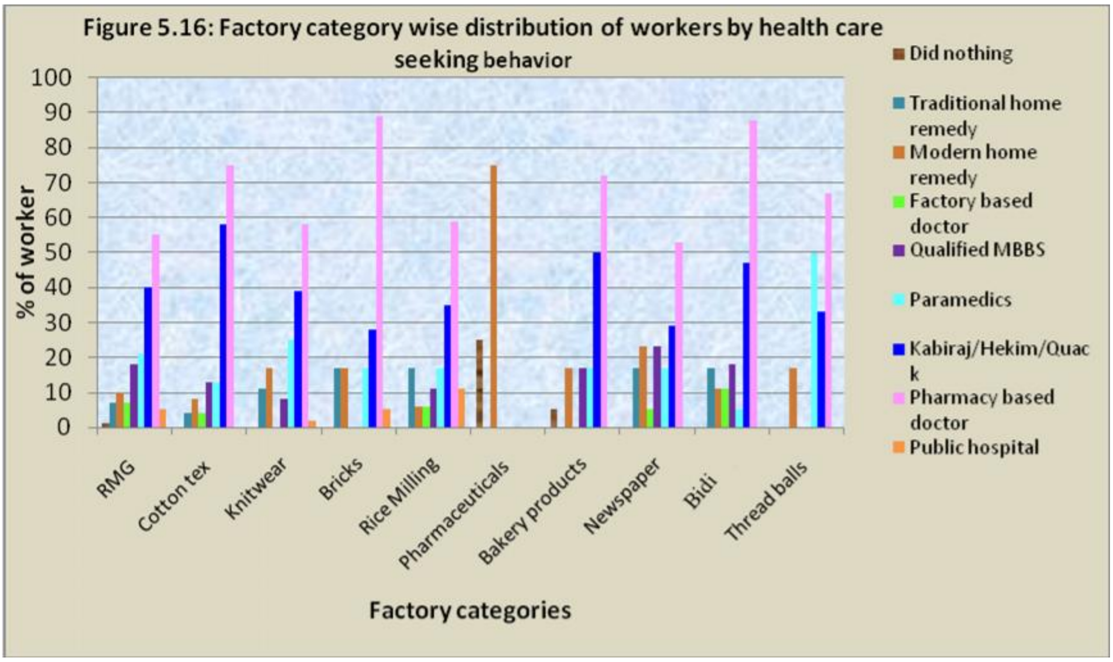
Figure 5.15: Distribution of workers by division wise health care seeking behavior of workers

Most of the workers in Dhaka and Chittagong took treatment from pharmacy based doctor and kabiraj/quack. But the workers of Khulna division took treatment mostly from kabiraj/ quack (35%), and paramedics (34%). ((Table 5.55 and figure 5.15).

Almost in all categories of factory except pharmaceuticals majority of the workers mainly received treatment due to illness from pharmacy based doctor. Kabbiraj/Hekim/Quack was found as the second major source of treatment for all categories of factory except pharmaceuticals. A significant number of workers (around 20%) in almost all factory categories visited paramedics when they became ill. It is necessary to mention that only a few percentage (less than 10%) of workers received treatment from public health facilities though the government of Bangladesh has taken various initiatives to ensure health facilities to all citizens (Table 5.56 and figure 5.16).

Table 5.56: Factory category wise distribution of workers by health care seeking behavior due to illness during the last month

Factory category / Source of treatment	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Did nothing	1	0	0	0	0	25	5	0	0	0
Traditional home remedy	7	4	11	17	17	0	0	17	17	0
Modern home remedy	10	8	17	17	6	75	17	23	11	17
Factory based doctor	7	4	0	0	6	0	0	5	11	0
Qualified MBBS	18	13	8	0	11	0	11	20	11	0
Paramedics	21	13	25	17	17	0	17	17	25	50
Kabiraj/ Hekim/Quack	40	58	39	28	35	0	50	29	47	33
Pharmacy based doctor	55	75	58	89	59	0	72	53	88	67
Public hospital	5	0	2	5	8	0	0	0	0	0
N	90	24	36	18	17	3	18	17	17	6



There is a strong positive association between education level and the source of treatment due to illness of the SMIE workers. As the education level rises, the workers seek of treatment diverts from pharmacy based doctor, kabiraj/quack, and paramedics to qualified MBBS, and public health facilities (Table 5.57).

Table 5.57: Distribution of workers by education level wise health care seeking behavior due to illness

Type of treatment	Illiterate (%)	Signature (%)	Primary education (%)	Lower secondary (%)	SSC (%)	HSC and Above (%)
Did nothing	0	0	2	0	0	10
Traditional home remedy	0	12	9	11	0	0
Modern home remedy	16	8	13	16	19	20
Factory based doctor	0	10	4	2	6	0
Qualified MBBS	16	15	8	11	35	40
Paramedics	16	13	24	23	6	0
Kabiraj/Hekim/Quack	33	53	43	34	15	10
Pharmacy based doctor	83	73	67	53	46	40
Public hospital	2	4	2	6	10	12
N	6	47	106	61	16	10

Number of visits to Doctor for Treatment

The distribution of workers by number of visits to doctor for treatment during the last month is given in table 5.58. About half of workers visited doctor once in a month, one third workers visited twice in a month, 11% workers did not visited doctor when they became ill.

No significant regional variation was found regarding number of visiting doctor when the workers became ill (Table 5.59). Most of the workers of all factory categories except the pharmaceutical industry visited doctor once in a month; only a few of them did it three or four times in a month. Factory category wise no considerable variation in times of visiting doctor was found (Table 5.60).

Table 5.58: Distribution of workers by number of visits to doctor for treatment during illness in the last month

Number of visit to doctor due to illness	Percentage of worker (%)
0	11
1	51
2	37
3	1
4	0
N	246

Table 5.59: Division wise distribution of by number of visits to doctor for treatment during illness in the last month

Number of visits to doctor due to illness	Dhaka (%)	Chittagong (%)	Khulna (%)
0	1	4	6
1	65	58	57
2	32	37	36
3	2	1	1
4	0	0	0
N	143	67	36

Table 5.60: Factory category wise distribution of workers by number of visits to doctor for treatment during illness in the last month

Factory Category / Number of visit to doctor	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
0	8	10	7	12	10	99	10	48	10	11
1	51	53	58	48	64	1	65	52	74	78
2	25	32	32	38	25	0	23	0	16	10
3	13	3	3	2	1	0	1	0	0	1
4	1	2	0	0	0	0	1	0	1	0
N	90	24	36	18	17	3	18	17	17	6

Expenses for Treatment

By asking the workers the question "what were his total expenses for treatment by heads in the last month" we had collected data on expenses for treatment. Their responses are recorded in table 5.61. Based on this information monthly mean expenses for treatment of the SMIE worker is estimated Tk 528 per worker. It is estimated higher for female (TK 561) workers than the male (TK 508) workers.Monthly mean expenses for treatment is found higher for the workers of Dhaka division (TK 638) than the workers of Khulna (TK 413) and Chittagong (Tk 362) division (Table 5.62 and figure 5.17).

Considering categories of factory, RMG, knitwear, and thread ball factories workers had higher monthly mean expenses for treatment than that of other factory categories. The amount was negligible for the workers of pharmaceutical factory because they suffer least from illness (Table 5.63and figure 5.18).

Table 5.61: Gender wise distribution of monthly mean expenses for treatment of workers

Gender	Monthly mean expenses for treatment (Tk)	N
Male	508	153
Female	561	93
Total	528	246

Table 5.62: Division wise distribution of monthly mean expenses for treatment

Division	Monthly mean expenses for treatment (Tk)	N
Dhaka	638	143
Chittagong	362	67
Khulna	413	36

Table 5.63: Factory category wise distribution of monthly mean expenses for treatment

Factory Category	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread balls
Mean Expenses for treatment (TK)	599	444	768	314	397	11	516	432	403	733
N	90	24	36	18	17	3	18	17	17	6

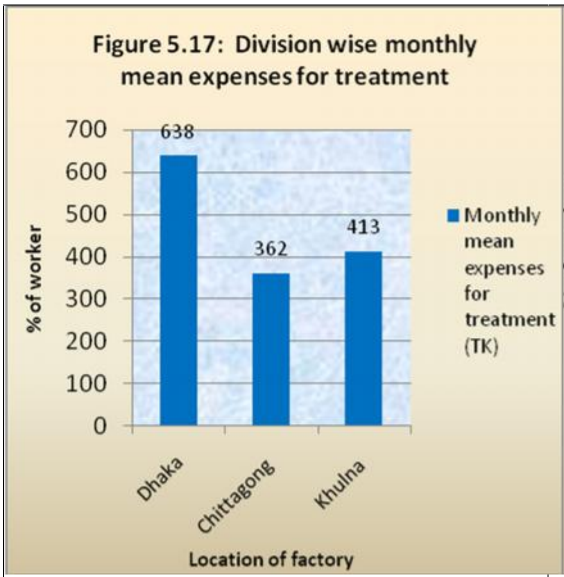


Figure 5.17: Division wise monthly mean expenses for treatment

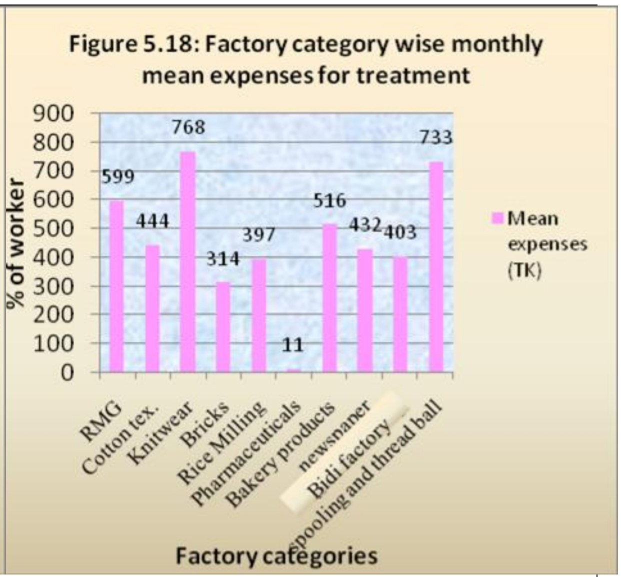


Figure 5.18: Factory category wise monthly mean expenses for treatment

Heads of Expenses for Treatment

The workers were asked about their heads of expenses for treatment. Their answers are given in table 5.64. Majority of the workers reported that their monthly doctor's fee, diagnosis and medicine cost, transportation cost, and others cost were less than Tk 200. Expense Tk 500 and above as doctors' fee, and diagnosis and medicine costs were stated by 6% and 15% workers respectively.

Table 5.64: Distribution of workers by heads of expenses for treatment

Heads of expenses for treatment	Less than Tk 50	Tk (50 to 200)	Tk (201 to 300)	Tk (301 to 500)	Tk 500+	N
Doctors' fee	20	49	16	9	6	259
Diagnosis and medicine cost	12	38	15	20	15	259
Transportation cost	92	7	0	1	0	259
Others cost	95	5	0	0	0	259

The mean expenses for doctor's fee, diagnosis and medicine cost, transportation cost, and other costs was found Tk 177, 327, 16, and 8 respectively . It is found that the mean heads of expenses for treatment were higher for the workers of Dhaka division compared with the workers of Chittagong and Khulna division (Table 5.65).

Table 5.65: Division wise distribution of mean heads of expenses for treatment

Mean heads of expenses for treatment	Dhaka	Chittagong	Khulna	Total
Doctor's fee(Tk)	198	142	160	177
Diagnosis and medicine cost (Tk)	408	206	236	327
transportation cost(Tk)	22	8	8	16
other costs(Tk)	9	5	8	8
N	159	70	40	259

Table 5.66: Factory category wise mean heads of expenses for treatment

Mean heads of expenses for treatment (TK)	RMG	Cotton tex	Knit wear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread
Doctor's fee (Tk)	202	190	251	114	129	0	172	150	137	216
Diagnosis and medicine cost(Tk)	364	335	487	190	260	11	312	261	256	448
Transportation cost(Tk)	16	11	30	8	8	0	18	6	6	68
Other costs(Tk)	16	8	1	2	0	0	12	14	4	0
N	91	24	36	18	18	12	18	18	18	6

Mean doctor's fee and diagnosis and medicine costs were higher for the workers of RMG, cotton textile, knitwear, bakery products and thread ball factory than the workers of other factories; transportation cost and other expenses were almost same for all categories of factory (Table 5.66).

It is evident that the SMIE workers spent most part of the treatment expenses for diagnosis and medicine (62%), and doctor's fee (34%). Doctor's fee was comparatively lower but diagnosis and medicine cost, and transportation cost were higher for the workers of Dhaka division than the workers of Chittagong and Khulna division (Table 5.67 and figure 5.19, 5.20).

Table 5.67: Division wise heads of treatment expense as a percentage of total expenses

Heads of expenses for treatment	Dhaka	Chittagong	Khulna	Total
Doctor's fee (%)	31	39	39	34
Diagnosis and medicine cost (%)	64	57	57	62
Transportation cost (%)	3	2	2	3
Other costs (%)	1	1	1	1
N	159	70	40	259

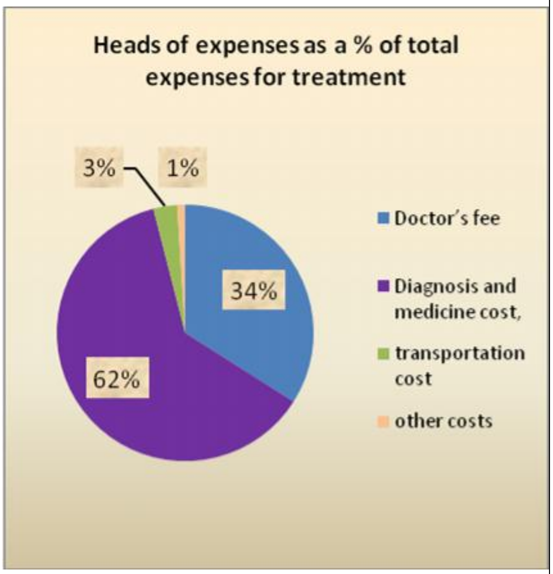


Figure 5.19: Heads of expenses as a percentage of total expenses for treatment

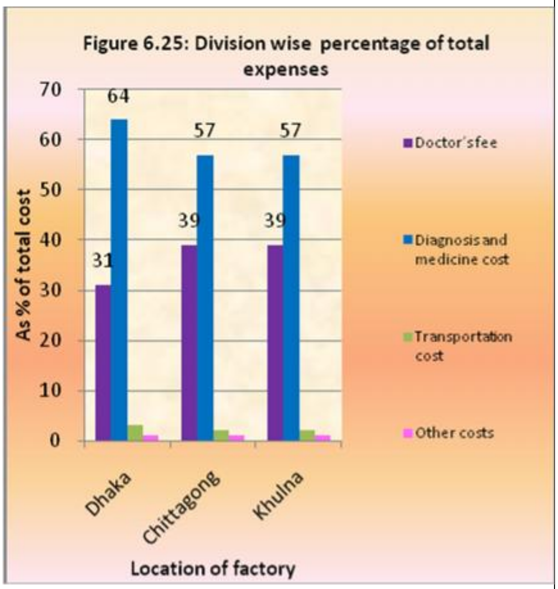


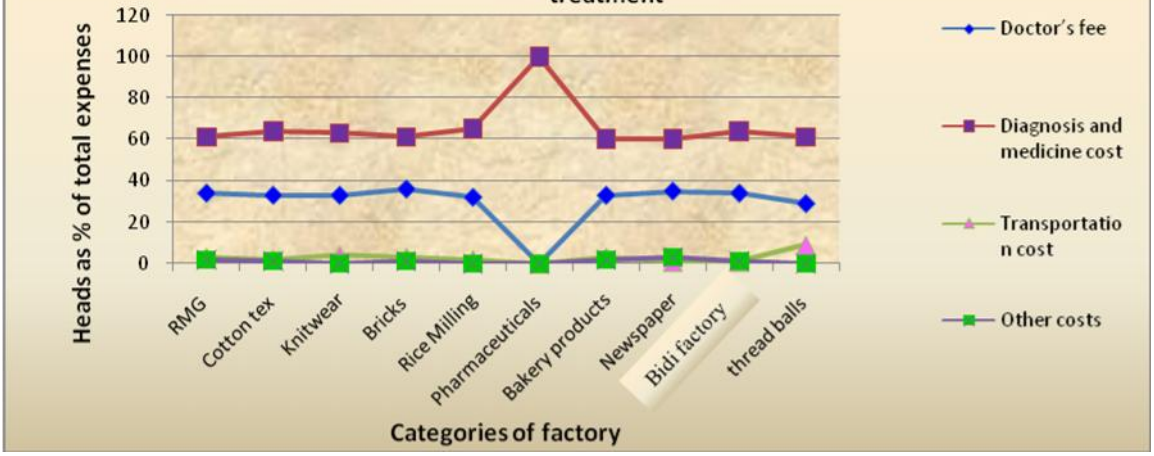
Figure 5.20: division wise heads of expenses as a percentage of total expenses for treatment

In view of factory categories it is found that in all factory categories except pharmaceuticals, workers spent around two third of treatment expenses for diagnosis and medicine, and one third for doctor's fee. Transportation cost and other costs of treatment were very negligible amount for the workers of all factory categories (Table 5.68 and figure 5.21).

Table 5.68: Factory category wise heads of expenses as a percentage of total expenses for treatment

Heads as percentage of total expenses for treatment	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factorye	Spooling and thread balls
Doctor's fee (%)	34	33	33	36	32	0	33	35	34	29
Diagnosis and medicine cost (%)	61	64	63	61	65	100	60	60	64	61
Transportation cost (%)	3	2	4	3	2	0	3	1	1	9
Other costs (%)	2	1	0	1	0	0	2	3	1	0
N	91	24	36	18	18	12	18	18	18	6

Figure 5.21: Factory category wise heads of expenses as % ot total expenses for treatment



Sharing of Treatment Expenses

The workers were asked whether or not their organization bear any treatment expenses. Their responses are tabulated in table 5.69. It reveals that almost all workers (97%) reported that their organization did not bear any treatment expense. If for someone they shared expenses, the amount was very small. No considerable regional or factory category wise variation was observed in this respect (Table 5. 69 and 5.70).

Table 5.69: Division wise distribution of workers by expense sharing of organization

Division	Yes (%)	No (%)	N
Dhaka	4	96	149
Chittagong	2	98	70
Khulna	2	98	40
Total	3	97	259

Table 5.70: Factory category wise distribution of workers by expense sharing of organization

Factory category / Expense sharing	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	3	0	8	5	0	98	5	0	0	4
No	97	100	92	95	100	2	95	100	100	96
N	91	24	36	18	18	2	18	18	18	6

Source of Treatment Expenses

The workers were asked about their sources of treatment. Their answers are tabulated in table 5.71. It is found that most of the SMIE workers (88%) managed treatment expenditure from their personal savings. About 10% of workers did it by taking loan. The similar scenario was observed for the workers of all divisions and all factory categories (Table 5.72 and 5.73).

Table 5.71 Distribution of workers by source of expenses for treatment

Ways to bear expenses for treatment	Percentage of worker (%)
Taking loan	10
Selling land	1
Personal savings	88
Others	1
N	259

Table 5.72: Division wise distribution of workers by source of expenses for treatment

Ways to bear expenses for treatment	Dhaka (%)	Chittagong (%)	Khulna (%)
Taking loan	13	11	0
Selling land	1	0	0
Personal savings	85	87	100
Others	1	2	0
N	149	70	40

Table 5.73: Factory category wise distribution of workers by source of expenses for treatment

Factory Category / Source of expense	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Taking loan	16	8	16	0	0	0	0	24	0	11
Selling land	1	0	0	0	0	0	0	0	0	0
Personal savings	83	92	81	100	94	100	100	77	100	88
Others	0	0	3	0	6	0	0		0	1
N	91	24	36	18	18	2	18	18	18	6

Affects of Treatment Expenses on other Expenses

The workers were asked whether or not their treatment expense affect other expenses. Their responses are recorded in table 5.74. It appears that nearly all workers (99%) reported that the treatment expenditure affected family's other expenditure such as on food, clothing, children's education, expenditure of next month's etc. The same situation was observed among the workers of all divisions and in all categories of factories (Table 5.75 and 5.76).

Table 5.74: Distribution of workers by how treatment expenses affect other expenditure

Affecting other expenditure	Percentage of worker (%)
Yes	99
No	1
N	259

Table 5.75: Division wise distribution of workers by how treatment expenses affect other expenditure

Affecting other expenditure	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes	98	99	99
No	2	1	1
N	149	70	40

Table 5.76: Factory category wise distribution of workers by how treatment expenses affect other expenditure

Factory Category / Affect other expenditure	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	99	100	100	100	100	0	100	98	100	99
No	1	0	0	0	0	100	0	0	0	1
N	91	24	36	18	18	2	18	2	18	6

Illness of Worker due to unhyzeinic Working and Living condition

The SMIE workers were asked whether or not their working and residential condition affect their their. Their responses are recorded in table 5.77. It reveals only 18% of SMIE workers reported that they became ill due to unhyzeinic working and living condition. This was reported by more workers in Dhaka division (20%) than the workers of Chittagong (18%) and Khulna (16%) division (Table 5.78). Considering factory category, the workers of rice milling, bricks factory, and cigarette factory felt that they were ill due to unhyzeinic working or living condition, but the workers of others factory did not think so (and 5.79).

But the managers/ owners of SMIEs argues that malnourished food habit of SMIE worker is more responsible for workers' illness rather than their working condition.

Table 5.77: Distribution of workers by their illness due to unhyzeinic working or living condition

Illness due to unhyzeinic working or living condition	Percentage of worker (%)
Yes	18
No	82
N	259

Table 5.78: Division wise distribution of workers by their illness due to unhyzeinic working or living condition

Illness due to unhyzeinic working or living condition	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes	20	18	16
No	80	82	84
N	149	70	40

Table 5.79: Factory category wise workers by their illness due to unhyzeinic working or living condition

Factory Category / Unhyzeinic Working or living condition	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	18	18	16	35	30	0	22	0	50	18
No	78	78	84	65	70	100	78	100	50	78
N	91	24	36	18	18	2	18	2	18	6

<u>Suggestions to improve Working and Living condition</u>

The workers who felt their illness had caused by bad working or living conditions suggested that their working and living environment can be improved by providing proper lighting and ventilation in both work and living place, adequate fan, factory based doctor and free medicine, awareness program, sufficient rest room, satisfactory monthly income, day care for children, and back stairs in the workplace as much as required (Table 5.80).

Table 5.80: Distribution of workers by their suggestions to improve working or living condition

Suggestions to improve working or living condition	Percentage of worker (%)
Proper Ventilation and adequate lighting	32
Sfficient Fan	15
Enough office space	22
Rest room	6
Day care for children	10
Factory doctor and free medicine	55
Back stair	5
Awareness program	25
Satisfactory monthly salary	80
N	47

Table 5.81: Division wise distribution of workers by their suggestions to improve working or living condition

Suggestions to improve working or living condition	Dhaka (%)	Chittagong (%)	Khulna (%)
Proper Ventilation and adequate lighting	22	18	16
Adequate Fan	8	8	5
Sufficient office space	5	8	10
Rest room	10	10	8
Day care for children	10	10	10
Factory doctor and free medicine	65	70	58
Back stair	30	25	40
Awareness program	50	55	35
Satisfactory monthly salary	80	75	70
N	26	11	10

No considerable regional variation was observed for providing suggestions to improve the workers' working and living conditions (Table 5.81).

In view of factory category, it is evident that the workers of rice milling, bakery products, and bidi factory suggested providing proper ventilation and lighting, and sufficient fan to maintain the workplace or living environment comfortable. Majority of the workers in almost all factory categories recommended providing factory doctor and free medicine to ensure good health as well as satisfactory income level so that the workers could afford the good quality housing (Table 5.82).

Table 5.82: Factory category wise workers suggestions to improve working or living condition

Factory Category / Suggestions	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Thread balls (%)
Proper Ventilation and adequate lighting	15	10	12	5	45	0	50	0	55	40
Sufficient Fan	20	15	15	18	54	0	55	0	45	30
Enough office Space	25	12	14	5	35	0	20	10	30	15
Factory doctor and free medicine	56	65	55	45	66		75	46	62	50
Back stair	10	12	7	8	12		8	12	10	8
Awareness program	43	22	25	10	20	5	25	15	12	10
Satisfactory monthly salary	75	80	65	87	57	55	76	62	68	70
Day care for children	10	5	6	5	6		5	5	5	8
Rest room	5	6	10	8	10		8	10	10	12
N	12	6	6	6	5	0	4	0	4	4

5.5.1 Regression Estimation on the Relationship between Health Care Expenditure and Health

To examine the relationship between health care expenditure and health of SMIE workers we have estimated the regression of health (Y) on worker's health care expenditure (X_1), age (X_2), and education (X_3). Worker's health is defined as number of absent days due to illness. Worker's health care expenditure is defined as X_1= 0 signifying insufficient per capita health care expenditure[3] (monthly mean health care expenditure < Tk 158) and X_1=1 indicting sufficient per capita health care expenditure

3 Per capita health expenditure in Bangladesh is $27 at current price in 2011(The World Bank, 2014)

(monthly mean health care expenditure ≥ Tk 158). Worker's age and education are measured in terms of year. Ordinary Least Squares (OLS) method is used to run the regression[4].

The estimated regression using number of ill days as dependent variable gives the following result:

$$Y= 0.606 - 1.026\ X_1 +0.022\ X_2-0.035\ X_3 \text{ ....(5.1)}$$

$$\textbf{(t= 1.810)}^{***}\ \textbf{(t= 6.345)}^{*}\quad \textbf{(t=-2.051)}^{**}\quad \textbf{(t= -1.822)}^{***}$$

R^2 =0.187 DW Statistic 1.613 F-statistic 19.603 Prob (F-statistic) 0.000

*Shows 1% level of significance, ** Shows 5% level of significance, *** Shows 10% level of significance

The estimation finds the significance of overall relation between dependent and independent variables. All independent variables are found in equation 5.1 with expected sign and all are statistically significant. It suggests a considerable negative association between number of absent days due to illness of worker and their health care expenditure. It indicates that when worker's health care expenditure changes from insufficient amount to sufficient amount by 1 unit absent days of worker due to illness is reduced by 1.026 units. The underlying reason is that SMIE workers can't spend sufficient amount of money for their health care. As a result, they become ill again and again and become absent from work. The regression result also suggest that for 1 unit increase in workers age, worker's absent days due to illness is increased by 0.022 units and for 1 unit increase in worker's education, absent days is reduced by 0.035 units.

5.6. Conclusion

It is found that the mean age of the SMIE worker was 26 years. Majority of them were married, Muslims, and in normal weight. Most of them had primary and lower secondary level education. Majority of the workers had no work experience anywhere else,among the others who had working experience the maximum tenure was 2 years. Monthly mean income of the worker is estimated Tk 5451 from workers' response and Tk 5035 from managers' response. It is found slightly higher for the workers of Dhaka division than the workers of Chittagong and Khulna division; it was observed as the highest in the pharmaceutical factory and the lowest in the bidi factory among other factory categories.

[4] In regression estimation, variables Y and X_1 are chosen here following the study of Nixon and Ul mann (2006), and variables X_2 and X_3 are selected following the study of Ghatak A. and Madheswaran S. (2013).

It is found that majority of the workers suffered from respiratory diseases like occupational asthma, bronchitis, allergic rhinitis etc.; pain like low back pain, knee joint pain, occupational hand injury, fever etc. It is to note that typhoid, jaundice, anemia and different types of pain were the major diseases suffered by RMG and apparel factory's workers. Workers of bricks factory suffered mainly from different types of pain from leg injury, hand injury etc. Workers of bidi factory mostly suffered from respiratory diseases say asthma.

It is observed that most of SMIE workers received treatment from pharmacy based doctor, kabiraj/hekim, and paramedics in all three study divisions. A very few of workers seek treatment from formal/modern healthcare services.

It interesting to mention that workers of pharmaceutical industry occasionally feel sick and they never received treatment from pharmacy based doctor, kabiraj/hekim or paramedics; they either 'did nothing' or took modern home remedy.

Monthly mean expense for treatment of the SMIE worker is Tk 528 per worker. It was higher for the workers of Dhaka division (TK 638) than the workers of Khulna (TK 413) and Chittagong (Tk 362) division. RMG, knitwear, and thread ball factories' workers had higher monthly mean expenses for treatment than that of other factory categories.

The study suggests that insufficient expenditure on health care is responsible for illness of worker. Bad working and living conditions were identified as causes of diseases by 18% SMIE workers. They suggested that their working and living environment can be improved by providing proper lighting and ventilation in both work and living place, adequate fan, factory based doctor and free medicine, awareness program, and satisfactory monthly income.

Though the government of Bangladesh has taken various steps to ensure health facilities for all, the SMIE workers didn't seek treatment while they became ill from the modern and public facilities as much as required. Therefore, more efforts are essential to improve the working and living environment of the workers as well as to increase the health related knowledge and skills so that the workers become less ill and they can seek appropriate health care services from modern public facilities.

CHAPTER SIX

HEALTH AND WORKING AND RESIDENTIAL ENVIRONMENT OF SMIE WORKERS

6.0 Introduction

The health status of an individual, a community or a nation is affected by the interplay and integration of two types of environment—the internal environment of worker himself or herself and the external environment which surrounds him or her. The internal environment relates each and every component, every tissue, organ and organ system and their harmonious functioning within the body system. The external environment consists of three main components—physical, biologic and psycho-social, which are closely related. Physical environment includes purely physical factors such as soil, climate, heat, light, water supply etc. with which man is in constant interaction. The biologic environment is the natural biological factors such as animals and plants, bacteria, viruses, insect are rodents etc that affect human life in a particular place or period. The psycho-social environment includes social and psychological factors such as cultural values, customs, habits, religion, education, occupation standard of living and community life.

It is seen in chapter five (Table 5.74) that 18% of SMIE workers reported they became ill due to their unhyzenic working or residential environment. Therefore, it is essential to discuss and examine how and in what extent the working and residential environment influences the health status of SMIE workers. To accomplish it the chapter is designed under two sections. First section discusses how the working environment influences workers' health, and the second section describes how the residential factors affect workers' health.

6.1 Working Environment and Workers' Health

Work and health are intimately connected, however the multiple associations between different features of employment arrangements and workers' health are not well understood (Ettner and Grzywacz, 2001).Workers of any industry are essential capital of any country. But it is distressing to say that they are facing a lot of problems in their workings condition, so it is important to study the workers' workplace problems that influence their health.

Therefore, this section describes and explores the consequences of workplace environment on the health status of workforces.

6.1.1 Review of Studies: Theoretical and Empirical

The healthy workers are the key factor for maintaining social and economic growth. Undoubtedly they adjoin to the wealth of the industries.

However, a rich body of literature examines how work and health are connected, most of the work-health research falls into the following three broad categories:

The first category, characterized by occupational health research, examines the effects of physical aspects of the work environment (e.g., ergonomic design of jobs, exposure to toxic substances) on the prevalence and severity of diseases and syndromes among workers (e.g., Slote, 1987).

The second category, characterized by sociological studies**,** examines how objective (e.g., number of hours worked per week, shift work) and social aspects (e.g., economic adequacy, social prestige) of individuals' jobs affect worker health (e.g., Ross & Mirowsky, 1995), and

The Third category, illustrated by occupational psychology, examines how psychological (e.g., decision latitude, demands) or psychosocial (e.g., relationships with coworkers, workplace culture) features of workers' jobs promote or undermine health and well-being (e.g., Karasek & Theorell, 1990).

The introduction of occupational health in industries and other occupation benefits everyone especially the management, the employers and the employees of the respective profession.

Achalu (2000) have found that when the employees are healthy physically, emotionally and mentally; the atmosphere within the occupational setting becomes inspiring, calm and attractive. Clark (1999) has identified four areas of influence in the workplace social environment that affects the health status of the workers. The first sphere of the influence is concerned with health related manners of employees, the second area of influence arises among groups of coworkers, the third sphere of influence includes the management sphere such as approaches toward health, and the fourth area of influence involves legal, social and political action that impacts the health of employees.

Asad et. al.(2013) have conducted a study to examine the effects of industrial environment on health status of a sugar mill factory workers in Pakistan. The study reveals that health status of the workers is affected by the industrial social and physical environment. Social environment like unpleasant relationships among workers and supervisor, lack of autonomy is badly affecting the health of workers. Physical factors like chemical pollution, noise pollution, air pollution, poor working condition, extreme heat, night shift work, extended working hours and physical work load are negatively associated with the health of workers and are the main causes of some diseases.

Ettner and Grzywacz (2001) have investigated workers' perceptions of how jobs affect health using a national sample of 2,048 workers in USA. The study finds that workers who have higher levels of perceived constraints and excessive anxiety, works nights or overtime, or reports serious ongoing stress at work or higher job pressure signifies more negative effects. On the other hand, workers who have a higher level of extraversion, self-employed, or works part time or have greater decision latitude or use of skills on the job represent more positive effects.

Melville (1999) has found that the workers of industries suffered from different type of sicknesses due to poor working circumstances. In some industries, the workers face an un-quantified rate of pain, strain, and injury due to poor working dealings and surroundings.

Therefore, based on the above literature and findings it can be said that there exists a correlation between the work environment and the health status of the workers.

6.1.2 Workplace Factors that Influence Workers' Health

The key workplace factors that affect workers' health can be summarized under the following two categories:

1. Physical aspects that arise from premises, office or factory design
2. Social aspects that are driven by social , psychological and psycho social features at workplace

The following figure presents the two categories of workplace factors that influence workers' health:

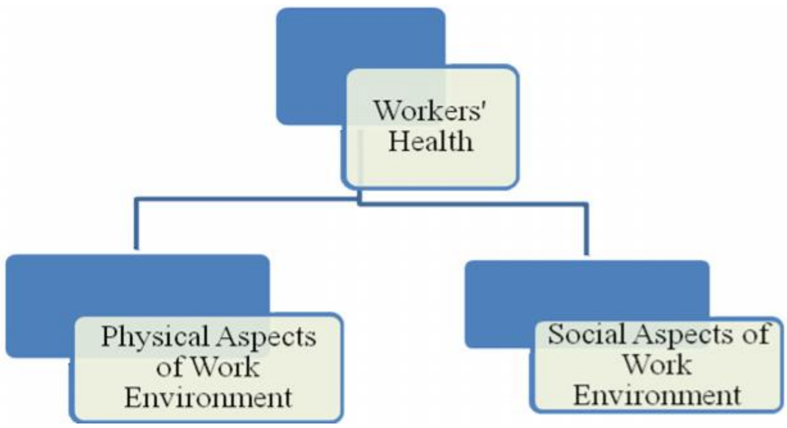


Figure 6.1: Working environment that influences workers' health

Physical Aspects of Work Environment

Physical aspects of work environment can affect both job performance and health status of the workers. Despite of the progress and improvement made for occupational safety and health, work environment especially in low and middle income countries is still hazardous for the workers (Butt S.M., 2012).

The physical aspects of work environment that influence workers' health are discussed in the following figure 6.2.

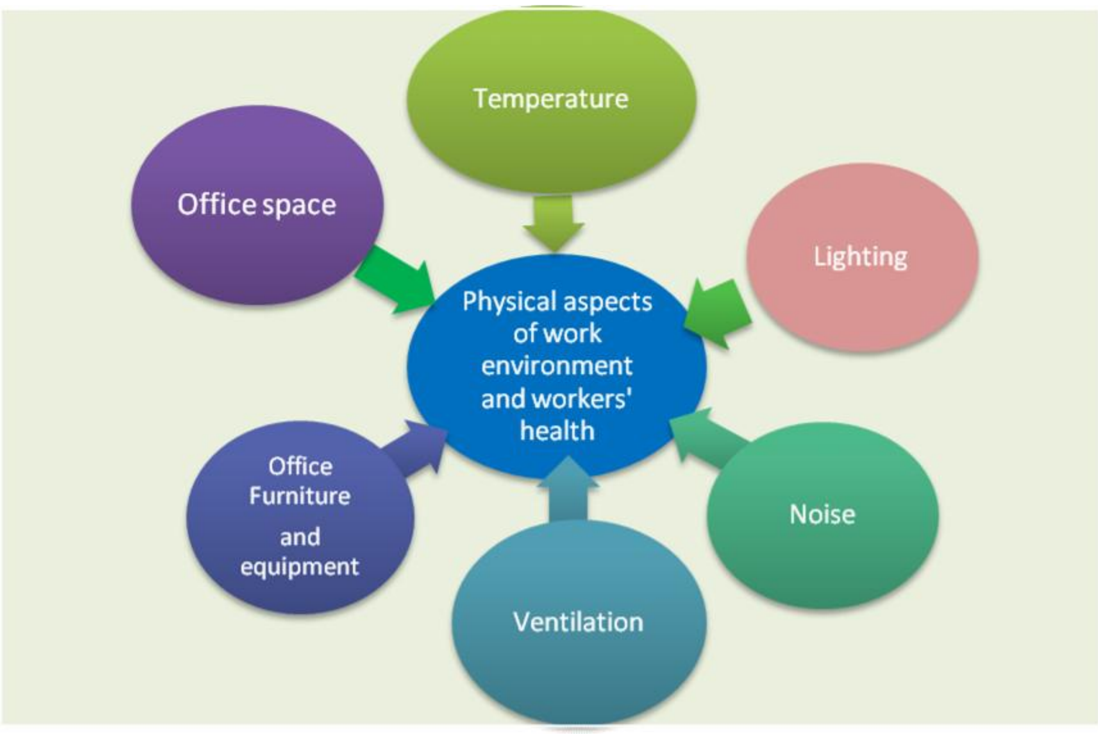


Figure 6.2: Physical aspects of work environment that affects workers' health

Office Space

Office space is an important factor that affects employees' health. When too much office equipment is kept in a small space, it can lead to the buildup of contaminants. Fax machines, photocopiers and printers all give off dust and other particulates. In most cases the effect of these is negligible, but problems arise when there is insufficient ventilation. The fine dust causes irritation leading to coughing, sneezing and other respiratory ailments in people who are allergic to dust. Ozone gas released from copiers and laser printers causes irritation of the nose, throat and lungs; in very high concentrations, it may lead to reproductive problems and cancer (www.ehow.com).

Office Furniture and Equipment

Office furniture comprises of desks chairs, the filing system, shelves, drawers, etc. Well-designed office allows each employee to work comfortably without needing to over-reach, sit or stand too long, or use awkward postures (correct ergonomic design). Sometimes, equipment or furniture changes are the best solution to allow employees to work comfortably. On other occasions, the equipment may be satisfactory but the task could be redesigned. For example, studies have shown that those working at computers have less discomfort with short, hourly breaks (CDC, 2013).

Office equipment refers to office machines and devices that can be found in the office, such as copier machines, facsimiles, telephones, typewriters, printers, and computers. Keeling and Kallaus (1996) has pointed out that office equipment is the intermediary between people and their work. Office equipment allows employees to undertake not only more work, but also less time and better quality, for instance, copier machines help employees in doubling documents in a short time.

Using office equipment that requires repetitive movements or unnatural posture leads to a wide range of conditions involving the muscles, tendons and other soft tissues. Computer operators using a keyboard and mouse often complain of pain in their hands and wrists, which may be symptomatic of carpal tunnel syndrome. Furniture that is not conducive to good posture can lead to neck, shoulder and back pain (http://www.ehow.com).

Ventilation

To produce a healthy office environment minimum standard of fresh air is required in the office space. One way by which it can be done is effective ventilation. ‘Office ventilation’ is a term used to define the flow of air into and out of a working area. Two ways of ventilation are natural ventilation and forced or mechanical ventilation. Natural ventilation relies on wind pressure and temperature differences to move fresh air through a building and is usually not fully controllable; and 'forced' or mechanical ventilation uses mechanical supply and/or extraction to provide fresh air and is controllable (HSE, 2000).

Office ventilation is one important factor affecting the relationship between airborne transmission of respiratory infections and the health and productivity of workers (CDC, 2013).

Noise

Noise can be defined as undesirable sound to which an individual is exposed. In general, noise can influence employees while doing their work and the impact can be both positive and negative. If there is soft background sound, which is coming from instrumental music, and there is an employee who has to tackle claims from some inpatient customers, the background sound in turn, will assist him/her to become more relaxed in solving the customer’s problems. In contrast, if the sound background is quite hard, which may develop from the telephone ringing and loud conversation among people in the same room, this situation can hamper both the employee and customers.

Bohgard, et al. (2009) have pointed out that differentiation between the desirable and undesirable sound depends upon various factors including time and duration, character of the sound and worth of the information containing in that sound. Nelson et al. (2005) have mentioned that excessive noise exposure can cause various physiological and psychological problems including increased blood pressure, reduction in performance, insomnia and short temperedness.

Smith (2004) has stated that hearing loss in adults is estimated from 120 million in 1995 to 250 million in 2004 worldwide and it is the fifteenth most serious problem in the world; most of the hearing loss in these adults was related with high occupational noise level.

National Institute for Occupational Safety and Health (NIOSH) has found that in United States of America alone there were around 30 million workers exposed to hazardous noise in 1998 (NIOSH, 1998).

Horino (1977) has mentioned that noise is a stress that not only harms hearing but also raises heart rate and disturbs other physiological limitations that decrease physical performance.

Lighting

Lighting is an essential element to the health and safety of workers at the workplace. There are two kinds of light that are available to office: natural light and artificial light. Natural light is a free resource that enters the office through window or skylight, whereas artificial light is the kind of light which is produced and designed by manufacturing.

Light allows an individual to gather the information from its surrounding, and determine the size, shape, color and movement. Sufficient light makes it more easy for the workers to work and can prevent accidents. Light environment and visual ergonomics are two main concepts that can be used to monitor the light condition at a workplace.

The effects of light on health can be divided into three classes. The first is that of light as radiation. Exposure to the ultra-violet, visible and infrared radiation produced by light sources can damage both the eye and skin, through both thermal and photochemical mechanisms. The second is light operating through the visual system. Lighting enables us to see but lighting conditions that cause visual discomfort are likely to lead to eyestrain. Anyone who frequently experiences eyestrain is not enjoying the best of health. The third is light operating through the circadian system. Light operating through the circadian system is known to influence sleep patterns and believed to be linked to the development of breast cancer among night shift workers (Boyce, 2009). HSE (2002) has found that there are some light related hazards which can adversely affect the health and safety of the workers. These factors include lighting effects, incorrect lightening design and poor installation of lightening source which can cause disability glare from a light fitting, color effects and distracting reflection.

A poor lighting system may reduce employee performance as well as productivity, because those who have to work related with reading might have a serious problem with their vision, which in turn may cause fatigue or eyestrain (Tjambolang et al.)

Temperature

A comfortable office environment is a building or room in which workers can generate their work properly as it clean, with proper range of temperature, enough ventilation, and an adequate humidity.

Normally workrooms (a place or a room where people normally work for more than short periods) should have a temperature of at least 16°C unless much of the work involves severe physical effort, in which case the temperature should be at least 13°C. Hot workplaces can cause heat exhaustion, dehydration, heat cramps and heat strokes, and may exacerbate existing health conditions such as such as heart problems, high or low blood pressure, respiratory conditions and kidney disease (Smith, 2010).Heat stress presents a great problem for the people who work in tropical and subtropical areas. Sometimes industrial climates have high temperature settings to which the workers are exposed (Noweir, et al., 1996).

Kjellstrom & Corvalan (1995) have found that problems of heat stress are very common in some industries such as Iron and Steel Mills, Sugar mills, Bricks and Tiles Factories.

Humidity level of an office environment has affect on the temperature level. Inappropriate humidity level may cause some damages to the office environments.

Besides the above mentioned factors, there are some other physical factors like chemical pollution, air pollution, poor working conditions, and extended working hours that are associated with health status of the workers.

Social Aspects of Work Environment

The social environment of any organization is directly influenced by the levels of satisfaction of the employees. For example, job dissatisfaction leads to poor interpersonal relationships with co-workers or supervisors. These relationships can contribute to a poor working environment, creating a downward spiral in the social environment. On the contrary, when the majority of the workers are happy and satisfied at their jobs, they are more likely to contribute positively to company culture and help to create a mutually pleasant environment for everyone involved (Xaxx J., 2013).

Social aspects of work environment that affect workers' health are illustrated in the following Figure 6.3:

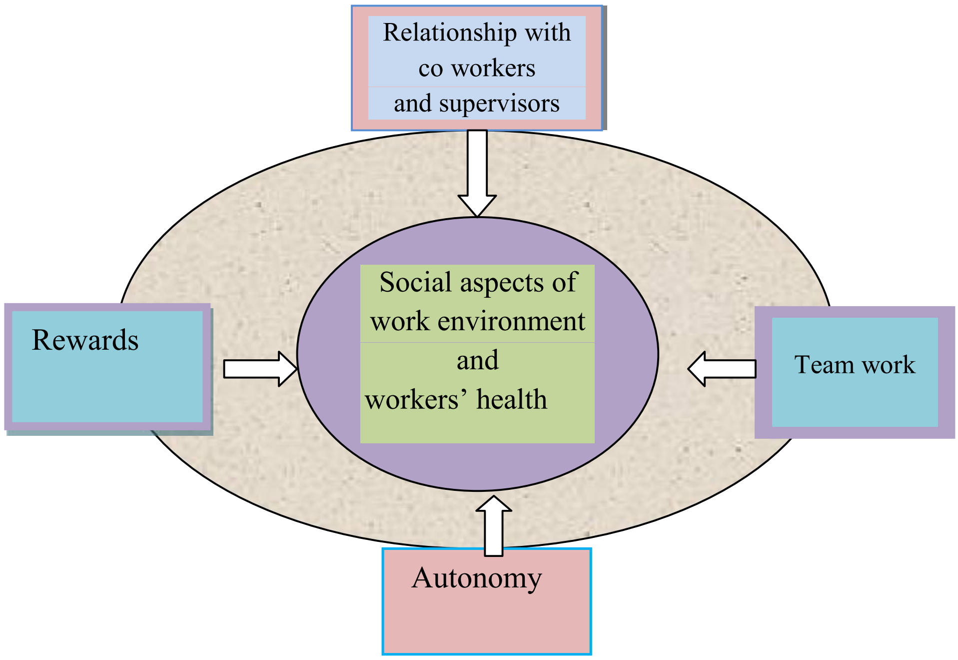


Figure 6.3: Social aspects of work environment

<u>Relationship with Co-workers and Supervisors</u>

Employer-employee, employee-employee relationships are the vital factor to produce an encouraging social environment at workplace. Pleasant relationship between worker and supervisor keeps the workers in fresh mood which may have positive impact on their mind and ultimately in health.

Asad et al., (2013) have stated that relationships among workers and supervisor are very important in terms of health. They have found that relationships and behavior of supervisor with workers at workplace affect the health and performance of workers. When conflict does erupt among workers and supervisors, it has a major effect on the social environment of an organization.

Papadakos & Marianna (2012) have found that conflict or difference of opinion between management and workers affect their health by raising anxiety and depression.

Teamwork

Teamwork in the workplace helps to create a supportive social environment. When people work together on projects rather than competing, they learn that their best interests are shared together. Progressive corporate managers are aware of this fact and encourage teamwork among their employees. Teamwork at workplace affects the workers' health positively; say by reducing the mental anxiety as well as physical stress at work.

Rewards

Rewards at workplace encompass the monetary incentive, pay and benefits, promotions and motivation that satisfy employees to some extent. Rewarding employees is a good way to increase motivation, improve job satisfaction and morale, and let employees know they are valued members of the business team.

Flynn (1998) has argued that rewards keep high spirits among employees, boosts up their morale and create a linkage between performance and motivation of the employees.

Baron (1983) has argued that when we recognize and acknowledge the employees in terms of their identification, their working capacity and performance is very high. High performance and increased job satisfaction due to rewards affect the health status of workers by raising their mental and physical strength.

Autonomy

Autonomy in the workplace refers to how much freedom employees have while working. For some organizations, autonomy means employees are allowed to set their own schedules. In other organizations, autonomy means employees can decide how their work should be done. No matter which concept is being applied, higher levels of autonomy tend to result in an increase in job satisfaction. It's theorized that the increased level of job satisfaction in employees form a feeling of greater responsibility for the quality of their work which may reduce the depression, work panic of the workers.

Besides the above mentioned social aspects of work environment, there are some other factors like job pressure, skill utilization, income level, and occupational prestige which can affect workers health.

6.1.3 Working Environment of SMIE Workers and Its Impact on Workers' Health

This section discusses the empirical findings of the SMIE workers' working environment and its impact on workers' health.

6.1.3.1 Working Environment of SMIE Workers

Literature review reveals that workplace environment affects workers' health in various ways.

Therefore, this section examines working environment of SMIE workers in Bangladesh by using the study data.

Working Hour

The SMIE workers were asked about their daily working hours. Their responses are recorded in table 6.1. It is found that a vast majority of the SMIE workers (88%) usually worked 12 hours a day but occasionally they work more than 12 hours. Female workers (91%) worked more hours of time than the male (86%) workers (Figure 6.4).

It reveals that most of the workers in all divisions worked 12 hours a day. Working hour 8 hours per day was found slightly more among the workers of Khulna division (12%) than the workers of Dhaka (8%) and Chittagong (9%) division (Table 6.2 and figure 6.5).

Only the workers of pharmaceutical industry worked 8 hours per day. Among the other factory categories, almost all workers of bidi factory (100%), spooling and thread ball (100%), bakery products (100%), RMG (95%), bricks and tiles factory (94%), and knitwear factory worked 12 hours daily (Table 6.3 and figure 6.6).

Table 6.1 : Gender wise distribution of workers by daily working hours

Daily working hours	Male (%)	Femal e (%)	Total (%)
8	14	9	12
12	86	91	88
N	159	100	259

Table 6.2 : Division wise distribution of workers by daily working hours

Division / Working hours (daily)	Dhaka (%)	Chitta gong (%)	Khulna (%)
8	8	9	12
12	92	91	88
N	149	70	40

Table 6.3: Factory category distribution of workers by daily working hours

Factory category / Working hours (daily)	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
8	5	12	6	6	22	100	0	22	0	0
12	95	88	94	94	78	0	100	78	100	100
N	91	24	36	18	18	12	18	18	18	6

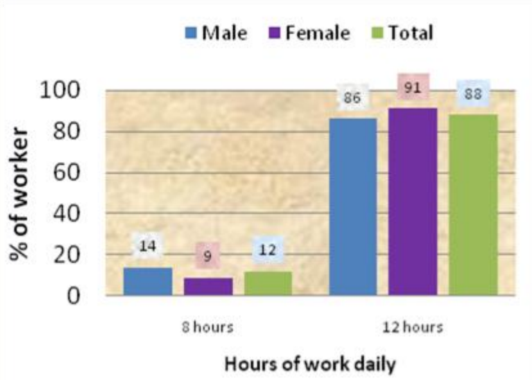


Figure 6.4: Gender wise distribution of workers by daily working hours

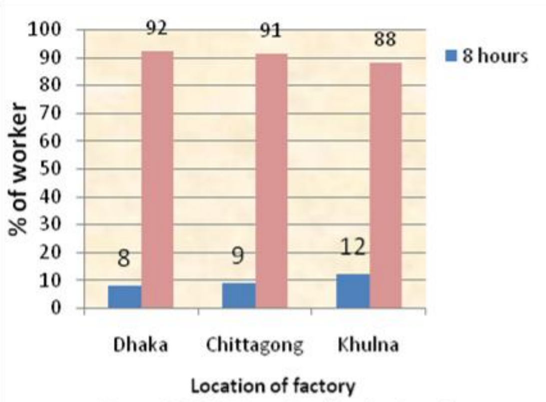


Figure 6.5: Division wise distribution of workers by daily working hours

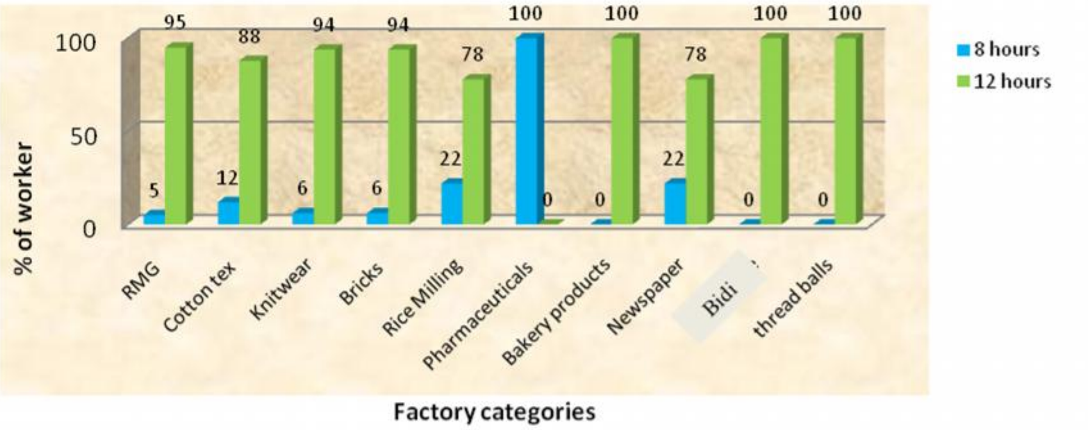


Figure 6.6: Factory category wise distribution of workers by daily working hours

Overtime Payment

The workers were asked whether or not they had received overtime payment if they worked more than regular time. Their answers were tabulated in table 6.4. It shows that two third of the workers' (68%) received extra payments or overtime payment while they work more than 12 hours and the rest 32% workers received it if they work more than 8 hours daily .

More workers received overtime payment in Khulna division (40%) than the workers of Chittagong (26%) and Dhaka (34%) division (Table 6.5).

Though internationally and nationally the daily work hour was fixed as 8 hours and overtime payment is compulsory, most of SMIEs in Bangladesh do not follow the rules.

Table 6.4 : Distribution of workers by getting extra payment for overtime

Get extra payment if work is	Percentage (%) of worker
More than 8 Hours	32
More than 12 hours	68
N	259

Table 6.5 : Division wise distribution of workers by getting extra payment for over time

Extra payment if work is / Division	Dhaka (%)	Chittagong (%)	Khulna (%)
More than 8 Hours	34	26	40
More than 12 hours	66	74	60
Total	159	70	40

In view of factory category, almost all workers of pharmaceutical industry, two third workers of rice milling factory, one third workers of RMG and cotton textile factory received overtime payment properly while they work more than 8 hours daily. On the other hand, majority of the workers of thread ball factory, bidi factory, bakery products, and bricks factory received over time payment for working hour more than 12 hours (Table 6.6). Almost all workers received overtime payment on the basis of salary per hour.

Table 6.6: Factory category wise distribution of workers by extra payment for over time

Factory category / Extra payment If work is	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Bidi factory (%)	Spooling and thread balls (%)
More than 8 hours	35	38	18	22	61	100	17	22	17	0
12 More than 12 hours	65	62	82	78	39	0	83	78	83	100
N	91	24	36	18	18	12	18	18	18	6

Mode of wage

It is apparent that all workers received monthly wage for their work (Table 6.7). It was true for all workers in all divisions and in all factory categories.

Table 6.7: Distribution of workers by the mode of wage received

Type of wage received	Percentage of worker (%)
Monthly	100
Fortnightly	0
Daily	0
N	259

Interval and Hour of Interval

The workers were asked whether they got interval for taking rest or meal and if yes how much hour they received. Their responses are given in table 6.8. All workers in all divisions and all factory categories got interval for rest or taking meal.

Table 6.8: Distribution of workers by interval for rest or taking meal

Getting interval	Percentage of worker (%)
Yes	100
No	0
N	259

About 72% of workers enjoyed 1 hour interval for taking rest or taking meal, the rest of the workers got it for less than 1 hour (Table 6.9).

More workers of Chittagong (83%) and Dhaka (70%) division took 1 hour interval than the workers of Khulna (60%) division (Table 6.10).

Table 6.9: Distribution of workers by interval hour

Interval time	Percentage of worker (%)
Less than 1 hour	28
1 hour	72
N	259

Table 6.10: Division wise distribution of workers by interval hour

Division / Interval	Dhaka (%)	Chittagong (%)	Khulna (%)
Less than 1 hours	30	17	40
1 hour	70	83	60
N	149	70	40

Considering factory category, majority workers of spooling and thread balls factory (67%), bidi factory (56%), bricks factory (56%), and knitwear factory (42%) got interval less than 1 hour (Table 6.11).

Table 6.11: Factory category wise distribution of workers by interval hour

Factory category / Interval	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Less than 1 hours	21	0	42	56	33	0	28	22	56	67
1 hour	79	100	58	44	67	100	72	78	44	33
N	91	24	36	18	18	12	18	18	18	6

Floor Cleanliness

The study reveals that almost all workers (97%) reported that the floors of every work room were cleaned at least once in a week by washing (Table 6.12). Regarding it no significant variation was found among the divisions as well the factory categories.

Table 6.12: Distribution of workers by floor cleanliness at least once in a week	
Floor cleanliness at least once in a week	Percentage of worker
Yes No	97 3
N	259

Ventilation in Workroom

The workers were asked about the ventilation in the workplace. Based on their response, more than half of the workers (57%) reported inadequate ventilation in the work room for circulating fresh air (6.13).

Insufficient ventilation was found more among the factories in Chittagong division than the factories in Dhaka and Khulna division (Table 6.14).

Table 6.13: Distribution of workers by adequate ventilation at workroom

Adequate Ventilation	Percentage of worker (%)
Yes No	43 57
N	259

Table 6.14: Division wise distribution of workers by adequate ventilation at workroom

Adequate Ventilation	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes No	45 55	37 62	45 55
N	159	70	40

A vast majority of the worker in spooling and thread ball factory (100%), knitwear factory (89%), and bidi and rice milling factory (78%) reported that the ventilation system of the factories was not adequate for circulating fresh air (Table 6.15).

Table 6.15: Factory category wise distribution of workers by adequate ventilation at workroom

Factory category / Proper ventilation	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	56	46	11	61	22	50	61	50	22	0
No	44	54	89	39	78	50	39	50	78	100
N	91	24	36	18	18	12	18	18	18	6

Temperature at Workroom

The study finds that most of the workers (92%) informed that the authority tried to maintain temperature in every work room. The same situation was observed in all categories of factories and in all divisions.

Table 6.16: Distribution of workers by maintain temperature at work room

Sufficient lighting	Percentage (%)
Yes	92
No	8
N	259

About 45%, 28% and 15% of workers informed that the workroom temperature was maintained by providing sufficient fan, increasing space, and by insulating and screening outside walls or roofs or windows respectively (Table 6.17). No considerable variation was observed among all factory categories and divisions.

Table 6.17: Distribution of workers by way of temperature maintaining in the work room

Means of temperature maintaining	Percentage of worker (%)
By insulating and screening outside walls or roofs or windows	15
By increasing space	28
By raising the level of roof	6
By providing sufficient fan	45
Other methods	3
N	259

Congestion of Workroom

The workers were asked whether or not their work rooms are congested. Their responses are given in table 6.18. It depicts that about half of the workers (53%) informed that the work room is congested and somehow congested.This congestion was higher in Dhaka division (60%) than the Chittagong (46%) and Khulna (40%) division (Table 6.19).

Table 6.18: Distribution of workers by congestion of work room

Work room is	Percentage of worker (%)
Congested	10
Somehow congested	43
Not congested	47
N	259

Table 6.19: Division wise distribution of workers by congestion of work room

Division / Workroom is	Dhaka (%)	Chittagong (%)	Khulna (%)
Congested	15	3	0
Somehow congested	45	43	40
Not congested	40	54	60
N	149	70	40

In view of factory categories, spooling and thread ball factory (100%), bidi factory (78%), newspaper factory (78%), bakery products (78%), and RMG (58%) factory were found as congested factories (Table 6.20).

Table 6.20: Factory category wise distribution of workers by congestion of work room

Factory category / Work room	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Congested	14	0	0	6	0	0	33	0	0	83
Somehow congested	44	46	47	6	28	17	44	78	78	17
Not congested	42	54	53	88	72	83	22	22	22	0
N	91	24	36	18	18	12	18	18	18	6

Lighting at Workroom

The study finds that nearly all (99%) workers informed that the authority provided and maintained sufficient lighting in the work room (Table 6.21).The same scenario was found in all factory categories and in all divisions.

Table 6.21: Distribution of workers by sufficient lighting in the work room

Sufficient lighting in the work room	Percentage of worker (%)
Yes	99
No	1
N	259

Drinking Water

The workers were asked whether or not their authority provided drinking water at work place. Their responses are tabulated in table 6.22. It shows that most of the workers (97%) reported that the authority provided drinking water for all workers. There are some factories where the authority did not provide drinking water for all workers were mostly situated in Dhaka and Chittagong division as reported by 3 to 4% of the workers (Table 6.22). Examples of such factories were mainly bidi factory (22%) and bricks (6%) factory (Table 6.23).

Table 6.22: Division wise distribution of workers by providing drinking water for all workers

Division / Providing drinking water	Dhaka (%)	Chittagong (%)	Khulna (%)	Total
Yes	96	97	100	97
No	4	3	0	3
N	149	70	40	259

Table 6.23: Factory category wise distribution of workers by providing drinking water for all workers

Factory category / Drinking water	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	98	100	100	94	100	100	100	100	78	98
No	2	0	0	6	0	0	0	0	22	2
N	91	24	36	18	18	12	18	18	18	6

Wash Room at Workplace

The study finds that a vast majority of the workers (91%) reported that the authority provided sufficient wash room for the workers. Insufficient wash rooms were found among the factories in Khulna division (12%) than the factories in Dhaka (8%) and Chittagong (9%) division (Table 6.24).

Table 6.24: Division wise distribution of workers by sufficient wash room

Division / Sufficient wash room	Dhaka (%)	Chittagong (%)	Khulna (%)	Total
Yes	92	91	88	91
No	8	9	12	9
N	159	70	40	259

About 50% workers of bidi factory and 11% workers of RMG factory informed that the authority did not provide sufficient wash room for the workers (Table 6.25).

Table 6.25: Factory category wise distribution of workers by sufficient wash room

Factory Category / Sufficient Wash room	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	89	100	100	94	100	100	100	96	50	98
No	11	0	0	6	0	0	0	4	50	2
N	91	24	36	18	18	12	18	18	18	6

Separate Washroom for male and female Workers

The workers were asked whether or not their authority provided wash room separately for male and female workers. It finds that all workers (100%) informed that the authority provided wash room separately for male and female workers (Table 6.26). No significant variation was found in three divisions and in all factory categories. Definitely it's a matter of appreciation for the SMIEs owner in Bangladesh.

Table 6.26: Distribution of workers by separate wash room for male and female

Separate wash room for male and female	Percentage (%)
Yes	100
No	0
N	259

Lighting, Ventilation and cleaning of Washroom

The study depicts that nearly all (98%) workers informed that the wash rooms were adequately lighted and ventilated, and cleaned with suitable detergent daily (Table 6.27and 6.28).No divisional variation regarding lighting, ventilation and cleaning in the wash room were found.

Only in case of bidi factory the washrooms were not adequately lighted, well ventilated, and cleaned with detergent. May be the reasoning behind this is that the bidi factories are mainly situated in rural areas and the rural people are less aware about the health status of individuals.

Table 6.27: Distribution of workers by adequate lighting and ventilation in the wash room

Adequate lighting and ventilation in wash room	Percentage (%)
Yes	98
No	2
N	259

Table 6.28: Distribution of workers by cleaning the washing room using detergent or disinfectants

Washing room using detergent	Percentage (%)
Yes	98
No	2
N	259

Washing Hands with Soap

The workers were asked whether or not they were used to wash hands with soap after defecation. Their responses are recorded in table 6.29. It reveals that a vast majority of the workers (97%) reported that they wash their hands with soap after defecation. No regional variation was found regarding washing hands with soap after defecation (Table 6.29). Only one third workers of bidi factory and 6% of rice milling factory reported that they did not wash hands with soap after defecation (Table 6.30).

Table 6.29:Distribution of workers by washing hands with soap after defecation

Washing hands with soap after defecation	Percentage of worker (%)
Yes	97
No	3
N	259

Table 6.30: Factory category wise distribution of workers by washing hands with soap after defecation

Factory Category / Wash hands With soap	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	99	100	100	100	94	100	100	100	67	98
No	1	0	0	0	6	0	0	0	33	2
N	91	24	36	18	18	12	18	18	18	6

Among the rest 3% of workers who did not wash hands with soap, 91% workers thought that using soap after defecation is not essential, 5% workers were not used to use it, and rest 4% workers informed that the authority did not provide sufficient soap in the wash room (Table 6.31).No regional or factory categories differences were found regarding the matter.

Table 6.31:Distribution of workers by reasons for not using soap after defecation

Reasons for not using soap after defecation	Percentage of worker (%)
It's not essential	91
Not used to using soap	5
The authority did not provide sufficient soap	4
N	259

6.1.3.2 Impact of Working Environment on SMIE Workers' Health

This section studies how and in what extent workplace environment influences the health status of the SMIE workers in Bangladesh.

Working Environment and Workers' Health

The workers were asked whether or not their working conditions affect their health. Their responses are given in table 6.32. It reveals that majority of the workers (82%) reported that the working environment of the factory did not affect their health.

In view of division, 12% workers of Dhaka division reported that their working conditions affect their health badly but such bad affect was not reported by 3% worker of both Chittagong and Khulna division (Table 6.33).

Considering factory category, all workers (100%) of pharmaceutical factory informed that their working environment did not affect their health. About 50% workers of thread ball factory, 22% workers of bidi factory, 6% workers of bakery products and rice milling factory, and 3% workers of RMG and apparel industry reported that they had harmful effect on health due to working environment (Table 6.34).

Table 6.32: Distribution of workers by effects of working condition on their health

Effect of working condition on workers health	Percentage of worker (%)
Good	1
Somehow good	3
Bad	14
Fatally bad	0
No effect	82
N	259

Table 6.33: Division wise distribution of workers by effect of working condition on their health

Effect of working condition on workers health	Dhaka (%)	Chittagong (%)	Khulna (%)
Good	1	2	2
Somehow good	5	4	18
Bad	12	3	3
Fatally bad	1	0	0
No effect	81	91	77
N	159	70	40

Factors affecting workers' Health Badly

We asked the workers about the factors that affect their health badly. It finds that irritating sound of machine, bad smell and dust of raw materials, congested office space, insufficient lighting and ventilation, continuous sitting, and weighty work in the working place were the main factors affecting workers health badly. (Table 6.35).The same factors were identified by the workers of all three divisions and all factory categories.

Table 6.34: Factory category wise distribution of workers by effects of working condition on their health

Factory category / Effect on health	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Good	8	0	0	6	0	100	11	22	0	0
Somehow good	2	0	0	0	0	0	11	0	0	0
Bad	3	4	3	0	6	0	6	0	22	50
Fatally bad	0	0	0	0	0	0	0	0	0	0
No effect	87	96	97	94	94	0	72	78	78	50
N	91	24	36	18	18	12	18	18	18	6

Suggestions to Improve the Existing Working Environment

We asked the workers about their suggestions to improve the existing working condition. Their suggestions are accumulated in table 6.35. It reveals that workers of all divisions and all factory categories suggested that the existing working environment can be improved by providing proper lighting and ventilation, adequate fan, sufficient office space, healthy sanitation system, drinking water for all,factory based doctor and free medicine, awareness program, rest room, day care for children, fire protected instruments, and back stairs as much as required (Table 6.36).

Table 6.35: Distribution of workers by how badly the working condition affect their health

How badly the working condition affect workers health	Percentage of worker (%)
Dust of raw materials	30
Insufficient lighting/Improper ventilation	20
Congested office space	11
Weighty work	20
Bad smell of raw materials	12
Irritating sound of machine	56
Continuous sitting	20
N	259

Table 6.36: Distribution of workers by suggestions to improve the existing working condition

Suggestions to improve the existing working condition	Percentage of worker (%)
Proper Ventilation and adequate lighting	30
Adequate Fan	12
Sufficient office space	11
Rest room	5
Day care for children	11
Factory doctor and free medicine	60
Back stair/ basic fire equipment for the factory	6 20
Awareness program	10
Drinking water for all	20
N	259

6.1.3.3 Regression Estimation on the Relationship between Working Environment and SMIE Workers' Health

We estimate a regression to examine the relationship between working environment and workers' health. Workers' health (Y) is defined by the number of absent days due to illness or by the BMI or by the individual expenses on health care. Therefore, the regression of workers' health (Y) is estimated on workers' age in years (X_1), years of education (X_2),daily working hour (X_3), congestion of work room (X_4), enough lighting in work room(X_5), providing sufficient drinking water(X_6), adequate wash room(X_7), proper cleanliness of wash room with suitable detergent(X_8), and washing hands with soap after using toilet (X_9). The independent variables, X_1 and X_2 are measured in years, X_3 is measured in ascending order, and others are defined as No=0, and Yes =1. Ordinary Least Squares (OLS) method is used to run the regression[5].

[5] In this regression estimation, variables Y, X_1 and X_2 are chosen following Ghatak A. and Madheswaran S. (2013), and other variables are selected following Asad et. al.(2013).

Therefore, the estimated regression using **number of absent days due to illness** as dependent variable gives the following result:

$Y=1.465+ 0.023 X_1-0.048 X_2+0.616 X_3+0.036 X_4-0.218 X_5 - 0.627 X_6 - 0.163 X_7 - 0.170 X_8 - 0.021 X_9$...... (6.1)

(t= 1.394) (t= 1.880) (t= -2.313)* (t= 3.072)* (t= .354) (t= -0.303) (t= -1.376) (t= -0.668) (t= -0.408) (t= -0.046)**

R^2 =0.117 DW Statistic 1.65 F-statistic 3.65 Prob (F-statistic) 0.000

*Shows 1% level of significance, ** Shows 10% level of significance

The estimated regression using **BMI** as dependent variable gives the following result:

$Y=17.204+ 0.050 X_1-0.005 X_2-.089 X_3-0.236 X_4 + 2.021 X_5 -0.331 X_6 +.989 X_7 - 0.071 X_8 +2.814 X_9$................ (6.2)

(t= 7.216)* (t= 1.845) (t= -112) (t= -.196) (t= -1.031) (t= 1.240) (t= -.320) (t= 1.790)** (t= -.075) (t= 2.722)***

R^2 =0.077 DW Statistic 1.342 F-statistic 2.315 Prob (F-statistic) 0.016

*Shows 1% level of significance, ** Shows 10% level of significance

The estimated regression using **individual expenses on health care** as dependent variable gives the following result:

$Y=225.005-.613 X_1-8.985 X_2+157.756X_3+25.810X_4-54.903 X_5 -283.317X_6 +164.692X_7 - 21.232X_8 + 238.483X_9$............ (6.3)

(t= .403) (t= -.096) (t= -.818) (t= 1.479) (t= .482) (t= -0.144) (t= -1.169) (t= 1.273) (t= -0.096) (t= .984)

R^2 =0.029 DW Statistic 1.402 F-statistic .834 Prob (F-statistic) 0.585

Using number of ill days, BMI and individual expenses on health care as dependent variable separately, the value of R^2 is found as 0.117, 0.077 and 0.029 in equation 6.1, 6.2 and 6.3 respectively. Since the highest value of R2 is found when we consider number of ill days as dependent variable, we analysis the regression estimation by using number of ill days as dependent variable (equation 6.1).

The estimation finds the significance of overall relation between dependent and independent variables. Workers' age, years of education and daily working hour are found significant with expected signs. It shows that for 1 unit increase in workers' age, number of ill days is increased by 0.023 units; 1 unit increase in years of education decreases the number of absent days by 0.048 units; for 1 unit increase in daily hours of work increased the number of absent days by 0.616 units. Other variables such as congestion of work room, enough lighting in work room, providing sufficient drinking water, adequate wash room, proper cleanliness of wash room with suitable detergent, and washing hands with soap after using toilet are found insignificant although each of the variables has expected sign representing the association between workers' health and productivity.

Hence, the estimation identified workers' age, years of education, daily working hour, congestion of work room, enough lighting in work room, sufficient drinking water, adequate wash room, proper cleanliness of wash room with suitable detergent, and washing hands with soap after using toilet as predominant causes of illness of the SMIE workers.

6.1.4 Concluding Remarks

The existing literatures discussed above recognize that industrial environment has both a positive and negative impact on workers health. Physical as well as social environment of workplace affects the health status of workers as well as their work performance. The estimated regression finds a positive association between working environment and workers illness.

Irritating sound of machine, bad smell and dust of raw materials, congested office space, insufficient lighting and ventilation, continuous sitting, and weighty work in the working place were identified as main causes that affect workers health badly.

The workers suggested that the existing working environment of SMIE sector can be improved by providing proper lighting, sufficient ventilation, adequate fan, enough office space, healthy sanitation system, factory based doctor, free medicine, awareness program, rest room, day care for children, fire protected instruments, and back stairs at work place as much as required to remain workers' healthy.

6.2 Residential Environment and Workers' Health

Residential environment plays a major role in individual health status, as a wide variety of residential features may influence the physical, social, and the mental well-being of occupants. Low per capita housing stock is a common problem in many economies, especially in the underdeveloped and developing countries where the population density is higher (Hacker, 1999).

There is a large and significant body of scientific literature that demonstrates convincingly that there are direct causal links between different aspects of poor housing and particular health conditions (Smith, 1990).

Therefore, this section describes and examines how and in what extent residential factors affect workers' health in Bangladesh.

6.2.1 Review of Studies: Theoretical and Empirical

For many years, the housing environment has been acknowledged as one of the main settings that affect human health. The quality of housing conditions plays a decisive role in the health status of the residents. Many health problems are either directly or indirectly related to the house itself and its surrounding conditions.

Numerous reviews and studies in the academic literature point to an association between various aspects of housing and health. However, despite the evidence linking housing to health, the direction of causality between housing and health is often unclear (Ranson 1991).

Jackson (2003) has identified that living conditions are the basis of many factors that influence workers health.

Fisher (2006) has stated that if the quality of rest, relaxation and personal care increase with household capital, say through the number of rooms in the home, household capital increases labor productivity as well as the health status of individuals.

Bonnefoy et al. (2003) with the assistance of World Health Organization (WHO) have conducted a study to assess the housing conditions in Eastern European countries and their potential health consequences. The study finds that health is affected by many different aspects of the home and its environment say, air quality, temperature, pests, noise, space, air- tightness, hygiene etc. The study identifies noise as one of the most constant factor influencing the perception of health and well-being of the workers.

They have found a strong association between housing conditions (eg tightness of windows), perception of indoor climate (temperature, indoor air quality) and the prevalence of people suffering from respiratory diseases (of an allergic nature or not).

Mullins and Western (2001) have conducted a study to examine the link between housing and health using survey data from a sample (N=1347) of South East Queensland households. The study has found that poor housing has a clear negative impact on residents' health. They identify cold, dampness, mould and overcrowding as the most the most significant residential factors that affect health.

Waters (2001) has examined the relationship between housing and health using data from the 1995 National Health Survey, which was conducted by the Australian Bureau of Statistics. The study reveals that overcrowded dwellings are associated with greater risk of infectious disease and poor mental health; and people who are living in residence that are damp, cold or mould are at greater risk of respiratory conditions, meningococcal infection and asthma.

WHO understanding of housing encompasses four dimension of residence: the physical structure of the residence as well as the meaning of home, the community with all neighbors, and the external dimension of the immediate housing environment.

For each individual dimension, there is an array of effects that can be expressed as direct or indirect health effects, or as a limitation of the quality of life of the residents.

Firstly, poor residence conditions such as mould growth, indoor air pollution, and emissions from building materials are as relevant issues as the occurrence of infestations, inefficiency of heating systems and insulation measures, or lack of hygiene and sanitation amenities may cause many of the direct health effects.

Secondly, on the structural side, the quality and the design of the residence are responsible for potential safety threats and the social functionality of the residence.

Thirdly, within the community, a range of health-relevant aspects depends on factors such as social unity of the community, the sense of trust, and collective efficacy that can facilitate social life.

Finally, the immediate housing environment has an impact on health through the quality of urban design. Poorly planned or deteriorated residential areas often lacking public services, greenery, parks, playgrounds, and walking areas.These have been associated with lack of physical exercise, increased prevalence of obesity, cognitive problems in children, and a loss of the ability to socialize.

Therefore, it is clear that housing conditions play a relevant role for individual as well as for public health. However, research based on the various sources of housing and health data suggests that poor housing is associated with increased risk of cardiovascular diseases, respiratory diseases and depression and anxiety.

6.2.2 Residential Factors that Influence Workers' Health

There are some factors related to the place where the workers live affect their health. These factors are summarized in the following figure 6.7:

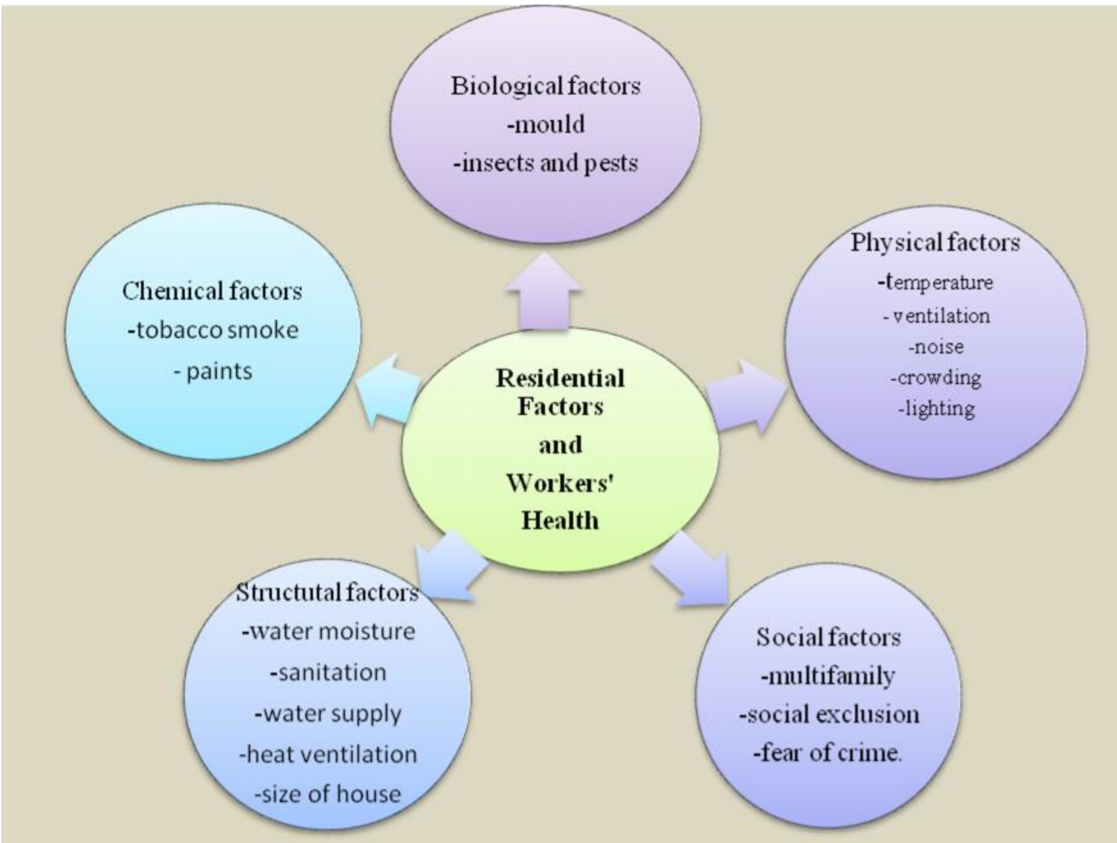


Figure 6.7: Residential environment affecting workers' health

Physical Factors

Crowding

Crowding is generally considered as more of a threat to mental than physical health, although the spread of infectious diseases such as tuberculosis and scabies is also associated with overcrowding.

Evans (2006) has found that residential crowding has been linked both with physical illness, including infectious diseases such as tuberculosis and respiratory infections, and with psychological distress among both adults and children. Children who live in crowded housing may have poorer cognitive and psychomotor development or be more anxious, socially withdrawn, stressed or aggressive.

There is some evidence that overcrowding in childhood may be associated with adult disease (Environmental Epidemiology Unit 1999: 27–28).

Noise Disturbance

The health effects of noise are twofold: auditory and non-auditory. The first is about hearing impairment and occurs almost exclusively from industrial settings such as environment noise. Non-auditory effects from noise disturbance occur from domestic and other environmental settings. This may comprise mental pressure and stress that can cause irritation and aggression, sleep disturbance, interruption of speech and social interaction, and cardiovascular effects.

Lighting

Adequate lighting in residence is an essential factor which can influence workers health. The scientific evidence, based on a recent European review, indicates that outdoor air supply rates below 25 L/s per person in commercial and institutional buildings are associated with an increased short-term sick leave and reduced productivity (Olesen).

Temperature and Ventilation

Exposure to very high or very low indoor temperatures can be detrimental to health. Cold indoor conditions have been associated with poorer health, including an increased risk of cardiovascular disease. Extreme low and high temperatures have been associated with increased mortality, especially among vulnerable populations such as the child and the elderly.

Biological factors

Damp and Mould

Mould spores are present in all kinds of indoor environment. There is increasing evidence that mould growth in damp buildings is an important risk factor for respiratory illness. Mould-related symptoms are likely as a result of irritation, allergy, or infection (Chapman et al., 2003).Some studies show a relation between dampness and mould and objective measures of lung function. Apart from respiratory symptoms, depression and the presence of general symptoms like fatigue, headache, dizziness, and difficulties in concentration were also reported due to mould (Rylander and Etzel, 1999).

Insect and Pests

The invasion of the home by harmful insects and pests is a direct threat to health. Once pests have entered into one household, they may lead to an infestation of the whole building and can become a small-scale epidemic if no counter-measures are taken. Allergies nowadays represent the most common health effect related to pests. For sensitive and allergic people, allergens from pest infestations are a major problem (WHO Regional Office for Europe, 1990).House dust mite and cockroaches are among the most relevant pests triggering adverse reactions and allergies.

Chemical Factors

Lead Paints

Lead is the main environmental toxin affecting children in housing. There are numerous sources of lead in the environment such as lead paint chips and dust from walls and older toys and contaminated soil from industrial sites, deteriorating external paint, and leaded gasoline emissions. Lead paint and leaded gasoline are no longer used, but there is still contamination from these sources.

Mushak & Crocetti (1989) have found that lead poisoning is associated with a decline in children's IQ, anemia, and damage to the nervous system.

Landrigan (2002) have identified lead exposure in young children as a particular hazard because children absorb lead more readily than adults do.

Environmental Tobacco Smoke

Environmental Tobacco Smoke (ETS) can be harmful to human health, in particular for children. Its effects include asthma, sudden infant death syndrome (SIDS), bronchitis and pneumonia, and other respiratory diseases (WHO Regional Office for Europe, 2000). Exposure to ETS may also cause lung cancer, eye, nose, and throat irritation, and may affect the cardiovascular system.

Radon Gas

Radon is an alpha-emitting radioactive gas that emerges from the soil and enters homes primarily through openings or cracks in the building foundation or through well water. Ambient radon gas and its particulate progeny result in respiratory exposure to alpha emissions. According to the available scientific evidence, inhalation of radon gas, especially in high doses, can cause lung cancer.

Structural Factors

Source of Drinking and Cooking Water

Source of drinking and cooking water is the vital element of residential environment. Access to an adequate and convenient supply of free potable water is essential to prevent dehydration, water poisoning and diseases resulting from lack of hygiene and access to a source of clean water. If the source of drinking and cooking water is not safe, obviously, the workers will be sick and it will reduce their productivity.

WHO (2005) has pointed out that although 83% of the population of developing countries has access to improved drinking water sources, only 42% have access through a household connection or a yard tap. Approximately 1.1 billion people do not have access to any type of improved drinking water facility.

Sanitation Facilities

Sanitation and restroom facilities are another crucial aspect of residential environment that have significant role in affecting workers health. Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease. Insufficient access to improved sanitation makes the worker ill and it may reduce their productivity.

Size of a House

Size or square fit of a house is a key factor of residential environment. If the residence is too much small in size it cannot maintain comfortable temperature; fresh air cannot be ventilated from the house. Number of room per household is also another important residential factor that can influence workers health.

Social Factors

Social factors like social exclusion, multifamily, and fear of crime as residential environment have a major impact on the quality of life of human being. Important housing-related factors affecting feelings of safety and fear of crime include having windows that close properly, being able to escape in case of fire, having adequate and working lights in the common areas, and being able to overlook the street from some part of the dwelling.

The World Health Organization (1998) has identified nine features of the housing environment that have important direct or indirect effects on the health of their occupants:

Firstly, the structure of the shelter, including the extent to which it protects the occupants from the elements;

Secondly, provision of adequate water supplies;

Thirdly, provision of proper sanitation and waste disposal;

Fourthly, the quality of the housing site;

Fifthly, overcrowding which can lead to household accidents and increased transmission of airborne infections such as acute respiratory infectious diseases, pneumonia and tuberculosis;

Sixthly, the presence of indoor air pollution associated with fuels used for cooking and heating;

Seventhly, food safety standards, including adequate provision for storing food to protect it against spoilage and contamination;

Eighthly, vectors and hosts of disease associated with the domestic environment; and

Lastly, the home as a workplace where the use and storage of toxic or hazardous chemicals and unsafe equipment may present health hazards.

6.2.3 Residential Environment of SMIE workers and Its Impact on Workers' Health

Various literature and studies identify an association between various aspects of residential environment and residents' health. Hence, this section makes an attempt to examine the residential environment and its influence on SMIE workers' health.

6.2.3.1 Residential Environment of SMIE workers

Using the study data, this section examines the residential environments of the SMIE workers in Bangladesh.

Type of Residence

The workers were asked about their type of residence. Their responses are given in table 6.37. It shows that majority of the SMIE workers lived in semi pacca house irrespective of the location where the factories are situated (Table 6.38). Only in case of pharmaceutical industry, most of the workers (92%) lived in pacca house (Table 6.39).

Table 6.37: Distribution of workers by type of house where they live

Type of house	Percentage of worker (%)
Kacha	8
Pucca	12
Semi pucca	70
Semi kacha	10
N	259

Table 6.38: Division wise distribution of workers by type of house where they live

Division / House type	Dhaka (%)	Chittagong (%)	Khulna (%)
Kacha	11	0	13
Pucca	11	10	23
Semi pucca	69	77	65
Semi kacha	9	13	0
N	159	70	40

Table 6.39: Factory category wise distribution of workers by type of house where they live

Factory Category / House type	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Kacha	6	0	11	11	17	0	0	0	39	0
Pucca	10	4	8	6	0	92	11	22	0	17
Semi pucca	69	96	81	83	83	8	83	50	39	83
Semi kacha	15	0	0	0	0	0	6	28	22	0
N	91	24	36	18	18	12	18	18	18	6

Staying Tenure at Present Residence

The study finds that about three fourth of the workers were staying in the same house more than one year (Table 6.40). The mean staying tenure in the present house was 2.7 years. No considerable regional or factory categorize variation was found regarding staying tenure of the workers.

Table 6.40: Distribution of workers by staying tenure in the present house

Staying tenure in the present house	Percentage of worker (%)
Less than 3 months	6
3-6 months	21
More than 1 year	74
N	259

Table 6.41: Distribution of workers by staying place before present job

Staying place	Percentage of worker (%)
Own house	86
House in the work place	14
N	259

Staying Place before Present Job

It is evident that mostly the SMIE workers (86%) reported that they used to live in their own house before their present occupation (Table 6.41). The same thing was observed for majority of the workers in all divisions and all factory categories.

Family Size of the worker

The workers were asked about their family size. Their responses are recorded in table 6.42. It depicts that the mean family size of the SMIE worker was 3 persons. Majority of the workers' (60%) family size was among 3 and 5 persons in all three study divisions (Table 6.43). Family size above 5 persons was found among the majority of the workers of bidi, bricks, and rice milling factories (Table 6.44).

Table 6.42:Distribution of workers by family size of the worker

Family size (persons)	Percentage of worker (%)
2	7
3-5	60
Above 5	33
Mean	3
N	259

Table 6.43: Division wise distribution of workers by family size of the worker

Division / Family Size (persons)	Dhaka (%)	Chittagong (%)	Khulna (%)
2	11	3	2
3-5	58	61	58
Above 5	31	36	40
N	159	70	40

Table 6.44: Factory category wise distribution of workers by their family size

Factory category / Family size	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
2	12	4	3	6	0	0	11	6	0	33
3-5	55	75	78	33	72	75	39	83	28	33
Above 5	33	21	19	61	28	25	50	11	72	33
N	91	24	36	18	18	12	18	18	18	6

Source of Drinking and Cooking Water

We asked the workers about their source of drinking and cooking water. Their responses are tabulated in table 6.45. It reveals that public tap was the main source of drinking water for the workers of Dhaka and Chittagong division where as it was tube well for the workers of Khulna division (Tabl 6.46, and figure 6.8). Factory category wise no considerable variation was not in this respect.

Table 6.45: Distribution of workers by source of drinking water

Source of drinking water	Percentage of worker (%)
Piped water	18
Public tap	56
Tube well/bore hole	26
N	259

Table 6.46: Division wise distribution of workers by source of drinking water

Division / Drinking water	Dhaka (%)	Chittagong (%)	Khulna (%)
Piped water	28	7	2
Public tap	56	66	38
Tube well/bore hole	16	27	60
N	259	70	40

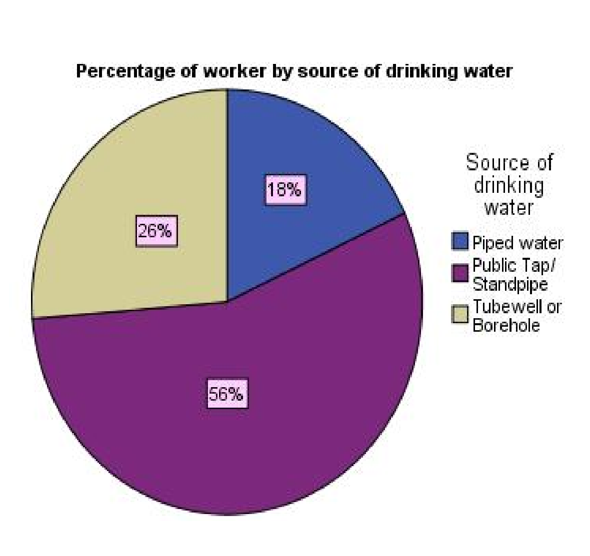


Figure 6.8: Distribution of workers by sources of drinking water

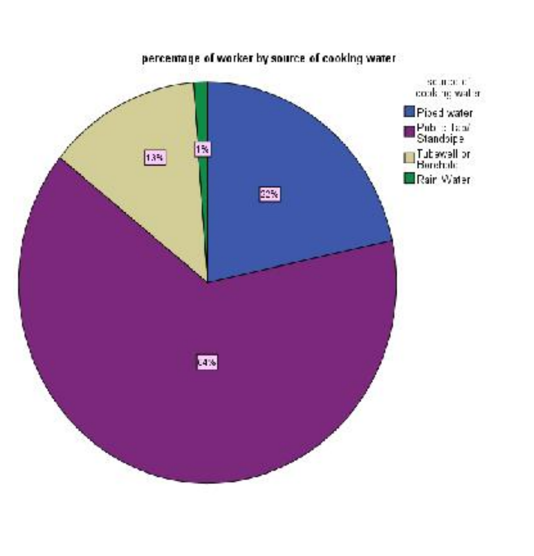


Figure 6.9: Distribution of workers by sources of cooking water

Public tap was the main source of cooking water for majority of the workers in all three divisions as well as as in all categories of factory. But the workers of Khulna division used tube well water more for cooking than the workers of other divisions (Table 6.47 and 6.48, and figure 6.9).

Table 6.47: Distribution of workers by source of cooking water

Source of cooking water	Percentage of worker (%)
Piped water	22
Public tap	64
Tube well/bore hole	13
Rain fall	1
N	259

Table 6.48: Division wise distribution of workers by source of cooking water

Division / Cooking water	Dhaka (%)	Chittagong (%)	Khulna (%)
Piped water	29	14	8
Public tap	60	73	65
Tube well/bore hole	11	13	27
N	259	70	40

Making Drinking Water Safe

We asked the workers whether or not they did anything to make water safe. Their answers are tabulated in table 6.49. It shows that about two third of workers did not do anything to make water safe .This situation was worst among the workers of Khulna division compared with the workers of Dhaka and Chittagong division (Table 6.50). A vast majority of the workers (92%) of pharmaceutical factory made the water safe but none of bidi factory did it at all (Table 6.51). Because the workers of bidi factory were mostly illiterate and they were not aware about safe drinking water.

Table 6.49: Distribution of workers by making water safe

Making water safe	Percentage of worker (%)
Yes	33
NO	67
N	259

Table 6.50: Division wise distribution of workers by making water safe

Division / Making Water safe	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes	35	40	15
NO	65	60	85
N	159	70	40

Table 6. 51: Factory category wise distribution of workers by making water safe

Factory category / Making water safe?	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	50	4	3	33	6	92	61	39	0	33
NO	50	96	97	67	94	8	39	61	100	67
N	91	24	36	18	18	12	18	18	18	6

Among the rest 33% of workers who made the drinking water safe, a vast majority (95%) of the workers did it by boiling water (Table 6.52). This was same among the workers in all divisions and in all factory categories.

Table 6.52: Distribution of workers by methods for making water safe

Methods to make water safe	Percentage of worker (%)
Boil	95
Purify tablet	4
Water filter	1
N	259

Toilet Facilities

The study finds that two third (65%) of the workers used septic tank as their toilet facility (Table 6.53).

Table 6.53: Distribution of workers by toilet facilities	
Type of toilet facility	Percentage of worker (%)
Flush or pour flush toilet	7
Septic tank	65
Pit latrine	14
Bucket toilet	10
Hanging toilet	4
N	259

Workers of Khulna division used bucket toilet facilities more than the workers of Dhaka and Chittagong divisions (Table 6.54 and figure 6.10).

Table 6.54: Division wise distribution of workers by toilet facilities

Division / Making Water safe	Dhaka (%)	Chittagong (%)	Khulna (%)
Flush or pour flush toilet	7	6	7
Septic tank	67	67	53
Pit latrine	17	17	0
Bucket toilet	6	4	38
Hanging toilet	3	6	2
N	149	70	40

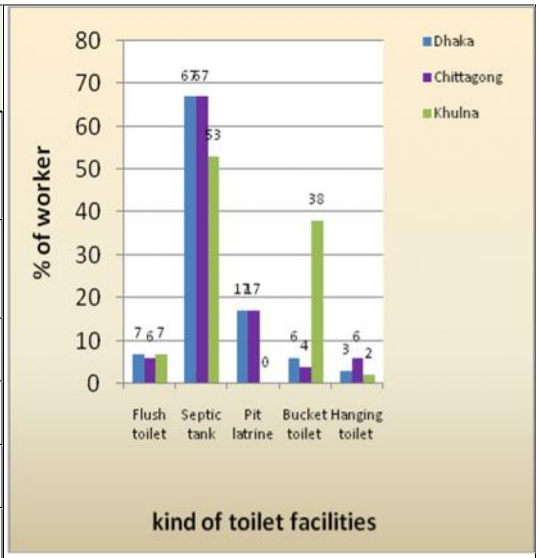


Figure 6.10: Division wise distribution of workers by toilet facility

Considering factory category, it is found that the workers of bidi factory, bricks and tiles factory, and bakery products used unhealthy toilet facilities more than the workers of other factory categories (Table 6.55). May be the workers of such factories were less conscious about the healthy sanitation due to not have proper education.

Table 6.55: Factory category wise distribution of workers by toilet facilities						
Factory Category	Percentage of workers by toilet facilities					
	Flush or pour flush toilet	Flush or septic tank	Pit latrine	Bucket toilet	Hanging toilet	N
RMG (woven)	9	64	21	3	3	91
Cotton textile except handloom	0	88	13	0	0	24
Knitwear	0	97	3	0	0	36
Bricks & tiles	0	50	6	27	17	18
Rice Milling	0	38	22	40	0	18
Pharmaceuticals	8	92	0	0	0	12
Bakery products	16	56	16	6	6	18
Printing and publication of newspaper	33	44	23			18
Bidifactory		11	17	61	11	18
Manufacturing of spooling and thread ball	0	100	0	0	0	6

Toilet Sharing

The workers were asked whether or not they used to share toilet with others. Their answers are shown in table 6.56. It is found that nearly all (94%) workers shared toilet facilities with other households; this sharing a bit lower among the workers of Khulna division than the workers of Dhaka and Chittagong division. Except pharmaceutical factory workers, almost all workers of other factories like bakery products, spooling and thread ball bricks factory, RMG, knitwear, cotton textile, and bidi factory shared their toilet facilities with others (Table 6.56, 6.57, 6.58, and figure 6.11).

Table 6.56: Distribution of workers by toilet sharing

Toilet sharing	Percentage of worker (%)
Yes	94
NO	6
N	259

Table 6.57: Division wise distribution of workers by toilet sharing

Division / Toilet sharing	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes	95	94	90
NO	5	4	10
N	159	70	40

Table 6.58: Factory category wise distribution of workers by toilet sharing

Factory category / Toilet sharing	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	93	96	94	100	89	67	100	80	94	100
NO	7	4	6	0	11	33	0	20	6	0
N	91	24	36	18	18	12	18	18	18	6

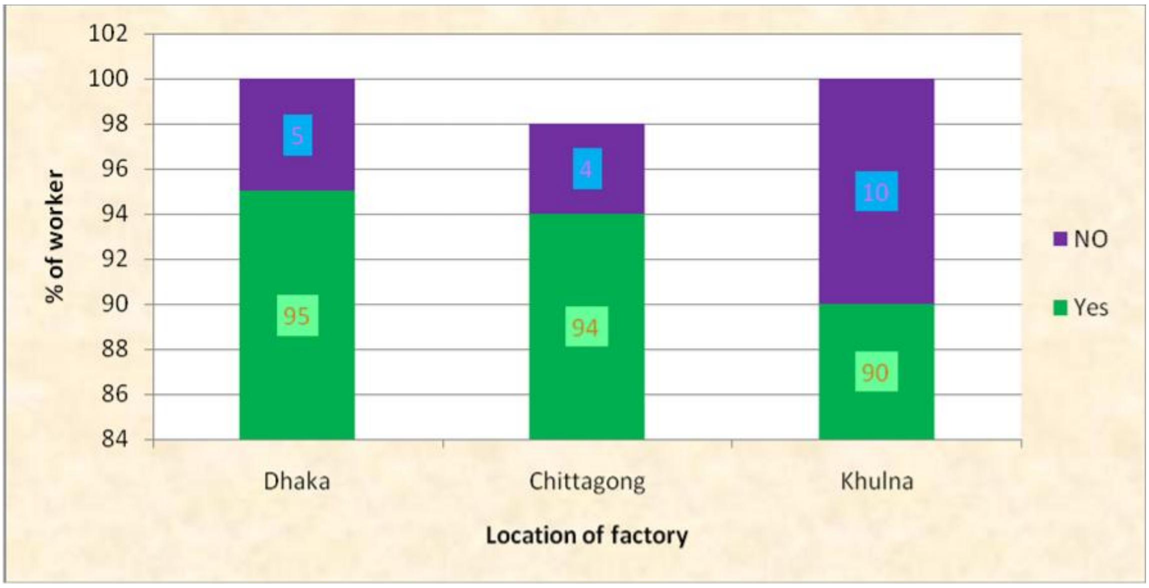


Figure 6.11: Location wise distribution of workers by toilet sharing

It is evident that about half of workers shared toilet with more than one household. This sharing was observed higher among the workers of Dhaka division than Chittagong and Khulna division. Workers of cotton textile, knitwear and rice milling factory shared toilet with more households than the workers of other factories (Table 6.59, 6.60 and 6.61).

Table 6.59: Distribution of workers by number of households with toilet sharing

Toilet sharing with households	Percentage of worker (%)
1	52
2-5	48
Others	0
N	259

Table 6.60: Division wise distribution of workers by number of households with toilet sharing

Division / Toilet sharing with house holds	Dhaka (%)	Chittagong (%)	Khulna (%)
1	43	60	76
2-5	57	40	24
Others	0	0	0
N	149	70	40

Table 6.61: Factory category wise distribution of workers by number of households with toilet sharing

Factory category / Toilet sharing with households	RMG (%)	Cotton tex (%)	Knitwear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
1	41	17	22	56	41	75	100	100	100	100
2-5	59	83	78	44	59	25	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
N	91	24	36	18	18	12	18	18	18	6

Washing Hands with Soap

It is evident that almost all (99%) workers in all divisions and in all factory categories reported that they used to wash their hands with soap after defecation (6.62).

Table 6.62: Distribution of workers by washing hands with soap after defecation

Washing hands after defecation	Percentage of worker (%)
Yes	99
No	1
N	259

But only 14% workers reported that they used to wash their hands with soap after taking meal. In this respect, the worst situation was observed among the workers of Khulna division (3%) among other divisions (Table 6.63).

Table 6.63: Distribution of workers by washing hands with soap after taking meal

Washing hands after taking meal	Dhaka (%)	Chittagong (%)	Khulna (%)	Total (%)
Yes	17	15	3	14
No	17	85	97	86
N	149	70	40	259

A vast majority of the workers of bidi factory, rice milling, thread balls factory, and cotton textile were not used to wash hands with soap after taking meal (Table 6.64).

Table 6.64: Factory category wise distribution of workers by washing hands with soap after taking meal

Factory category / washing hands after meal	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	Newspaper (%)	Bidi factory (%)	Spooling and thread balls (%)
Yes	21	4	20	0	11	100	22	22	0	0
No	79	96	80	100	91	0	78	78	100	100
N	91	24	36	18	18	12	18	18	18	6

Fuel for Cooking

Table 6.65 shows the distribution of workers by their fuel for cooking. It is evident that majority of the workers (78%) used natural gas and 21% used wood as a fuel of cooking (Table 6.65). Workers of Dhaka and Chittagong divisions used natural gas mostly as a fuel of cooking but the workers of Khulna division used wood as a main fuel of cooking (Figure 6.66). No significant variation regarding fuel of cooking was found among the workers of different factories.

Table 6.65: Distribution of workers by fuel of cooking

Fuel of cooking	Percentage of worker (%)
Electricity	1
Natural Gas	78
Biogas	0
wood	21
N	259

Table 6.66: Division wise distribution of workers by fuel of cooking

Division / Fuel of cooking	Dhaka (%)	Chittagong (%)	Khulna (%)
Electricity	0	0	0
Natural Gas	85	90	12
Biogas	0	0	0
wood	13	10	88
N	149	70	40

6.2.3.2 Impact of Residential Environment on Workers' Health

This section examines how and in what extent residential environment of SMIE workers' affect their health.

<u>Affect on Health</u>

We asked the workers whether or not their residential environment affect their health. Their answers are recorded in table 6.67. It reveals that almost all (97%) workers in all divisions and all factory categories reported that the residential environment affect their health.

Table 6.67: Distribution of workers by health affect due to living condition

Health affect due to living condition	Percentage of worker (%)
Yes	97
No	3
N	259

<u>Factors Affecting Workers Health Badly</u>

The workers were asked about the residential factors that affect workers health badly. Their responses are recorded in table 6.68.It is found that congested house, noise/crowding , insufficient ventilation and lighting, unhealthy sanitation facilities, toilet sharing, damp house, lack of sufficient drinking water, and insufficient income were the major factors that affect workers' health badly (Table 6.68). No significant regional and factory category wise variation was found in this respect.

Table 6.68: Distribution of workers by factors affecting workers health badly

How badly the living condition affect workers health	Percentage of worker (%)
Congested house	20
Noise/crowding	15
Insufficient ventilation and lighting	30
Unhealthy sanitation facilities	45
Toilet sharing	58
Insufficient income	88
Damp house	12
Lack of sufficient drinking water	42
N	259

Suggestions to Improve the Existing Residential Environment

We asked the workers about their suggestion to improve the existing residential environment. Their suggestions are given in table 6.69. It reveals that the workers irrespective of location and factories suggested that the workers living condition can be improved by increasing awareness program about healthy environment and the monthly income of the workers so that they can enjoy an affordable housing (Table 6.69).

Table 6.69: Distribution of workers by suggestions to improve their living conditions

Suggestions to improve living conditions of workers	Percentage of worker (%)
To increase the monthly income of workers	89
To increase the awareness program	11
N	259

6.2.3.3 Regression Estimation on the Relationship between Residential Environment and SMIE Workers' Health

To examine the relationship between residential environment and SMIE workers' health, we estimate the regression of individual health on their residential environment. Individual health is defined by number of absent days due to illness or BMI or individual expenses on health care. The regression of individual health (Y) is estimated on workers' age in years (X_1), years of education (X_2),type of house (X_3), source of drinking water(X_4), source of cooking water (X_5), making water safe (X_6), toilet facilities (X_7), sharing of toilet facilities (X_8), and washing hands with soap after using toilet (X_9), washing hands after taking meal (X_{10}), and fuel for cooking (X_{11}). The independent variables X_1 and X_2 are measured in years; X_3, X_4, X_5, and X_7 are arranged as ascending order; X_6, X_8, X_9, X_{10}, X_{11}, are defined as No=0, and Yes =1 . Ordinary Least Squares (OLS) method is used to run the regression[6].

The estimated regression using **number of absent days due to illness** as dependent variable gives the following result:

$$Y=1.222+ 0.039 X_1-0.060 X_2-0.149 X_3-0.211 X_4-0.217 X_5 - 0.378 X_6 + 0.155 X_7 + 0.552 X_8 + 0.068 X_9+ 0.072X_{10} \quad \text{............(6.4)}$$

(t= 2.039)** (t= 3.432)* (t= -2.888)* (t=-1.687)*** (t= -1.838)*** (t= -1.902)*** (t= -2.642)* (t= 2.092)** (t= 2.132)** (t= .392) (t= 1.376)

R^2 =0.166 DW Statistic 1.714 F-statistic 4.864 Prob (F-statistic) 0.000

*Shows 1% level of significance, ** Shows 5% level of significance, *** Shows 10% level of significance

The estimated regression using **individual expenses for health care** as dependent variable gives the following result:

$$Y=494.364+ 4.006 X_1-14.623 X_2 -65.888X_3-65.702X_4-7.368X_5 -113.151X_6 + 104.790X_7 + 2.676X_8 + 245.559X9-8.413X_{10} \quad \text{............ (6.6)}$$

(t= 1.531) (t= .649) (t= --1.315) (t= -1.387) (t= -1.06) (t= -.120) (t= -1.467) (t= 2.632)* (t=.019) (t= 2.622)* (t=-.299)

R^2 =0.0776 DW Statistic 1.541 F-statistic 2.034 Prob (F-statistic) 0.031

*Shows 1% level of significance

[6] In this regression estimation, variables Y, X_1 and X_2 are chosen following Ghatak A. and Madheswaran S. (2013), and other variables are selected following Office of the Surgeon General (2009).

Using number of absent days due to illness, BMI, and individual expenses on health care as dependent variable separately, the value of R^2 is found as 0.166, 0.072, and 0.077 in equation 6.4, 6.5 and 6.6 respectively. Since the highest value of R^2 is found when we consider number of absent days due to illness as dependent variable in equation 6.4, we explain the regression estimation taking number of ill days as dependent variable.

The estimation finds the significance of overall relation between dependent and independent variables. All independent variables are found with expected sign and all are statistically significant except two variables, washing hands with soap after taking mean and fuel of cooking. In implies that a 1 unit increase in sharing of toilet facilities increases the absent days of worker by 0.552 units. The estimation identifies workers' age, years of education, type of house, source of drinking water, source of cooking water, making water safe, toilet facilities, sharing of toilet facilities, and washing hands with soap after using toilet, washing hands after taking meal and fuel for cooking as leading causes of illness of the workers.

6.3. Conclusion

Literature and empirical findings reveal that bad working and residential environment are responsible illness of worker. The regression estimations also find a strong association between working as well as residential environment of workers and their illness.

Irritating sound of machine, bad smell and dust of raw materials, congested office space, insufficient lighting and ventilation, continuous sitting, and weighty work at work place are identified as main factors affecting workers health badly. On the other hand, congested house, noise/crowding, insufficient ventilation and lighting, unhealthy sanitation facilities, toilet sharing, damp house, lack of sufficient drinking water, and insufficient income are identified as major residential factors that affect workers' health badly.

To improve the existing working environment of SMIE sector the workers suggest to provide proper lighting, sufficient ventilation, adequate fan, healthy sanitation system, factory based doctor, free medicine at work place; and to improve the existing residential environment the workers suggest to increase their income level and to raise the health related awareness program among the workers.

CHAPTER SEVEN

WAGE DETERMINATION OF SMIE WORKERS

7.0 Introduction

In chapter 4, it is seen that wages and labor productivity are highly related supporting that labor productivity is an important determinant of wages in the labor market. In this chapter, at attempt is made to examine the wage-productivity relationship of SMIE workers in Bangladesh.

7.1 Wage Determination Systems in Bangladesh

In Bangladesh there is no uniform minimum wages for the workers across all sectors. Different wage structures prevail in different industries that are relevant to the job pattern of the workers (Faruque, 2009). Several wage boards have been set up at different times with the aim to fix minimum wages for workers employed in various enterprises, both public and private.

7.1.1 How Wages are Determined in Bangladesh?

Generally wages are specified in three ways:

Firstly, by laws laid down by the government on recommendation of National Pay Commission, Wages and Productivity Commission, and Minimum Wage Board.

Secondly, through negotiation between employers and the employees for private sector enterprises, and

Thirdly, through agreement between the trade unions and the employers for private sector enterprises.

In Bangladesh, wages are determined by three separate bodies. Wages for government employees are fixed up by National Pay Commission (NPC) that announces new pay scales every five or six years after.

Wages and related fringe benefits for workers in the public sector enterprises are determined from time to time through recommendation of the National Workers' Wages and Productivity Commission (Popularly known as Wages and Productivity Commission, WPC) established under the State-Owned Manufacturing Industries Workers (Terms and Conditions of Service) Ordinance, 1985. These commissions are normally set up by the government on *ad-hoc* basis from time to time in order to rationalize the pay and wage structure with cost of living, indices and other related factors. Usually, Wages Commission recommends a new pay structure by looking into the pay scale declared by the Pay Commission along with other factors.

On the other hand, rates of minimum wages for private sector workers are fixed by the Government on the recommendation of the Minimum Wages Board. The Board undertakes the task after every five years either by direct requisition of the Government or if the workers or employer or both of a particular industry so demands from the Government.

On the recommendation of the Minimum Wages Board, the Government fixes the minimum rates of wages for workers of the enterprises concerned. In case the Government considers that the recommendation is not, in any respect, equitable to the employers or the workers, it may refer it back to the Board for reconsideration. The Board is required to reconsider the recommendation after taking into account comments made and information given by the Government. On receiving the revised recommendation of the Board, the Government declares, through a Gazette notification, the minimum rates of wages for the workers concerned. Even then, if the rates so fixed seem to be inequitable to the employers or workers, the Government may again refer it back to the Board for reconsideration according to the procedure mentioned above. The minimum rate of wages declared by the Government is final and cannot be challenged by any person before any court.

If any of the factors mentioned above, require necessary changes in the rates of wages, the Board reviews its recommendation. It then recommends the Government any amendment, modification or revision of the minimum rates of wages declared earlier.

7.1.1.1 Determination of Minimum Wages in Public Sector Enterprises

In Bangladesh, the public sector plays a dominant role in employment generation for large segment of population. Government's intervention in wage regulation is, therefore, predominant. The first Wage Commission was set up in 1973 and according to its recommendations eight grades of wages were formulated for different categories of workers. In 1977 another commission was set up to revise the wage structure. This time the numbers of grades were increased to sixteen for different categories of workers. The Fourth Minimum Wage & Productivity Commission was formed in 1998.

The Fifth National Wages and Productivity Commission for workers of public sector enterprises (state owned industries) were formed in 2005. It recommended taka 2,850 as minimum wages and taka 4,250 as the highest wage to be paid in 16 scales. The government, with necessary modifications of the recommendations given by the Wages Commission, declared new pay scales with effect from January 1, 2006. Government fixed minimum monthly wage at 2,450 taka and the highest monthly wages at 3,980 taka. The highest possible wages, taking into account 16 scale increments, was taka 9,000.

7.1.1.2 Fixation of Minimum Wages for Private Sector Enterprises by the Minimum Wage Board

Until now no proper attention has been given to the private sectors for wage fixing. Specification of minimum national wage for private sector industries was mentioned when government signed an agreement with Sromik Kormochari Oikko Parishad (SKOP). The minimum wages board prepared a draft wage-scale for 38 private sectors in 2001. It kept agricultural and domestic workers outside the scheme of minimum wages. Minimum wages was fixed in that declaration as taka 1,200. Subsequently, another wage board was formed in January 2004 and it submitted its recommendation for minimum wages in private sector workers in March 2004. But agriculture and domestic workers' have been left out of the recommendations. Thus only 8 million workers have been brought under this scheme although about a 50 million of toiling workers are living without any legal protection regarding their wages.

7.1.1.3 Minimum Wages for RMG Workers

The first minimum wage board in Bangladesh, constituted in 1994, had fixed Tk940 as minimum wage per month for garment workers. The second one, formed in 2006, set the minimum wage at Tk1662.50 per month. The declaration was made on November 19, 2006 to be put into effect from October 22, 2006. The third review of the minimum wages has been announced on 29 July 2010. The monthly minimum wage (at entry level) for workers in the readymade garments industry (RMG) was settled (effect since November 2006) to Tk.3, 000. This breaks down to Tk.2,000 for basic needs, Tk.800 for rent, and a medical allowance of Tk.200 and was effective as of 1 November 2010.It was done after 3 years and it increased 80.45% of wages.

The government of Bangladesh announced a new minimum wage board for garment workers on May 12, 2013 and accordingly formed a six-member wage board to formulate a minimum wage structure for garment workers. Leaders of garments workers have placed their proposals to the chairman of minimum wage board, proposing a minimum of Tk 8,114 as monthly wages for the workers (Dhaka tribune, 2013). On the other hand, the owners of garments industry are not agreed to pay more than a minimum of Tk 3,600 as monthly wages for the workers (Daily Prothom Alo, 2013). At last, 14th November 2013, the government formally announced Tk 5,300 as the minimum salary with a basic of Tk 3, 000 for entry-level garment workers which would come into effect on December 1, 2013(Dhaka tribune, 22nd November 2013).

7.1.1.4 Minimum Wages for Unskilled and Juvenile Workers in All Private Sector Industries

On April 15, 2007, the government announced minimum wages for unskilled and juvenile workers employed in all private sector industries in Bangladesh. Here again, agricultural workers and workers in household affairs have been excluded. The government considered the recommendations of Minimum Wages Board and fixed minimum wages as taka 1500 inclusive of basic, house rent and medical allowance. In addition to minimum wages, workers will be entitled to all other benefits allowed by the employer. It applies to all private industries. If the government declares separate minimum wages for workers of any private industrial enterprises this minimum wages shall not apply to them. But no minimum wages structure should be below the amount fixed above.

7.1.1.5 Summary

The reality of wage structure for workers in public and private sectors is quite different from the legal framework discussed earlier. Informal sector workers, who form the largest section of the total workforce in Bangladesh, have not been brought within the legal framework of minimum wages. In some sectors, workers are still being paid under the decades old wages structure. For example, wages for agricultural workers were last determined in 1984 and since then wage structure has not been reviewed and no new scale has been fixed.

7.2 Estimation of the Relationship between Wages and Productivity of SMIE workers

The study uses data from 10 small and medium manufacturing sub-sectors that consists of 44 factories, which are located in three divisions like Dhaka, Chittagong and Khulna in Bangladesh. It examines the relationship between wage and productivity of workers from both workers' response and managers' responses.

From workers' response monthly wage of a labor is easily obtained from worker's response. Monthly average productivity of labor (APL) can be obtained by multiplying reported daily output of a worker with 24 (Since according to the labor law, for workers of industrial sector 1 month= 24 work days)). From managerial response, monthly wage of a labor is estimated by dividing monthly total wage bill of a firm by the total number labor. The average productivity is calculated by using the following formula:

Suppose, $Q=Q_L+Q_K+Q_{others}$ ………………(1)

Where, Q= total output of a firm

Q_L=output produced by total labor of a firm

Q_K=output produced by total capital of a firm

Q_{others}=output produced by other factors of a firm

Rearranging equation (1),

$Q_L=Q- Q_K-Q_{others}$………..(2)

Therefore, Average Productivity of Labor, $AP_L= \frac{QL}{L}$ ……………….(3)

Usually 'L' of a firm implies all employees of a firm. But since the study observes the relationship between wage and productivity; health and productivity of workers only, therefore 'L' in the study involves only labor excluding management personnel of a firm.

Age and education of workers are measured in years. Work experience is calculated by adding pervious factory's days of experience and present factory's experience.

Information collected from questionnaire on workers, and on managers is referred to as workers' response and managers' response respectively.

7.2.1 Regression Estimation on the Relationship between Wage and Productivity of SMIE Workers

Based on Workers' Response

Using Ordinary Least Squares (OLS) method we have estimated the regression[7] of Y (Wage) on X_1 (Productivity), X_2 (Age), X_3 (Education), X_4 (work experience). The variables Y and X_1 are measured in terms of taka; X_2, X_3 and X_3 are measured in terms of years. The estimated regression gives the following results:

$$Y = 1315 + 0.28\,X_1 + 27\,X2 + 122X_3 + .03\,X_4 \ldots\ldots\ldots\ldots (7.1)$$

$$(t=4.44)^{*} \quad (t= 12.25)^{*} \quad (t=2.8)^{*} \quad (t= 6.4)^{*} \quad (t= .44)$$

R^2 =0.612 DW Statistic = 1.575 F-statistic =100.083 Prob (F-statistic) = 0.0000

*Shows 1% level of significance,

The regression estimation finds the overall significant relation between dependent and independent variables. All independents variables are found in equation 7.1 with expected sign and statistically significant except the variable working experience (X_{4}). The estimated result implies that the monthly minimum wage of the SMIE worker is Tk 1315.

It suggests a significant positive relationship between wage and productivity of the SMIE workers indicating for every 1 unit increase in labor productivity, wage is incresed by 0.28 units. It also suggests that for every 1 unit increase in age, wage is increase ed by 27 units implying a strong positive correlation between wage and age of workers. The estimation shows a highly significant relationship between wage and education level of the workers.

To understand the relationship between wage and productivity, again we have estimated the regression[8] of Y (Productivity) on X_1 (Age), X2 (Education) and X_3 (Wage) using Ordinary Least Squares (OLS) method. The estimated regression is given below:

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[7] All variables in this regression estimation are chosen following the study of Goh S.K. (2009) and Klein (2012).

[8] Both dependent and independent variables in this regression estimation are chosen following the study of Rath and Madleswarna (2008) and Guiwen and Yanjuan (2010).

$$Y = 1585.79 + 11.94 X_1 + 94.75 X2 + 1.34 X_3$$

$$(t=2.43)^{**} \quad (t= 0.559) \quad (t=2.18)^{**} \quad (t= 12.42)^{*}$$

R^2 =0.547 DW Statistic = 1.905 F-statistic =102.798 Prob (F-statistic)= 0.0000

*Shows 1% level of significance, **Shows 5 % level of significance,

The estimated results suggest that productivity is significantly influenced by wages of worker indicating that 1 unit increase in wage increased the productivity by 1.34 units.

Based on Managers' Response

To examine the relationship between wage and productivity of workers, we have estimated the regression of Y (Wage) on X (Productivity) by using OLS method where both dependent and independent variables are measured in taka terms. The estimated regression gives the following result:

$$Y = 3522 + 0.19 X$$

$$(t=9.2)^{*} \quad (t= 4.1)^{*}$$

R^2 =0.29 DW Statistic = 2.071 F-statistic= 17.02 Prob (F-statistic) = 0.000

*Shows 1% level of significance

The estimated result signifies that the monthly minimum wage for the SMIE workers in Bangladesh is TK 3522. It suggests a significant relationship between wage and labor productivity implying that for every 1 unit change in labor productivity, worker's wage is changed by 0.19 units.

Again, using Ordinary Least Squares (OLS) method we have estimated the regression of Y (Productivity) on X (Wage) where both dependent and independent variables are measured in terms of taka. The estimated regression is given below:

$$Y = 313.88 + 1.52 X$$

$$(t=0.16) \quad (t= 4.13)^{*}$$

R^2 =0.288 DW Statistic = 2.399 F-statistic =17.029 Prob (F-statistic)= 0.0000

*Shows 1% level of significance,

The estimated results suggest that productivity is significantly influenced by wages of worker indicating that 1 unit increase in wage increased the productivity by 1.52 units.

7.2.2 Correlation Coefficient of Wage-Productivity Relationship

We have found a positive co relationship between wage and labor productivity of SMIE workers with correlation co-efficient value 0.734 (r = 0.734) from workers' response and correlation co-efficient value 0.537 (r = 0.537) from managers' response (table 7.1).

Table 7.1: Correlation Co-efficient of wage-productivity relationship of SMIE workers

		From workers' response		**From managers' response**	
		Monthly mean wage	**Monthly mean productivity**	**Monthly mean wage**	**Monthly mean productivity**
Monthly mean wage	Pearson Correlation	1	.734**	1	.537**
	Sig. (2-tailed)		.000		.000
	N	259	259	44	44
Monthly mean productivity	Pearson Correlation	.734**	1	.537**	1
	Sig. (2-tailed)	.000		.000	
	N	259	259	44	44
**. Correlation is significant at the 0.01 level (2-tailed).					

7.3 Wage-Productivity Gap of the SMIE Workers in Bangladesh

This section investigates the gap between wage and productivity of SMIE workers based on information collected from both workers and managers.

7.3.1 Gap Based on Workers' Response

It is evident that SMIE workers' mean wage is 56% of mean productivity that is wage –productivity gap is 44%. The mean difference between wage and productivity of worker is statistically significant (Table 7.2).

Table 7.2: Gap between wage and productivity of SMIE workers

	Wage	Productivity	Wage as a % of Productivity	Wage – Productivity Gap (%)
Mean (TK)	5451	9732	56	44
Mean difference (TK)	4281			
P-value	0.000			
N	259			

Source: Table 5.28 and Table 8.13

To investigate division wise gap between wage and productivity, it is found that this gap is slightly lower for the workers of Dhaka division (43%) than the workers of

Chittagong (45%) and Khulna (46%) division. Division wise mean difference between wage and productivity is statistically significant (Table 7.3).

Table 7.3: Division wise gap between wage and productivity of workers							
Division		Mean (TK)	Wage as a % of Productivity	Wage – Productivity Gap (%)	Mean difference (TK)	P-value	N
Dhaka	Wage	5517	57	43	4141	0.000	149
	Productivity	9658					
Chittagong	Wage	5369	55	45	4362	0.000	70
	Productivity	9731					
Khulna	Wage	5353	54	46	4657	0.000	40
	Productivity	10010					

Source: Table 5.30 and table 8.13

It is apparent that for all factory categories the gap between wage and productivity of worker is 41-47%. But it is to some extent higher for the workers of bidi factory (47%), and slightly lower for the workers of cotton textile, knitwear, and thread ball factory (41% for all three categories of factory).The mean difference between wage and productivity of workers is statistically significant for all factory categories (Table 7.4).

Table 7.4: Factory category wise gap between wage and productivity of workers							
Factory categories	Mean Wage (Tk)	Mean Productivity (Tk)	Wage as a % of Productivity	Wage – Productivity Gap (%)	Mean difference (Tk)	P-value	N
Readymade garments (woven)	5495	9871	56	44	4376	0.000	91
Cotton textile except handloom	5771	9804	59	41	4033	0.000	24
Knitwear	5197	8847	59	41	3650	0.000	36
Bricks & tiles	4861	8667	56	44	3806	0.000	18
Rice Milling	4567	8306	55	45	3739	0.000	18
Pharmaceuticals	7817	14083	56	44	6266	0.000	12
Bakery products	4805	8811	55	45	4006	0.000	18
Printing and publication of	6994	13000	54	46	6056	0.000	18

newspaper							
Bidi factory	4072	7656	53	47	3584	0.000	18
Manufacturing of spooling and thread ball	6300	10616	59	41	4283	0.000	6

Source Table 5.31 and Table 8.14

7.3.2 Gap Based on Managers' Response

Based on managers' response it is found that workers' mean wage is 63% of mean productivity; consequently the wage-productivity gap is 37%. The mean difference between wage and productivity of worker is highly significant (Table 7.5).

Table 7.5: Gap between wage and productivity of SMIE workers

	Wage	Productivity	Wage as a % of Productivity	Wage – Productivity Gap (%)	N
Mean (TK)	5035	7988	63	37	44
Mean difference (TK)	2953				
P-value	0.000				

Source: Table 5.33 and Table 8.22

Division wise this gap is slightly lower for the workers of Dhaka division (36%) than the workers of Chittagong (38%) and Khulna (40%) division. Mean difference of division wise wage-productivity gap is statistically significant (Table 7.6).

Table 7.6: Division wise gap between wage and productivity of workers

Division		Mean (TK)	Wage as a % of Productivity/	Wage-Productivity Gap (%)	Mean difference (TK)	P-value	N
Dhaka	Wage	5203	64	36	2884		
	Productivity	8087				0.000	25
Chittagong	Wage	4891	62	38	2974		
	Productivity	7865				0.000	12
Khulna	Wage	4682	60	40	3961		
	Productivity	7845				0.000	7

Source: Table 5.33 and Table 8.22

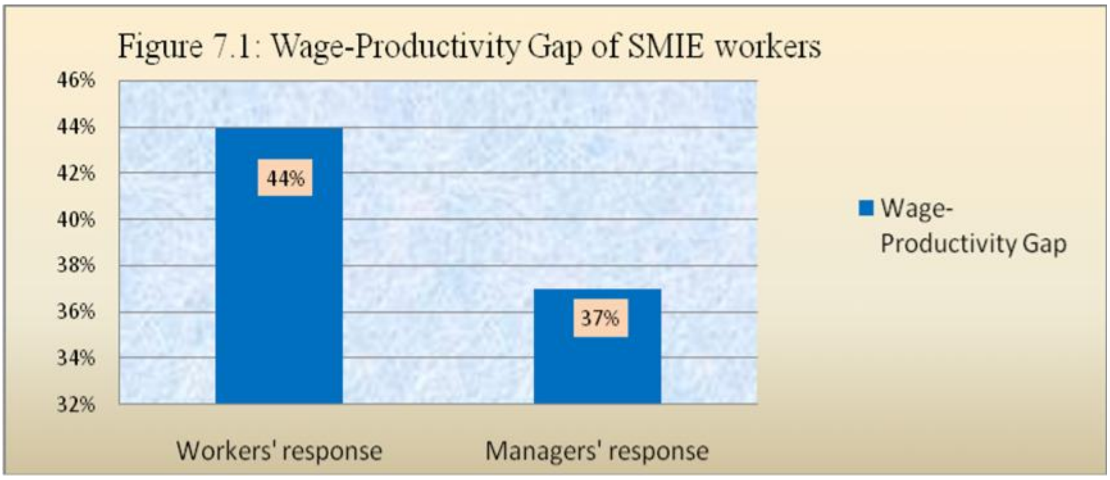
Table 7.7: Factory category wise gap between wage and productivity of workers							
Factory categories	Mean Wage (Tk)	Mean Productivity (Tk)	Wage as a % of Productivity	Wage – productivity Gap (%)	Mean difference (Tk)	P-value	N
Readymade garments (woven)	5062	7914	64	36	2852	0.000	15
Cotton textile except handloom	5030	8803	57	43	3773	0.000	4
Knitwear	5591	8745	64	36	3154	0.000	6
Bricks & tiles	5572	7959	70	30	2387	0.000	3
Rice Milling	4646	6099	76	24	1453	0.000	3
Pharmaceuticals	4137	6812	61	39	2675	0.000	3
Bakery products	5332	8094	66	34	2762	0.000	3
Printing and publication of newspaper	4765	7542	63	37	2777	0.000	3
Bidi factory	4832	9007	54	46	4175	0.000	3
Mfg of spooling and thread bal	5882	8529	69	31	2647	0.000	1

Source: Table 5.34 and Table 8.23

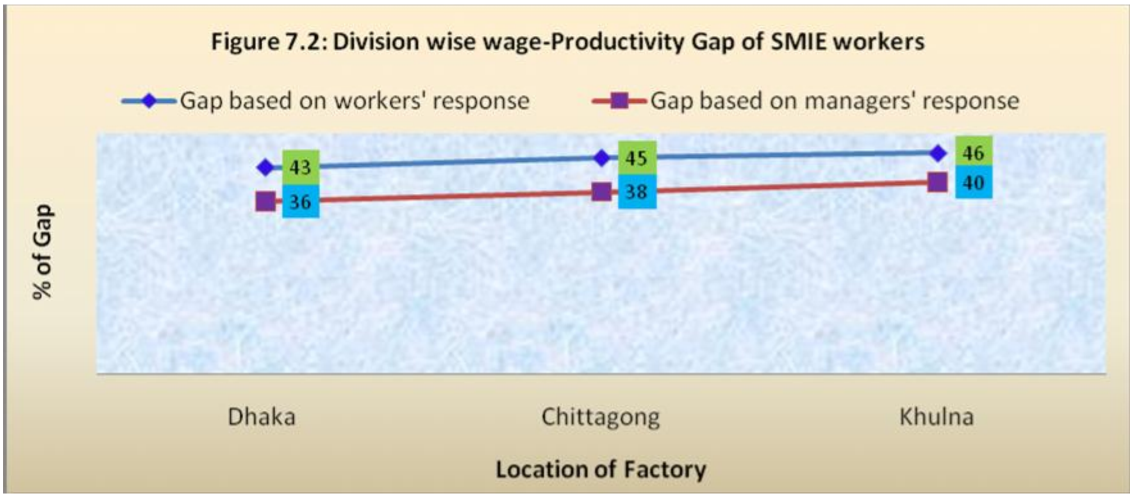
It is found that for all factory categories the gap between wage and productivity of SMIE worker is 24-46 %. But it is slightly higher for the workers of bidi factory (46%), and slightly lower for the workers of rice milling factory (24%) and bricks factory (30%).The mean difference between wage and productivity of worker is statistically significant for all factory categories (Table 7.7).

7.3.3 Gap Based on both Workers' and Managers' Response

It is found that from workers' response the overall wage-productivity gap is 44% and from managers' response this is 37% (Figure 7.1).

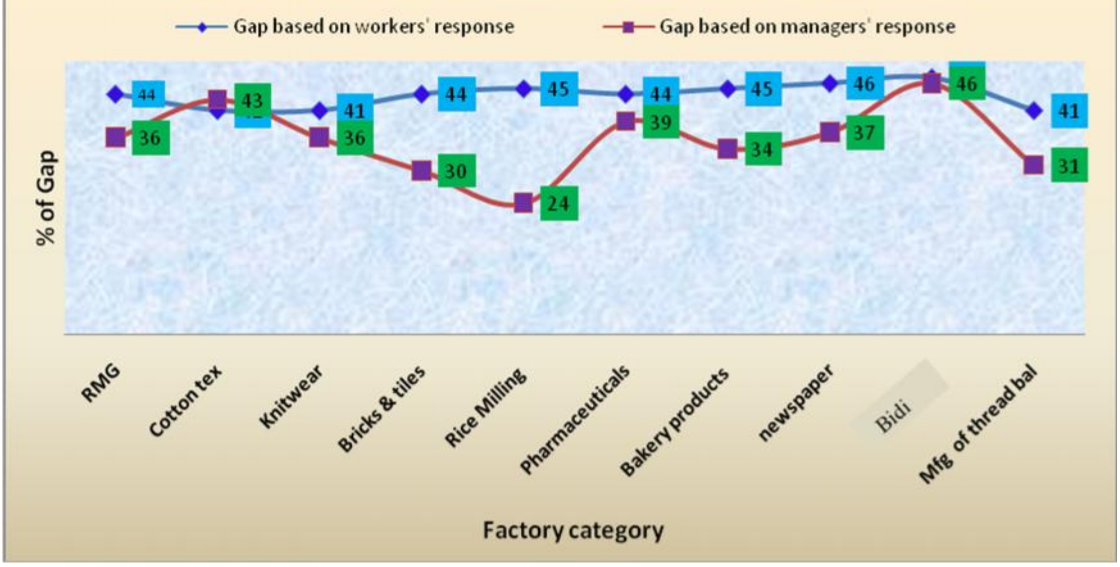


From both responses, the gap is lower for the workers of Dhaka division than the workers of Chittagong and Khulna division (Figure 7.2).



From both responses, the gap is higher among the workers of cigarette factory than the other categories of factory (Figure 7.3).

Figure 7.3: Fctory category wise wage-productivity Gap of SMIE workers



Hence, the study finds a significant widening gap between wage and productivity of small and medium manufacturing industries in Bangladesh. This gap was found as 16% in the manufacturing industries in Turkey (Elgin and Kuzubaş, 2012); 15% in the manufacturing industries in USA (Madeline Zavodny, 1999); 13% in the manufacturing sector of 31 OECD countries (Elgin and Kuzubaş, 2013).

7.4 Conclusion:

The findings of the study suggest that there exists a significant relationship between wage and productivity of SMIE workers in Bangladesh. It also identifies a considerable gap between wage and productivity of SMIE workers.

CHAPTER EIGHT

PRODUCTIVITY LOSS OF SMIE WORKERS DUE TO ILL HEALTH

8.0 Introduction

To fulfill the final objective of the study, in this chapter we would like to examine the productivity of SMIE workers and to estimate their lost productivity due to illness. Therefore, this chapter is designed under four sections. First section examines the empirical results on SMIE workers' productivity based on both workers' and managers' responses, and section two monetizes the lost productivity of SMIE workers due to illness. Section three estimates the total productivity loss of SMIE workers at selected ten 4-digit SMIEs and in total SMIE sector, section four examines the percentage share of lost productivity of SMIE sector at different sector's contribution to the economy of Bangladesh, and finally we have summarized the chapter.

8.1 SMIE Workers' Productivity

In this section we have discussed the findings on SMIE workers productivity on the basis of both workers and managers responses.

8.1.1 Information on SMIE Workers' Productivity from Workers' Response[9]

Missed Work Time

By asking the workers the question "did he miss any time from work because of his illness during the last 4 weeks", we have estimated the missed work time of SMIE workers due to their illness. It is observed that a vast majority of the workers (96%) missed work time during the last 4 weeks because of their illness (Table 8.1). It is found more among the workers of Dhaka division compared with the workers of Chittagong and Khulna division (Table 8.2). All the workers of all factory categories except pharmaceuticals have missed work time due to illness (Table 8.3).

[9] When information was collected by interviewing SMIE workers using 'questionnaire for workers' it is termed as workers' response. And when information was collected by interviewing owners or managers of factories using 'questionnaire for owners or managers' it is termed as managers' response.

Table 8.1: Distribution of workers by missed work time due to illness

Missed work time due to illness	Percentage of worker (%)
Yes	96
No	4
N	259

Table 8.2: Division wise distribution of workers by missed work time due to illness

Missed work time due to illness	Dhaka (%)	Chittagong (%)	Khulna (%)
Yes	98	94	90
No	2	6	10
N	149	70	40

Table 8.3: Factory category wise distribution of workers by missed work time due to illness

Factory category / Missed Work time	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products (%)	News paper (%)	Biri factory (%)	Spooling and thread balls (%)
Yes	100	100	100	100	100	8	100	100	100	100
No	0	0	0	0	0	92	0	0	0	0
N	91	24	36	18	18	12	18	18	18	6

Missed Work Days

The workers were asked about their missed work days due to illness. Their responses are recorded in table 8.4. It reveals that almost three fourth SMIE workers in all divisions and all factory categories missed maximum 2 days monthly from work due to their illness (Table 8.5).

Table 8.4: Distribution of workers by missed work days during the last 4 weeks by divisions

Missed work days due to illness during last 4 weeks	Dhaka (%)	Chittagong (%)	Khulna (%)	Total (%)
0	2	5	12	4
1	32	36	52	36
2	42	42	27	40
3	14	7	5	11
4	9	9	2	8
5 and above	1	1	2	2
N	149	70	40	259

Table 8.5: Factory category wise distribution of workers by missed work days during the last 4 weeks due to illness

Factory Category / Missed Work days	RMG (%)	Cotton tex (%)	Knit wear (%)	Bricks (%)	Rice Milling (%)	Pharmaceuticals (%)	Bakery products(%)	Newspaper (%)	Biri factory (%)	Spooling and thread balls (%)
0	0	0	0	6	0	92	0	0	0	0
1	24	25	36	61	50	8	44	84	39	33
2	52	46	44	28	39	0	34	11	33	50
3	12	21	6	5	11	0	22	0	17	0
4	10	8	14	0	0	0	0	5	11	17
5 and above	2	0	0	0	0	0	0	0	0	0
N	91	24	36	18	18	12	18	18	18	6

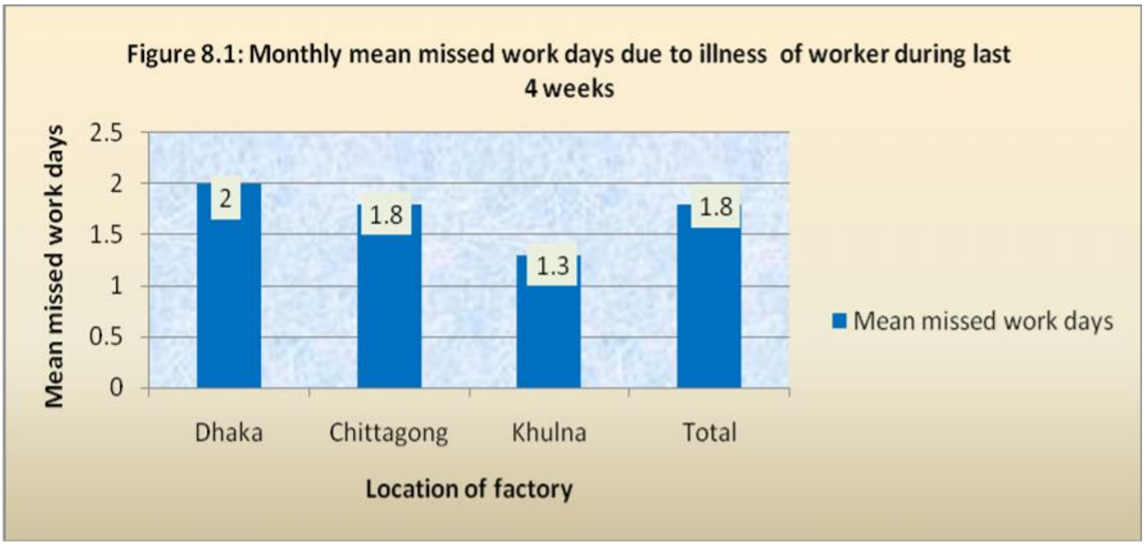
It is apparent that the mean missed workdays due to illness during the last 4 weeks was 1.8 days. It is evident slightly higher among the workers of Dhaka division (2 days) than the workers of Chittagong (1.8 days) and Khulna (1.3 days) division (Table 8.6 and figure 8.1). Workers of RMG sector have missed highest number of workdays due to illness in the last month than that of other factory categories (Table 8.7).

Table 8.6: Distribution of mean missed work days among the workers' during the last 4 weeks due to illness by divisions

Missed work days due to illness during last 4 weeks	Dhaka	Chittagong	Khulna	Total
Mean (days)	2	1.8	1.3	1.8
N	149	70	40	259

Table 8.7: Factory category wise distribution of mean missed work days among the workers' during the last 4 weeks due to illness

Factory category / Missed Work days	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Biri factory	Spooling and thread balls
mean	2.2	2.1	2	1.3	1.6	.08	1.8	1.3	2	2
N	91	24	36	18	18	12	18	18	18	6



Yearly Missed Work days

Multiplying monthly mean missed work days (Table 8.6) with 12, yearly mean missed work days of worker due to illness is estimated. It is found that the yearly mean missed workdays due to illness of SMIE worker is 22 days i.e. the inactivity rate[10] (absent days in percent) is 7.5 % of total work days. This is found higher (24 days) among the workers of Dhaka division and less among the workers in Khulna division (16 days) compared with the workers of other divisions. Considering categories of factory it is found higher among the workers of RMG and apparel factories and less in pharmaceuticals factory than the workers of other factory categories (Table 8.8 and 8.9).

[10] Inactivity rate is calculated by using the following formula which is also used by Statistics, Canada (2012).

$$\text{Inactivity rate} = \frac{\text{absent days in a month}}{\text{total work days in a month}} * 100 = \frac{1.8}{24} = 7.5$$

[According to labor law, 24 work days= 1 month and according to table 8.6 missed mean work days of worker in a month is 1.8 days.]

Table 8.8: Distribution of yearly missed mean work days among the workers due to illness				
Yearly missed work days due to illness of worker	Dhaka	Chittagong	Khulna	Total
Mean	24	22	16	22
N	149	70	40	259

Table 8.9: Factory category wise distribution of yearly missed mean work days due to illness										
Factory category / Missed Work days	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	News paper	Biri factory	Spooling and thread balls
mean	26	25	24	16	19	1	22	16	16	16
N	91	24	36	18	18	12	18	18	18	6

Payment for Missed Workdays

The workers were asked whether or not they received payment for missed workdays. Their answers are tabulated in table 8.10. It appears that a vast majority of the workers (96%) received regular pay even though they missed days from work. In this respect, no regional or factory category wise significant variation was found. Only the workers of pharmaceuticals factory reported that they had received the regular pay probably due to least missed work days due to illness.

Table 8.10: Distribution of workers by regular payment for missed work days due to illness	
Payment for missed work days	Percentage of worker (%)
Yes	96
No	4
N	259

Compensation of Missed Output and Cut down Salary

The workers were asked about the method of compensation of missed output when they become absent due to illness. Their responses are given in table 8.11. It reveals that the overwhelming majority of the workers (97%) stated that when they became absent due to illness the authority compensated the missed output by hiring someone within the same industry. In this regard, no regional or factory category wise considerable variation was observed. Almost all workers (96%) reported that the authority did not cut down their salary for the absent days due to illness (Table 8.12). No remarkable regional or factory category wise difference was found regarding cut down salary of the workers. The rest 4% workers who did not received salary during absent days reported that their salary was cut down on the basis of the respective workers' basic salary for their absence.

Table 8.11: Distribution of workers by compensating output by hiring someone

Compensating output by hiring some one	Percentage of worker (%)
Yes	97
No	3
N	259

Table 8.12: Distribution of workers whether the authority cut down salary for their absence

The authority cut down salary for absence	Percentage of worker
Yes	4
No	96
N	259

Absenteeism due to Ill health in terms of BMI

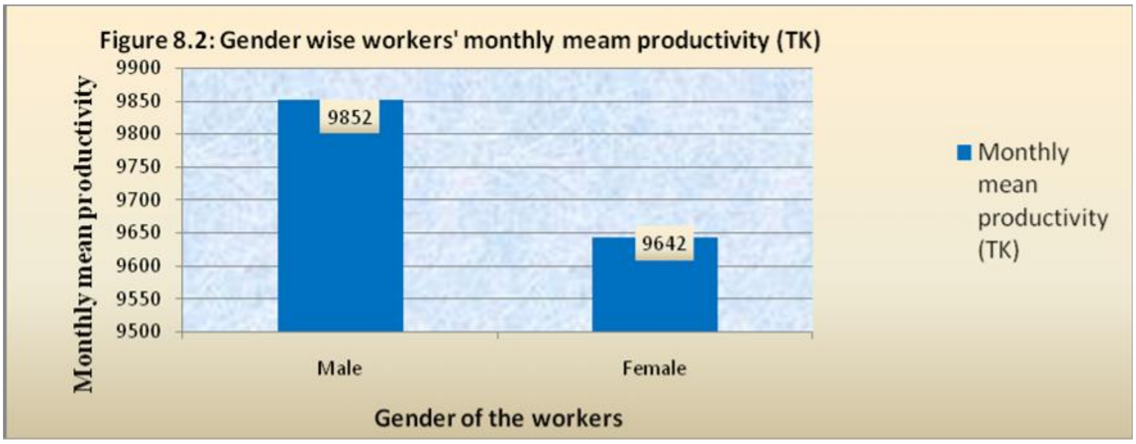
It is found that SMIE workers with under- weight, over-weight and obese (BMI less than 18.5 above 24.9) experience higher levels of absenteeism (24 days per year) due to illness than the normal weight workers (20 days per year). It indicates that under-weight, over-weight and obese workers miss approximately 4 more work days per year than normal-weight workers. That is, SMIE workers with under- weight, over- weight and obese have missed 20% more days than the workers with normal weight (Table 9, Appendix D).

Productivity of SMIE Workers

By asking the workers the question "how much output he or she produces daily or monthly", we obtained the answer in terms of money. On the basis of this, monthly mean productivity of the SMIE worker is estimated as Tk 9732. It was slightly lower for the workers of Dhaka division (TK 9658) than the workers of Chittagong (TK 9731) and Khulna (TK 10010) division (Table 8.13).

Table 8.13: Distribution of monthly mean productivity of workers by divisions				
Monthly productivity[11] (TK)	Dhaka	Chittagong	Khulna	Total
Mean	9658	9731	10010	9732
N	149	70	40	259

Monthly mean productivity of worker is found higher for the male workers (TK 9852) than the female workers (TK 9642) but it is not statistically significant (figure 8.2)



It is apparent that monthly mean productivity of the workers is the highest in the pharmaceuticals factory and the lowest in the cigarette factory (Table 8.14).

Table 8.14: Factory category wise distribution monthly mean productivity of workers										
Factory category / monthly productivity (TK)	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread balls
Mean	9871	9804	8847	8666	8305	14083	8811	13000	7655	10616
N	91	24	36	18	18	12	18	18	18	6

Lost Output due to Absenteeism

The workers were asked the question "could he or she roughly estimate the amount of output you could not produce due to absenteeism (missed workdays due to illness) during last 4 weeks". Their responses were received in money terms. Based on this,

[11] Monthly productivity is calculated by multiplying average daily output (in terms of TK) with 24 days. Since in labor law, 1 month equals 24 work days

monthly mean lost productivity for absenteeism is estimated as Tk 681.It is found higher among the workers of Dhaka (TK 750) division than the workers of Chittagong (TK 632) and Khulna (TK 505) division (Table 8.15).

Table 8.15: Distribution of monthly mean lost productivity of workers' due to absenteeism by divisions

Monthly lost productivity duo to absenteeism	Dhaka	Chittagong	Khulna	Total
Mean (TK)	750	632	505	681
N	149	70	40	259

It was prevalent more among the female workers than the male workers (Table 8.16).

Table 8.16: Gender wise workers' monthly mean lost productivity due to absenteeism (TK)

Lost productivity due to absenteeism (TK)	Male	Female
Mean	622	772
N	149	100

Monthly mean lost productivity was found higher among the workers of apparel factory and lower in pharmaceuticals compared with the workers of other factory categories (Table 8.17).

Table 8.17: Factory category wise workers' monthly mean lost productivity due to absenteeism

Factory category / lost monthly productivity (TK)	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread balls
Mean	845	822	654	425	513	58	605	677	586	800
N	91	24	36	18	18	12	18	18	18	6

Presenteeism

To collect the information on presenteeism (unable to concentrate on working because of not feeling well) the workers were asked whether or not they had any days they did work at job but put fewer hours than usual because of illness during last month. Their answers are tabulated in table 8.18. It shows that one fourth of the workers (28%)

reported that they did job but gave fewer hours than usual. In this respect, no considerable regional and factory category wise variation was found.

Table 8.18: Distribution of workers by missed hours due to presenteeism	
Missed work hours	Percentage of workers
Yes	28
No	72
N	259

Missed Work Hours due to Presenteeism

We asked the workers about their missed work hours during the last month due to presenteeism. Their answers are recorded in table 8, Appendix D. Based on this information monthly missed mean work hours due to presenteeism of worker is found 0.73 hours and it is found higher for the workers of Chittagong (1.19 hours) and Khulna division (0.90 hours) than the workers of Dhaka (0.47 hours) division (Table 8, Appendix D).

Lost Output due to Presenteeism

By asking the workers the question "can he estimate the output he could not produce due to presenteeism during last month", we received the responses in money term. On the basis of this, monthly mean lost productivity of workers due to presenteeism is estimated as Tk 27. Considering location of factory, it is marked that mean lost productivity due to presenteeism was the lowest in the Dhaka division (Tk 22) and the highest in Chittagong (Tk 45) division (Table 8.19).

Table 8.19: Distribution of monthly mean lost productivity of workers due to presenteeism by divisions

Monthly lost productivity duo to presenteeism	Dhaka	Chittagong	Khulna	Total
Mean (TK)	22	45	40	27
N	149	70	40	259

In view of factory category, it is apparent that the mean lost productivity due to presenteeism was higher for cotton textile (Tk 58), bakery products (Tk 55), and spooling and thread ball (Tk 52) factories than other categories of factory (Table 8.20).

Table 8.20: Factory category wise workers' monthly mean lost productivity due to presenteeism										
Factory category / monthly lost productivity (TK)	RMG	Cotton tex	Knit wear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Biri factory	Spooling and thread balls
Mean	28	58	30	20	23	10	55	45	28	52
N	91	24	36	18	18	12	18	18	18	6

Steps Taken to Reduce Absenteeism and Presenteeism

The workers were asked about the steps taken by the authority to reduce absenteeism and presenteeism. Their responses are recorded in table 8.21. It is found that warning, incentives for full attendance, hazira bonus, free medicine and 3 days late equal to 1 day absent were the major steps taken by the authority to reduce absenteeism and presenteeism of the SMIE workers (Figure 8.3). No considerable regional or factory category wise variation was found in this respect.

Table 8.21: Distribution of workers by managerial steps taken to reduce absenteeism and presenteeism

Steps to reduce absenteeism and presenteeism	Percentage of worker (%)	N
Cut down salary	3	19
3 days late =1 day absent	10	79
Notice to sack from job	6	51
Give warning	24	182
Incentives for full attendance	17	129
Warning to dismiss job	7	56
Hazira bonus	16	120
First aid	4	33
Free medicine	11	86
Try to understand about the necessity of attendance	2	17
Total	100	259

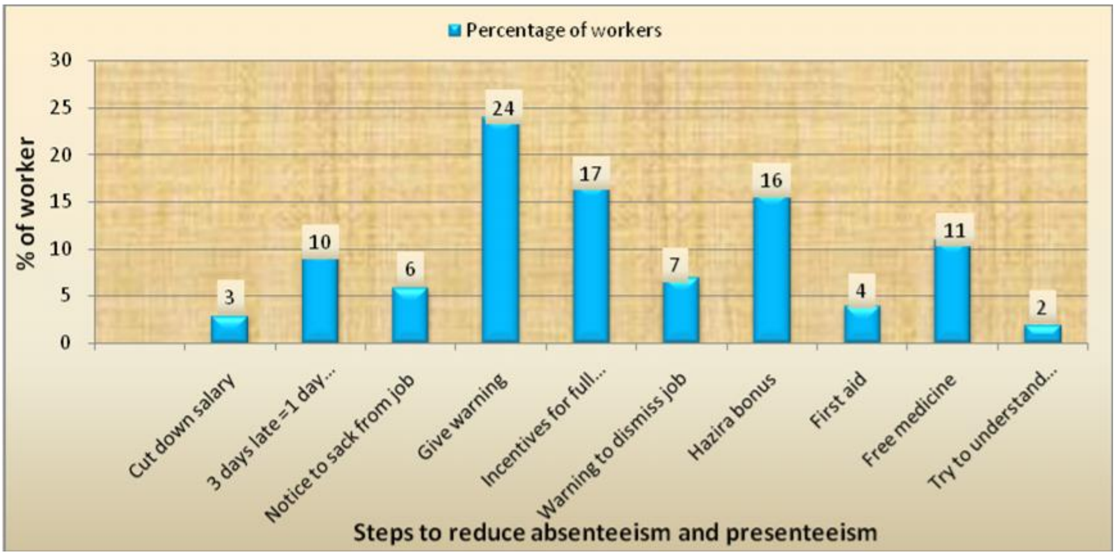


Figure 8.3: Distribution of workers by managerial steps to reduce absenteeism and presenteeism

8.1.2 Information on SMIE Workers' Productivity from Managers' Response*

Productivity of SMIE Workers

By interviewing the SMIEs' owners or managers using the questionnaire for SMIE owners' or managers', and by using the subtraction method of value added (in Chapter 3), the SMIE workers' productivity has estimated in taka word. Based on this, monthly mean productivity of SMIE workers is estimated as TK 7988.It has found to some extent higher among the workers of Dhaka (Tk 8087) division than the workers of Chittagong (Tk 7865) and Khulna (Tk 7846) division (Table 8.22).

Table 8.22: Distribution of monthly mean productivity of workers by divisions

Monthly productivity (TK)	Dhaka	Chittagong	Khulna	Total
Mean	8087	7865	7846	7988
N	25	12	7	44

Considering factory category it is evident that monthly mean productivity is lower for rice milling workers and higher for cotton textile workers compared with the workers of other factory categories (Table 8.23).

Table 8.23: Factory category wise distribution of monthly mean productivity of workers

Factory category / monthly productivity (TK)	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread balls
Mean	7914	8803	8745	7960	6099	6812	8094	7542	8006	8529
N	15	4	6	3	3	3	3	3	3	1

Missed Workdays

The owner or manager of each SMIE was asked about monthly average missed work day of the workers due to illness. Their responses are recorded in table 8.24. Based on this information, a monthly mean missed work day due to illness is estimated 1.9 days per worker. It is found slightly lower among the workers in Dhaka division (1.8 days) than Chittagong (2 days) and Khulna (2days) divisions (Table 8.24).

Table 8.24: Distribution of monthly mean missed work days due to absenteeism of workers by divisions

Monthly mean missed work days duo to absenteeism	Dhaka	Chittagong	Khulna	Total
Mean (Days)	1.8	2.0	2.0	1.9
N	25	12	7	44

To some extent it is found higher among the workers of cotton textile, bakery products, cigarette factory, and spooling and thread ball factories than other factory categories (Table 8.25).

Table 8.25: Factory category wise distribution of monthly mean missed work days

Factory category / monthly missed work days	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Bidi factory	Spooling and thread balls
Mean (Days)	1.8	2.2	1.6	1.6	1.8	1.4	2.2	2.0	2.2	2.2
N	15	4	6	3	3	3	3	3	3	1

Presenteeism

To get the information on presenteeism of workers, the managers/owners were asked about monthly average presenteeism rate (in hours). Their answers are given in table 8.26. On the basis of this, monthly mean presenteeism in terms of hour was estimated 2.9 hours per worker. In this respect, no considerable regional variation was observed.

Table 8.26: Distribution of monthly mean presenteeism (in hours) of workers by divisions

Monthly mean presenteeism	Dhaka	Chittagong	Khulna	Total
Mean (Hours)	2.9	2.8	2.9	2.9
N	25	12	7	44

It is observed a bit higher among the workers of RMG and knitwear factories compared with other factory categories workers (Table 8.27).

Table 8.27: Factory category wise distribution of monthly mean presenteeism (in hours) due to illness

Factory category / monthly presenteeism	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Biri factory	Spooling and thread balls
Mean (Hours)	3.1	2.8	4.1	2.3	2.7	2.3	2	2.3	2.3	2
N	15	4	6	3	3	3	3	3	3	1

Absenteeism Rate

To collect the information on absenteeism rate of SMIE workers we asked the managers or owners of factory about the monthly rate of absenteeism among the worker due to their illness. They have provided us the information on absenteeism rate using attendance book of workers of respective enterprise. Based on this information, it is found that the mean monthly absenteeism rate among the SMIE worker was 7.3 % and it is to some extent higher among the workers of Chittagong division (7.5 %) than the workers of Dhaka (7.2%) and Khulna (7.0 %) divisions (Table 8.28).This is found higher among the workers of spooling and thread balls (10%) and cotton textiles (9%)

and lower among the workers of pharmaceuticals (1.7%) factory than other factory categories (Table 8.29).

Table 8.28: Distribution of monthly mean absenteeism rate among the SMIE workers by divisions

Monthly absenteeism rate due to illness of worker	Dhaka	Chittagong	Khulna	Total
Mean (% of worker)	7.2	7.5	7.0	7.3
N	25	12	7	44

Table 8.29: Factory category wise distribution of monthly mean absenteeism rate due to illness

Factory category / absenteeism rate	RMG	Cotton tex	Knitwear	Bricks	Rice Milling	Pharmaceuticals	Bakery products	Newspaper	Biri factory	Spooling and thread balls
Mean (% of worker)	7.9	9.0	6.8	6.0	7.3	1.7	7.0	7.7	8.5	10
N	15	4	6	3	3	3	3	3	3	1

Compensation of Missed Output due to Absenteeism

The managers were asked about how they compensate output when the workers become absent due to illness. Their responses are recorded in table 8.30. It reveals that almost all owners/managers (99%) have stated that when the workers became absent due to illness the authority compensated the missed output by hiring someone within the same factory (Table 8.30). In this respect, no regional or factory category wise considerable variation has observed.

Table 8.30: Distribution of mangers by compensating output by hiring someone

Compensating output by hiring some one	Percentage of manager (%)
Yes	99
No	1
N	44

Steps Taken to Reduce Absenteeism of Workers

The managers were asked about the steps they had taken when the workers become absent due to illness. Their responses are given in table 8.31. It appears that incentives for full attendance, warning, and hazira bonus were identified as major steps taken by the authority to reduce absenteeism of the SMIE workers (Table 8.31). No considerable regional or factory category wise variation was found in this respect.

Table 8.31: Distribution of managers by managerial steps taken to reduce absenteeism

Steps to reduce absenteeism	Percentage of managers (%)	N
Cut down salary	4	4
Dismiss from Job	2	2
Give warning	28	32
Incentives for full attendance	32	35
Hazira bonus	22	25
Free medicine	4	5
Counseling	4	5
Written show cause	4	5
Total	100%	113

Measures Taken to Reduce Preenteeism of Workers

The managers were asked about the steps taken to reduce presenteeism. Based on their responses it is found that motivations to the workers towards more attentive in work, free medicine and warning were identified as major steps taken by the authority to reduce presenteeism of the SMIE workers (Table 8.32). No considerable regional or factory category wise variation was found in this respect.

Table 8.32: Distribution of managers by managerial measures taken to reduce presenteeism

Measures taken to reduce presenteeism	Percentage of managers (%)	N
Sick Leave	6	4
Send to Doctor	6	10
Motivation to be more attentive in work	47	30
Cut down salary	3	2
Give warning	12	8
Free medicine	16	10
Total	100%	64

Productivity of SMIE Workers based on both Workers' response and Managers' Response

Based on above table 8.13 and 8.22, it is clear that there exists a significant variation in monthly mean productivity of SMIE workers (Tk 9732 and Tk 7988 respectively) based on workers' response and managers' response (Figure 8.4).

Figure 8.4: Mothly mean productivity of workers based on both workers' and managers' responses

8.2 Monetization of Lost Productivity of SMIE Workers Due to Illness

Depending on the different methods of measuring lost productivity discussed in chapter two, the study selects salary conversion method to measure the productivity loss of the SMIE workers.

8.2.1 Estimation of Lost Productivity by Using Salary Conversion Method (Considering workers' response)

According to salary conversion method,

Monthly Lost Productivity due to illness = (Daily wage or output * Missed work days) + (Hourly wage or output * Missed work hours)

= Lost productivity due to absenteeism + Lost productivity due to presenteeism

Based on Wage

Monthly mean wage of the SMIE worker is estimated in table 5.28 in chapter 5. Dividing monthly mean wage by 24 (since according to the labor law for factory work, 1 month = 24 work days) daily wage per worker is found. Multiplying daily wage with missed work days, lost productivity due to absenteeism is estimated. Similarly, hourly wage is calculated by dividing daily wage by 8 (since 1 day = 8 work hour). Multiplying hourly wage with missed work hours, lost productivity due to presenteeism is measured. By adding productivity loss due to absenteeism and due to presenteeism, lost productivity due to illness is estimated (Table 8.33).

Table 8.33: Monthly mean lost productivity of SMIE workers due to their illness[12]		
Based on	Monthly mean lost productivity (TK)	N
Absenteeism	410	259
Presenteeism	20	259
Both absenteeism and presenteeism	430	259

The mean lost productivity of sample SMIE worker due to both absenteeism and presteeism is estimated Tk 430 per month (Table 8.20). Since 96% workers reported that they received wages when they missed workdays due to illness, monthly mean lost productivity of SMIE worker due to illness would be Tk 413 (96% of Tk 430).

Thus, according to salary conversion method,

[12] Monthly mean lost productivity (Tk) due to absenteeism (based on wage)

= Daily wage * Monthly missed work days

$= \frac{\text{Monthly mean wage}}{\text{total work days in a month}} *$ missed mean work days

$= \frac{5451}{24} * 1.8 =$ Tk 410 (Ref. table 5.28 and table 8.6)

Monthly mean lost productivity (Tk) due to presenteeism (based on wage)

= Hourly wage * monthly missed work hours

$= \frac{\text{daily mean wage}}{\text{total work hours in a day}} *$ missed mean work days

$= \frac{227}{8} * 0.73 =$ Tk 20 (Ref. table 5.28 and table 8, appendix D)

Monthly Lost Productivity due to illness = Lost productivity due to absenteeism + Lost productivity due to presenteeism

= Tk(410 + 20) = Tk 430

Monthly Lost Productivity due to illness (Based on wage)

= (Daily wage * Missed work days)

+

(Hourly wage * Missed work hours)

= TK 413

Based on Output (Productivity)

Monthly mean productivity of the SMIE worker is estimated in above table 8.13. Dividing monthly mean productivity by 24 (since 1 month = 24 work days) daily productivity per worker is found. Multiplying daily productivity (in taka) with missed work days, lost productivity due to absenteeism is calculated. Similarly, hourly productivity is calculated by dividing daily productivity by 8 (since 1 day = 8 work hour). Multiplying hourly productivity with missed work hours, lost productivity due to presenteeism is measured. By adding productivity loss due to absenteeism and due to presenteeism, lost productivity due to illness is estimated (Table 8.34).

Table 8.34: Monthly mean lost productivity of SMIE workers due to illness		
Based on	Monthly mean lost productivity (TK)	N
Absenteeism	675	259
Presenteeism	33	259
Both absenteeism and presenteeism	708	259

Monthly mean lost productivity due to both absenteeism and presenteeism (on the basis of output) is estimated Tk 708 (Table 8.34). This amount is 207% higher than mean lost productivity estimated by using wage. Therefore,

Monthly Lost Productivity due to illness (based on output)

= (Daily output * Missed work days)

+

(Hourly output * Missed work hours)

= TK 708

Location and Factory category wise monthly Mean Lost Productivity Due to Illness

Based on both wage and output it is evident that monthly mean lost productivity of SMIE worker is higher among the workers of Dhaka division (Tk 450 and Tk 763 respectively) than the workers of Chittagong and Khulna division.

There exists a highly significant difference between lost productivity based on wage and based on output in all three divisions (Table 8.35).

Table 8.35: Division wise monthly mean lost productivity of SMIE workers due to illness based on both wage and output			
Monthly Mean Lost Productivity due to Illness	Based on Wage* (TK)	Based on Output(TK)	N
Dhaka	450	763	149
Chittagong	400	683	70
Khulna	296	550	40
Total	413	708	259

* Since 4% workers did not received wage during absenteeism, 4% wages are deducted from lost productivity based on wage

It is found higher for the workers of cotton textile, RMG and spooling thread ball factories than the workers of other factory categories; It is the lowest (Tk 36 and 68 respectively) in the pharmaceuticals factory due to lower rate of both absenteeism and presenteeism. (Table 8.36).In view of factory categories, highly significant difference in lost productivity was found based on wage and output.

Table 8.36: Factory category wise monthly mean lost productivity of SMIE workers based on both wage and output			
Monthly mean lost productivity due to illness	Based on Wage[13] (TK)	Based on Output(TK)	N
RMG (woven)	498	860	91
Cotton textile	534	880	24
Knitwear	419	684	36
Bricks	266	445	18
Rice milling	296	536	18
Pharmaceuticals	36	68	12
Bakery	371	660	18
Newspaper	392	723	18
Bidi factory	348	614	18
Manufacturing of thread ball	518	852	6
Total	413	708	259

[13] Since 4% workers did not received wage during absenteeism, 4% wages are deducted from lost productivity based on wage

8.2.2 Estimation of Lost Productivity of SMIE Workers by Using Salary Conversion Method (Considering Managers' Response)

Based on Wage

Monthly mean wage of the SMIE worker is estimated in table 5.33 in chapter 5. Dividing monthly mean wage by 24 daily wages per worker is found. Multiplying daily wage with missed work days, lost productivity due to absenteeism is estimated. Similarly, hourly wage is calculated by dividing daily wage by 8. Multiplying hourly wage with missed work hours, lost productivity due to presenteeism is measured. By adding productivity loss due to absenteeism and due to presenteeism, lost productivity due to illness has estimated (Table 8.37).

According to salary conversion method,

Monthly mean lost productivity due to illness (based on wage)

= (Daily wage * Missed work days)
+
(Hourly wage * Missed work hours)

= TK 466

Based on Output (Productivity)

Monthly mean productivity of the SMIE workers is estimated in above table 8.22. Dividing monthly mean productivity by 24, daily productivity per worker is estimated. Multiplying daily productivity (in taka) with missed work days, lost productivity due to absenteeism is estimated. Information on missed work days is observed in above table 8.24. Similarly, hourly productivity is calculated by dividing daily productivity by 8. Multiplying hourly productivity with missed work hours, lost productivity due to presenteeism is measured. The information on workers presenteeism is estimated in table 8.26. By adding productivity loss due to absenteeism and due to presenteeism, lost productivity due to illness is estimated.

Hence, monthly mean lost productivity due to illness (based on output)

= (Daily output * Missed work days)
+
(Hourly output * Missed work hours)

= TK 739

Therefore, based on managers' response monthly mean lost productivity of SMIE worker due to both absenteeism and presteeism is estimated as Tk 466 and Tk 739 on the basis of wage and output respectively (Table 8.37).

Table 8.37: Monthly mean lost productivity of SMIE workers due to illness based on both wage and output

Monthly mean lost productivity (Tk)	On the basis of Wage (Tk)	On the basis of Output (Tk)	N
Based on absenteeism	389	617	44
Based on presenteeism	77	122	44
Based on both absenteeism and presenteeism	466	739	44

<u>Location and Factory category wise monthly Mean Lost Productivity Due to Illness</u>

From managerial response, it is evident that based on both wage and output monthly mean lost productivity is estimated higher among the workers of Chittagong division compared with other divisions; and among the workers of cotton textile and thread ball factory than other factory categories. There exists highly significant difference of lost productivity based on wage and based on output among the location and factory categories (Table 8.38 and 8.39).

Table 8.38: Division wise monthly mean lost productivity of SMIE workers based on both wage and output from managers' response

Monthly Mean Lost Productivity due to Illness	Based on Wage (TK)	Based on Output(TK)	N
Dhaka	458	703	25
Chittagong	487	805	12
Khulna	454	752	7

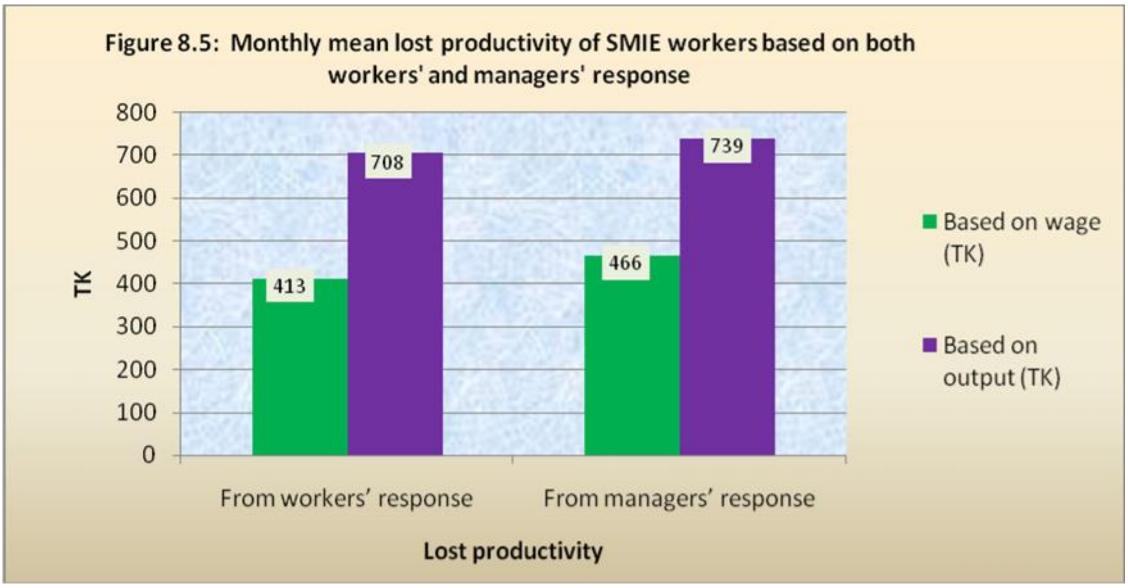
Table 8.39: Factory category wise monthly mean lost productivity of SMIE workers due to illness based on both wage and output from managers' response			
Monthly Mean Lost Productivity due to Illness	Based on Wage (TK)	Based on Output (TK)	N
RMG (Oven)	458	712	15
Cotton textile	535	936	4
Knitwear	463	808	6
Bricks	392	554	3
Rice milling	404	521	3
Pharmaceuticals	313	521	3
Bakery	501	743	3
Newspaper	520	823	3
Bidi factory	474	834	3
Manufacturing of thread ball	649	941	1
Total	466	739	44

Monthly mean lost productivity of SMIE workers based on both workers' and managers' response

No significant variation is found regarding monthly mean lost productivity based on wage and output separately from both workers' response and managers' response. But highly significant variation is observed about monthly lost productivity estimation based on wage and output from workers' response and managers' response separately.

The following table 8.40 and figure 8.5 represents the monthly lost productivity of workers based on both wage and output from both workers and managers responses.

Table 8.40: Monthly mean lost productivity based on both workers and managers response		
	Monthly mean lost productivity based on wage (Tk)	Monthly mean lost productivity based on output (Tk)
From workers' response	413	708
From managers' response	466	739



8.2.3 Lost Productivity as a Percentage of Productivity

It is estimated that overall monthly mean lost productivity of SMIE worker is 4% to 7% of monthly average productivity based on wage, and 6% to 9% of monthly average productivity based on output (Table 8.41). No significant location wise variation is found. It is evident that lost productivity due to illness of worker is a negligible percentage of average productivity among the workers of pharmaceuticals factory but for other factory categories, this percentage is almost closer each other (Table 5 and 6, Appendix D).

Table 8.41: Lost productivity of SMIE workers as percentage of productivity

Responses	Monthly mean productivity of workers (Tk)	Monthly mean lost productivity based on wage (Tk)	Monthly mean lost productivity based on wage (Tk) as % of monthly mean productivity	Monthly mean lost productivity based on output (Tk)	Monthly mean lost productivity based on output (Tk as % of monthly mean productivity
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
From workers' response	9732	413	4	708	7
From managers' response	7988	466	6	739	9

Sources: Column 2 uses information from table 8.13 and 8.22,Column 3 and column 5 use information from table 8.40,Column 4 is estimated as percentage of column 3 of column2 ,Column 6 is estimated as percentage of column 5 of column2

8.2.4 Lost Productivity of SMIE workers as a Share of their Direct Medical Expenses

It is found in table 5.55 in chapter 5 that the monthly mean medical expenses due to illness of the SMIE worker is Tk 528. Based on wage, monthly mean productivity of worker is found as 0.73 to 0.88 times of direct monthly mean medical expenses; and based on output, it is found as 1.34 to 1.40 times of direct mean medical expenses (Table 8.42). It is similar in all three study locations and all categories of factories except pharmaceutical factory where both the lost productivity and direct medical expenses were negligible.

Table 8.42: Monthly mean lost productivity of SMIE workers from both workers' and managers' response as percentage of their monthly mean direct medical expenditure

	Monthly mean direct medical expenses	Monthly mean lost productivity based on wage (TK)	Monthly mean lost productivity based on wage (TK) as share of monthly mean direct medical expenditure*	Monthly mean lost productivity based on output (TK)	Monthly mean lost productivity based on output (Tk) as share of monthly mean direct medical expenditure*
Column1	Column 2	Column 3	Column 4	Column 5	Column 6
From workers' response	528	413	0.73	708	1.34
From managers' response		466	0.88	739	1.40

* i) Column 4 is estimated as share of column3 of column 2
ii) Column 6 is estimated as share of column 5 of column 2

8.3 Total Lost Productivity of Selected Ten Industry Sub-group 4-Digit Level SMIEs

List of selected ten 4-digit level SMIEs are given in table 2.4 in chapter 2, and the monthly mean lost productivity of SMIE workers based on wage and output from both workers' and managers' response are estimated in tables 8.36 and 8.39.

On the basis of this information, monthly and yearly total lost productivity of ten 4-digit level SMIEs is estimated in the following table 8.43 and 8.44 on the basis of workers' response and managers' response respectively.

It is estimated by multiplying factory category wise total number of absent workers (due to illness) with respective factory's mean lost productivity.

Monthly lost productivity of selected ten 4-digit level SMIEs is estimated as Tk 2.17 crore and Tk 3.70 crore on the basis of wage based and output based monthly mean lost productivity respectively from workers' response and Tk 2.22 crore and Tk 3.52 crore respectively from managers' response.

Multiplying monthly total lost productivity of each category of selected ten 4-digit level SMIEs with 12, yearly total lost productivity of selected ten 4- digit level SMIEs are estimated. It is estimaed as Tk 26.07 crore and Tk 44.43 crore from workers' response , and Tk 26.66 crore and Tk 42.24 crore from managers' response on the basis of wage and output based lost productivity respectively.

It is significantly higher in RMG, knitwear and cotton textile factory than other factory categories from both workers' response and managers' response.

Table 8.43: Factory category wise monthly total lost productivity of selected ten 4-digit level SMIEs workers on the basis of wage and output based mean lost productivity from workers' response.

Sl. No.	BSIC (4-digit)	Selected SMIEs at 4-digit level	Sector wise Total employment in ten 4-digit SMIEs	Sector wise absenteeism rate (%) of ten 4-digit SMIEs	Sector wise Absent worker at 4-digit level	monthly Mean lost productivity based on wage(TK)	Monthly Mean lost productivity based on output (TK)	Wage based monthly total lost productivity (Tk in crore) [multiplying column 6&7]	Wage based yearly total lost productivity (Tk in crore)[column 9*12]	Output based monthly total lost productivity (Tk in crore)[multiplying column 6&8]	Output based yearly total lost productivity (Tk in crore) [column 11*12]
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12
1	1811	RMG (woven)	298778	7.9	23603	498	860	1.18	14.11	2.03	24.36

(Continued Table 8.43)

2	1711	Cotton textile except handloom	105451	9	9491	534	880	0.51	6.08	0.84	10.02
3	1730	Knitwear	57119	6.8	3884	419	684	0.16	1.95	0.27	3.19
4	2692	Bricks & Tiles	52725	6	3164	266	445	0.08	1.01	0.14	1.69
5	1535	Rice Milling	37305	7.3	2723	296	536	0.08	0.97	0.15	1.75
6	1541	Bakery products	20092	7	1406	371	660	0.05	0.63	0.09	1.11
7	2212	Printing and publication of newspaper	13621	7.7	1049	392	723	0.04	0.49	0.08	0.91
8	2423	Pharmaceuticals	10027	1.7	170	36	68	0.00	0.01	0.00	0.01
9	1603	Bidies Manufacturing	8020	8.5	682	348	614	0.02	0.28	0.04	0.50
10	1724	Manufacturing of spooling and thread ball	8640	10	864	518	852	0.04	0.54	0.07	0.88
Total ten 4-digit SMIE workers			611778		47036			2.17	26.07	3.70	44.43

Sources:

i) Column 1, 2, 3 and 4 are in used from table 2.4 in chapter 2.
ii) Column 5 i.e. sector wise absenteeism rate is taken from table 8.28.
iii) Column 6 is created by multiplying column 4 with percentage share of column 5.
iv) Column 7 and column 8 use information from table 8.36.

Table 8.44: Factory category wise total lost productivity of ten 4-digit level SMIE workers on the basis of wage and output based mean lost productivity from mangers' response

Sl.No.	BSIC (4-digit)	SMIE Establishment	Total employment in ten 4-digit SMIEs	Absenteeism rate of ten 4-digit SMIEs	4-digit SMIE wise Absent worker	monthlyMean lost productivity based on wage(TK)	Monthly Mean lost productivity based on output (TK)	Wage based monthly total lost productivity (Tk in crore) [multiplying column 6&7]	Wage based yearly total lost productivity (Tk in crore)	Output based monthly total lost productivity (Tk in crore)[multiplying column 6&8]	Output based yearly total lost productivity (Tk in crore)
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12
1	1811	RMG (woven)	298778	7.9	23603	458	712	1.08	12.97	1.68	20.17
2	1711	Cotton textile except handloom	105451	9	9491	535	936	0.51	6.09	0.89	10.66
3	1730	Knitwear	57119	6.8	3884	463	808	0.18	2.16	0.31	3.77
4	2692	Bricks & Tiles	52725	6	3164	392	554	0.12	1.49	0.18	2.10
5	1535	Rice Milling	37305	7.3	2723	404	521	0.11	1.32	0.14	1.70
6	1541	Bakery products	20092	7	1406	501	743	0.07	0.85	0.10	1.25

(Continued Table 8.44)

7	2212	Printing and publication of newspaper	13621	7.7	1049	520	823	0.05	0.65	0.09	1.04
8	2423	Pharmaceuticals	10027	1.7	170	313	521	0.01	0.06	0.01	0.11
9	1603	Bidies Manufacturing	8020	8.5	682	474	834	0.03	0.39	0.06	0.68
10	1724	Manufacturing of spooling and thread ball	8640	10	864	649	739	0.06	0.67	0.06	0.77
Total ten 4-digit SMIE workers			611778		47036			2.22	26.66	3.52	42.24

Sources:

i) Column 1, 2, 3 and 4 are in used from table 2.4 in chapter 2.
ii) Column 5 i.e. sector wise absenteeism rate is taken from table 8.28.
iii) Column 6 is created by multiplying column 4 with percentage share of column 5.
iv) Column 7 and column 8 uses data from table 8.39

8.3.1 Lost Productivity of Total SMIE Sector

8.3.1.1 Total Lost Productivity of 57 Categories SMIEs at 3-Digit Level

Based on the report on survey of manufacturing industries 2005-06, the total number of employment (operating workers) in the selected ten 4-digit level SMIEs is 611778 persons (Table 8.43) and the total employment in 57 categories 3-digit level SMIEs is 878760 persons (Table 3 in Appendix C).

Thus, total employment in the selected ten 4-digit level SMIEs covers 70% employment share of total SMIEs employment.

Monthly and yearly lost productivity of workers in selected ten 4-digit level SMIEs based on wage and output from both workers' and managers' responses are estimated in table 8.43 and 8.44.

Therefore, multiplying monthly lost productivity of workers in selected ten 4-digit level SMIEs with the ratio of 100 and 70, monthly lost productivity of total 57 categories 3-digit level SMIEs are estimated. Similarly yearly lost productivity of total 57 categories 3-digit level SMIEs are estimated.

On the basis of this, monthly total lost productivity of 57 categories 3-digit level SMIEs due to illness of worker was estimated as Tk 3.11 crore and Tk 5.30 crore from workers' response and Tk 3.17 crore and Tk 5.02 crore from managers' response based on wage and output based monthly lost productivity respectively.

Yearly total lost productivity of 57 categories SMIEs due to illness of worker was estimated as Tk 37.24 crore and Tk 63.47 crore from workers' response and Tk 38.09 crore and Tk 60.34 crore from managers' response based on wage and output based monthly lost productivity respectively (Table 8.45).

<u>From Workers' Response</u>

<u>Monthly</u>

Total lost productivity of 57 categories SMIEs,

Based on wage = (100/70) * (Tk 2.17 crore) =Tk **3.11** crore

Based on output = (100/70) * (Tk 3.70 crore) =Tk **5.30** crore

Yearly

Total lost productivity **of 57 categories SMIEs,**

Based on wage = (100/70) * (Tk 26.07 crore) =Tk **37.24** crore

Based on output = (100/70) * (Tk 44.43 crore) =Tk **63.47** crore

From Managers' Response

Monthly

Total lost productivity of **57 categories SMIEs,**

Based on wage = (100/70) * (Tk 2.22 crore) =Tk **3.17** crore

Based on output = (100/70) * (Tk 3.52 crore) =Tk **5.02** crore

Yearly

Total lost productivity **of 57 categories SMIEs,**

Based on wage = (100/70) * (Tk 26.66 crore) =Tk **38.09** crore

Based on output = (100/70) * (Tk 42.24crore) =Tk **60.34** crore

The following table 8.45 summarizes the estimation of monthly and yearly total lost productivity of 57 categories 3-digit level SMIEs due to illness of worker.

Table 8.45: Monthly and yearly total lost productivity of 57 categories 3-digit level SMIEs due to illness of worker

	Monthly lost productivity of total 57 categories SMIEs (Tk in crore)	Yearly lost productivity of total 57 categories SMIEs(Tk in crore)
From workers' response		
Based on wage	**3.11**	**37.13**
Based on output	**5.30**	**63.47**
From mangers' Response		
Based on wage	**3.17**	**38.09**
Based on output	**5.02**	**60.34**

8.3.1.2 Lost Productivity of Total SMIE Sector

According to the report on survey of manufacturing industries 2005-06, this 57 categories 3-digit level SMIEs cover only 16% enterprises of total SMIEs in Bangladesh (page 1 in SMI report 2005-06).

Assuming that total SMIEs in Bangladesh are homogeneous in the sense that all of these are manufacturing industry i.e. produced final goods from intermediate goods or raw materials, uses labor intensive technology, and follows ILO labor standard with respect to work time, over time payment, work leave as well as other work environment.

On the basis of above assumption, monthly lost productivity of total SMIEs in Bangladesh are estimated by multiplying monthly lost productivity of total 57 categories SMIEs with the ratio of 100 and 16. Similarly yearly lost productivity of total SMIEs is estimated.

Therefore, monthly lost productivity of total SMIEs in Bangladesh due to illness of the worker is estimated Tk **19.44 crore** and Tk **33.13 crore** from workers' response and Tk **19.81 crore** and Tk **31.38 crore** from managers' response based on wage and output based monthly lost productivity respectively.

Similarly, yearly lost productivity of total SMIEs in Bangladesh due to illness of the worker is estimated as Tk **232.75 crore** and Tk **396.69 crore** from workers' response and Tk **238.06 crore** and Tk **377.13 crore** from managers' response based on wage and output based monthly lost productivity respectively (Table 8.46).

<u>From Workers' Response</u>

<u>Monthly</u>

Lost productivity of total **SMIEs in Bangladesh,**

Based on wage = (100/16) * (Tk 3.11 crore) =Tk **19.44** crore

Based on output = (100/16) * (Tk 5.30 crore) =Tk **33.13** crore

<u>Yearly</u>

Lost productivity of total **SMIEs in Bangladesh,**

Based on wage = (100/16) * (Tk 37.24 crore) =Tk **232.75** crore

Based on output = (100/16) * (Tk 63.47 crore) =Tk **396.69** crore

<u>From Managers' Response</u>

<u>Monthly</u>

Lost productivity of total **SMIEs in Bangladesh,**

Based on wage = (100/16) * (Tk 3.17 crore) =Tk **19.81** crore

Based on output = (100/16) * (Tk 5.02 crore) =Tk **31.38** crore

<u>Yearly</u>

Lost productivity of total **SMIEs in Bangladesh,**

Based on wage = (100/16) * (Tk 38.09 crore) =Tk 2**38.06** crore

Based on output = (100/16) * (Tk 60.34 crore) =Tk **377.13** crore

The estimation of monthly and yearly total lost productivity of total SMIEs in Bangladesh due to illness of worker are summarized in the following table 8.46.

Table 8.46: Monthly and yearly lost productivity of total SMIEs in Bangladesh due to illness of workers from workers' and managers' response

	Monthly lost productivity of total SMIEs in Bangladesh (Tk in crore)	Yearly lost productivity of total SMIEs in Bangladesh (Tk in crore)
<u>From workers' response</u>		
Based on wage	**19.44**	**232.75**
Based on output	**33.13**	**396.69**
<u>From mangers' Response</u>		
Based on wage	**19.81**	**238.06**
Based on output	**31.38**	**377.13**

It is essential to mention here that our estimation of lost productivity of the total SMIE workers is undoubtedly underestimated. The reason is that our estimation is based on the number and employment of SMIEs obtained from SMI report 2005-2006. Since the year 2005, government of Bangladesh has taken various policies and steps to enhance SME sector which mainly includes formation of a national taskforce on SME development, formulation of an SME Advisory Panel, formation of an SME Foundation, providing financial support from various financial institutions like state-owned commercial banks (SOBs), specialized banks (SCBs), non-bank financial institutions (NBFIs), domestic private commercial banks (PCBs), foreign commercial banks (FCBs) and some government and non government organizations. Therefore, it is reasonable to think that both the number and employment of SMIEs have certainly increased in the year 2012-13. But since the number and employment data on SMIEs after SMI report 2005-06 are not available from any public or private sources, we are not able to estimate the lost productivity for this increased number and employment of SMIEs.

8.3.2 Total Lost Productivity of SME Sector (Based on Chowdhury and Ahmed, 2009)

In 2003 the International Consultancy Group (ICG) of the UK, in collaboration with the Micro Industries Development Assistance and Services (MIDAS), conducted the National Private Sector Survey of Enterprises in Bangladesh. The survey estimated that there were approximately 6 million Small and Medium Enterprises (SMEs), which included enterprises with up to 100 workers employing a total of 31 million people, equivalent to 40 per cent of the population of the country of age 15 years and above. The survey also found that the industrial structure of SMEs consisted of primarily wholesale and retail trade and repairs (40 per cent), production and sale of agricultural goods (22 percent), services (15 percent), and manufacturing only (14 per cent)(Chowdhury and Ahmed, 2009). There is no recent data on the exact number of SMEs and its employment number.

Therefore, we have estimated the total productivity loss of SME sector depending on the above information.

Total number of SME=6 million

Total employment in SMEs = 31 million = 31000000 persons

Total number of absent SME workers due to illness = 7.3 % of 31000000 =248000 persons

(In table 8.28 it is estimated that the average absenteeism rate among the workers of SMIEs' is 7.3 % due to their illness. Assuming that same absenteeism rate is prevalent among the workers in the SME sector.)

Based on the above assumption and information in table 8.42, we have estimated the lost productivity of total SME sector as follows:

<u>From Workers' Response</u>

<u>Monthly</u>

Lost productivity of total SME Sector due to illness of worker

Based on wage = mean lost productivity * Total number of absent SME workers

due to illness

= Tk 413*248000 =Tk **10.24** crore

Based on output = mean lost productivity * Total number of absent SME workers

due to illness

= Tk 708*248000 = Tk **17.60** crore

<u>Yearly</u>

Lost productivity of total SME Sector due to illness of worker

Based on wage=Tk **10.24** crore*12=Tk **123** crore

Based on output = Tk 17.6 crore*12 =Tk **211** crore

<u>From Managers' Response</u>

<u>Monthly</u>

Lost productivity of total SME Sector due to illness of worker

Based on wage = Tk 466*248000 =Tk **11.6** crore

Based on output = Tk 739*248000 = Tk **18.3** crore

<u>Yearly</u>

Lost productivity of total SME Sector due to illness of worker

Based on wage=Tk **11.6** crore*12= Tk **139** crore

Based on output = Tk **18.3** crore*12 =Tk **220** crore

The estimation of monthly and yearly total lost productivity of total SME sector in Bangladesh due to illness of worker are summarized in the following table 8.47.

Table 8.47: Monthly and yearly lost productivity of total SME sector in Bangladesh due to illness of workers from workers' and managers' response

	Monthly lost productivity of total SME sector in Bangladesh (Tk in crore)	Yearly lost productivity of total SMIE sector in Bangladesh (Tk in crore)
From workers' response		
Based on wage	**10.24**	**123**
Based on output	**17.60**	**211**
From mangers' Response		
Based on wage	**11.6**	**139**
Based on output	**18.3**	**220**

8.4 Importance of Lost productivity of SMIE Sector in the Economy of Bangladesh

The basis of sample selection of the study is the report on SMI 2005-06 but the study data was collected during the financial 2012-2013. So, it is logical that the amount of lost productivity of workers be compared with the same financial year's data.

From table 7, Appendix D, it is seen that from financial year 200-06 to 2012-13, nominal wage index for manufacturing industries is increased by 79%; within the same period GDP at constant price has increased by 54% ,and the GDP at current price is increased by 149% which is over inflated. Therefore, in this respect it is more reasonable to consider GDP at constant price.

It is noted that in FY 2012-13, GDP at constant price (Base year: 1995-96) was Tk 433720 crore, contribution of manufacturing industry to GDP was 19.54 % i.e. Tk 84749 crore, contribution of SME to GDP was 25% i.e. Tk 108430 crore, total national budget was TK 189326 crore, and health sector budget was Tk 9495 crore. [14]

Considering above information and table 8.46, percentage share of yearly lost productivity of total SMIE sector with different sectors' contribution to the economy is estimated and shown in table 8.48.

It is found as 0.27% to 0.47 % of manufacturing GDP from workers' response and from managers' response this share is 0.28% to 0.44%.

From workers' response, lost productivity is estimated as 0.21 % to 0.37 % of SME's contribution to GDP, and from managers' response it is found 0.22 % to 0.35%.

Lost productivity of total SMIE sector is estimated as 0.05% to 0.09% of GDP from both worker' and managers' responses though these share is not in remarkable amount.

It is found as 8.3% to 14.2% of SME sector's loan from workers' response and from managers' response this is found 8.5% to 13.5%.

It is noteworthy that lost productivity of total SMIE sector is estimated as a significant share of health sector's budget i.e. 2.5% to 4.2% from workers' response and 2.5% to 4.0% from managers' response

From both workers' and managers' responses, lost productivity of total SMIE sectors' workers are estimated as 0.12% to 0.21% of total national budget.

Though the share of lost productivity due to illness of worker is found small with respect of different sector's contribution to the economy of Bangladesh, it carries importance to the owners or managers of SMIEs. Because most of the owners of SMIEs are working with insufficient capital even some of them are facing acute financial crisis to run the factory properly though the government of Bangladesh has taken various initiatives to develop the SME sector for the economic development in Bangladesh.

[14] Bangladesh Economic Review 2013, Dhaka Tribune, June 7, 2013

Thus,

<u>From Workers' Response</u>

<u>Lost productivity of Total SMIE sector due to illness of worker</u>

i) as a percentage of manufacturing GDP

Based on wage = (232.75/84749) *100= 0.27 %

Based on output = (396.69/84749) *100=0.47 %

ii) as a percentage of contribution of SME to GDP

Based on wage = (232.75/108430) *100= 0.21%

Based on output = (396.69/108430) *100=0.37 %

iii) as a percentage of GDP

Based on wage = (232.75/433720) *100= 0.05 %

Based on output = (396.69/433720) *100=0.09 %

iv) as a percentage of SME sector's loan[15]

Based on wage = (232.75/2793) *100= 8.3%

Based on output = (396.69/2793) *100=14.2 %

v) as a percentage of Health sector's budget

Based on wage = (232.75/9495) *100= 2.5%

Based on output = (396.69/9333) *100=4.2 %

vi) as a percentage of total national budget

Based on wage = (232.75/189326) *100= 0.12%

Based on output = (396.69/189326) *100 = 0.21 %

[15] In order to boost up the SME sector in FY 2012-13, a total of Tk. 2,792.60 crore has been provided to 33,000 entities from the refinancing fund managed by Bangladesh Bank for small and medium enterprises (SMEs).

<u>From Managers' Response</u>

<u>Lost productivity of total SMIE sector due to illness of worker</u>

i) as a percentage of manufacturing sector's contribution to GDP

Based on wage	=	(238.06/84749) *100= 0.28 %
Based on output	=	(377.13/84749) *100=0.44 %

ii) as a percentage of contribution of SME to GDP

Based on wage	=	(238.06/108430) *100= 0.22 %
Based on output	=	(377.13/108430) *100=0.35 %

iii) as a percentage of GDP

Based on wage	=	(238.06/433720) *100= 0.05 %
Based on output	=	(377.13/433720) *100=0.09 %

iv) as a percentage of SME sector's loan

Based on wage	=	(238.06/2793) *100= 8.5%
Based on output	=	(377.13/2793) *100=13.5 %

v) as a percentage of Health sector's budget

Based on wage	=	(238.06/9495) *100= 2.5%
Based on output	=	(377.13/9495) *100=4.0 %

vi) as a percentage of total budget

Based on wage	=	(238.06/189326) *100= 0.13%
Based on output	=	(377.13/189326) *100 = 0.20 %

The following table 8.48 summarizes the lost productivity of workers due to illness as a share of different sector's contribution in the economy of Bangladesh.

Table 8.48: Yearly lost productivity of total SMIE sectors' workers as a percentage share of different sector's contribution to the economy from both workers' and managers' responses

	From worker's Response		From Manager's Response	
Lost productivity of SMIE sector	Based on wage	Based on output	Based on wage	Based on output
i) as a percentage of manufacturing GDP	0.27	0.47	0.28	0.44
ii) as a percentage of SME sector's contribution to GDP	0.21	0.37	0.22	0.35
iii) as a percentage of GDP	0.05	0.09	0.05	0.09
iv) as a percentage of SME sector's loan	8.3	14.2	8.5	13.5
v) as a percentage of health sector's budget	2.5	4.2	2.5	4.0
vi) as a percentage of total national budget	0.12	0.21	0.13	0.20

8.5 Conclusion

Study suggests that the missed mean work days of the worker due to illness are estimated as 8% of work days and the mean absenteeism rate of SMIE worker is 7.3 %. No significant variation regarding missed work days as a percentage of work days and absenteeism rate among location of factories and factory categories except pharmaceuticals factory have observed.

Monthly mean lost productivity of worker due to illness is estimated Tk 413 and Tk 708, from workers' response, and Tk 466 and Tk 739 from managers' response based on wage and output respectively. Wage based and output based lost productivity are almost similar separately from both responses.

Monthly lost productivity of selected ten 4-digit level SMIEs is estimated as Tk **2.17 crore** and Tk **3.70 crore** on the basis of wage based and output based monthly mean lost productivity respectively from workers' response and Tk **2.22 crore** and Tk **3.52 crore** respectively from managers' response.

Monthly mean lost productivity of total SMIEs in Bangladesh is estimated Tk **19.44 crore** and Tk **33.13 crore** from workers' response and Tk **19.81 crore** and Tk **31.38 crore** from managers' response based on wage and output based monthly lost productivity respectively.

From both workers' and managers' responses lost productivity of total SMIE sector is estimated as 0.05% to 0.09% of GDP, 2.5% to 4.2% of health sector's budget, and 0.12% to 0.20% of national budget.

Due to unavailability of most recent data, the study uses SMIE data available in the report on survey of manufacturing industries 2005-2006 but it collects the data on productivity of SMIEs workers in the year 2012-2013. Because of this time lag our estimated lost productivity of total SMIE sector is undoubtedly underestimated. The underlying reason for this is that during this time gap both the number and employment of SMIEs increased manifold in the presence of government promotional policies.

In fine, it can be said that though the share of estimated lost productivity of total SMIE workers due to their illness with respect to GDP and national budget is small, it has importance to the national economy of Bangladesh.

CHAPTER NINE

SUMMARY AND CONCLUSION

9.0 Introduction

In this chapter we have attempted to represent a short summary of our findings on the relationship between health and productivity of SMIE workers in Bangladesh and finally we have drawn some conclusions and put forward a few recommendations.

9.1 A Brief Summary of the Study

This section provides a brief summary of the findings of the study.

9.1.1 It is found that SMIE workers are mostly below middle aged, married, Muslims and in normal weight. Most of the workers' educational status is primary and lower secondary level. Workers of bidi, bricks and tiles, rice milling, and bakery product factories have less education than the workers of newspaper and pharmaceuticals factories. Majority of the workers have no work experience anywhere else; among the others who have work experience, the maximum work tenure is 2 years.

9.1.2 Theoretical literature and empirical evidences suggest that health is an important underlying determinant of productivity at the both micro- and macroeconomic levels. The empirical findings reveals that a good health of SMIE worker has a significant positive impact on workers' productivity implying that a decrease in 1 absent day due to illness increases worker's productivity by 94.52 units and a 1 unit increase in BMI (ill health to good health) increases worker's productivity by 318.16 units.

We have found that SMIE workers with under- weight, over-weight and obese (BMI less than 18.5 above 24.9) experience higher levels of absenteeism (2 days per month or 24 days per year) due to illness than the normal weight workers (1.67 days per month or 20 days per year). It indicates that under- weight, over-weight and obese workers miss approximately 4 more work days i.e. 20% more days per year than normal-weight workers.

The similar estimation was done by Tucker and Friedman (1998).They have found that over-weight and obese (BMI above 25) employees experience higher levels of absenteeism due to illness than normal weight employees in U.S.A. They have estimated that normal-weight workers miss an average of 3.2 days each year due to illness or injury but it was found 4.5 days for over -weight and obese workers. That is, workers with over- weight and obese missed 40% more days than the workers with normal weight.

9.1.3 Both theoretical and empirical literature suggests that labor productivity and wages are positively related. Sometimes higher productivity determines higher wages and sometimes higher wages leads to higher productivity. Linking labor productivity with wages has a positive effect on the economy.

We find a positive co-relationship between wage and labor productivity of SMIE workers with correlation co-efficient value 0.734 (r = 0.734) from workers' response and correlation co-efficient value 0.537 (r = 0.537) from managers' response.

Similarly, Nayak and Patra (2013) finds a positive relationship between wage and labor productivity of Odisha (in India) manufacturing sector workers with correlation co-efficient value 0.883 (r = 0.883).

Our regression results shows a significant association between wages and productivity of SMIE workers suggesting that a 1 unit increase in labor productivity increases the wage by 0.28 units from workers' response and by 0.19 units from managers' response. On the other hand, a 1 unit increase in wage raises the labor productivity by 1.34 units from workers' response and by 1.52 units from managers' response.

In the same way, the study of Guiwen and Yanjuan (2010) reveals a significant long run relationship between wages and labor productivity in the construction industry in Guangdong province, China suggesting that a 1 unit increase in labor remuneration increases the labor productivity by 0.25 units.

Rath and Madheswaran (2008) have estimated that a 1 percent increase in real wage is associated with a 4.2 percent rise in labor productivity in the Indian manufacturing sector in the long run. Goh S.K. (2009) finds a positive relationship between real wage and labor productivity implying that in the long run every 1 percent rise in labor productivity raises the real wage of Malaysian workers by 1.223 percent.

9.1.4 The monthly mean income of the SMIE worker is found as Tk 5451.It is slightly higher among the workers of Dhaka division than the workers of Chittagong and Khulna division. Considering factory categories, it is the highest among the workers of pharmaceutical factory (Tk 7817) and the lowest among the workers of bidi factory (TK 4072).

It is found that the monthly mean expense for treatment of the SMIE worker due to illness is Tk 528. It is higher for the female (TK 561) workers than their male (TK 508) counterpart, and for the workers of Dhaka division (TK 638) compared with the workers of Khulna (TK 413) and Chittagong (Tk 362) division. Considering categories of factory, RMG, knitwear, and thread ball factories workers have higher monthly mean expenses for treatment than that of other factory categories. The amount is negligible for the workers of pharmaceutical factory because they suffer least from illness.

Our regression result suggest that insufficient expenditure on health care is found as cause of depleted health stock of SMIE workers supporting that a 1 unit increase in health care expenditure (insufficient amount to sufficient amount) reduces the ill days of worker by 1.026 units.

It is evident that the SMIE workers have spent most part of the treatment expenses for diagnosis and medicine (62%), and doctor's fee (34%). Doctor's fee is comparatively lower but diagnosis and medicine cost, and transportation cost are higher for the workers of Dhaka division than the workers of Chittagong and Khulna division. Among the workers of all divisions and in all categories of factories, it is apparent that workers' expenditure for treatment affects their family's other expenditure such as expenditure on food, clothing, children's education, and next month's expenditure etc.

9.1.5 We have found that majority of the SMIE workers suffered from respiratory diseases like occupational asthma, bronchitis, allergic rhinitis etc.; pain like low back pain, knee joint pain, occupational hand injury etc. It is noted that typhoid, jaundice, anemia and different types of pain were the major diseases suffered by RMG and apparel factories workers. Workers of bricks factory suffered mainly from different types of pain from leg injury, hand injury etc. Workers of bidi, bakery products and rice milling factories mostly suffered from respiratory diseases. Workers of pharmaceuticals and newspapers rarely have suffered from any diseases. No significant regional variation in diseases pattern has observed.

Similar findings were found from the study of Rahman et al. (2011).They have found that fever, gastrointestinal diseases and respiratory diseases as the most reported complaints among the rural people in Bangladesh. Rahman and Rahman (2013) have identified loose motion, cough and breathlessness as predominant disease among the garments workers in Bangladesh.

Our study reveals that about 15% SMIE workers did not seek any treatment when they became ill and most of the SMIE workers received treatment from pharmacy based doctor, kabiraj/hekim, paramedics etc in all three study divisions and in almost all categories of factories. A very few of workers (2%) seek treatment from formal/modern healthcare services. It interesting to mention that workers of pharmaceutical industry occasionally feel sick and they never received treatment from pharmacy based doctor, kabiraj/hekim or paramedics; they either ‘did nothing’ or took modern home remedy.

A study of Zaman S. et al (2000) reveals that majority (54%) of the female factory workers did not seek any treatment when they became ill and their main sources of treatment included pharmacies, local doctors, or traditional healers. Rahman and Rahman (2013) find that about 11% of garments worker in Bangladesh did not take any treatment for their illness and they mainly seek treatment from local medical assistant and family planning training, pharmacists& kabiraj.

Though the government of Bangladesh has taken various steps to ensure health facilities for all, the SMIE workers usually don’t seek treatment while they become ill from the modern and public facilities as much as required. May be the reason is that the SMIE workers have not enough health related knowledge and skills so that they can seek appropriate health care services from modern public facilities when they become ill.

9.1.6 We have found that majority of the SMIE workers usually work 12 hours daily but occasionally their work time becomes more than 12 hours. Workers of Dhaka and Chittagong divisions have worked more hours of time (Usually 12 hours) than the workers of Khulna division. Workers of bidi factory, spooling and thread ball, bakery products, bricks and tiles factory, knitwear and RMG have worked 12 hours daily. Two third of the workers get extra payment or overtime payment when they work more than 12 hours.

Though internationally and nationally the daily work hour was fixed as 8 hours and if it is more than 8 hrs, overtime payment is compulsory but most of SMIEs in Bangladesh do not follow these rules.

We have found that working environment affects the health of SMIE workers. Irritating sound of machine, bad smell and dust of raw materials, congested office space, insufficient lighting and ventilation, continuous sitting, and weighty work in the working place are identified as main causes that affect workers health badly. The regression results of our study find a significant association between number of ill days and the working conditions of the workers suggesting that for every 1 unit increase in daily hours of work increases the number of ill days by 0.616 units.

Asad et. al.(2013) have conducted a study to examine in what extent the health status of a sugar mill factory workers in Pakistan is affected by the industrial social and physical environment. They have found that social environment like unpleasant relationships among workers and supervisor, lack of autonomy is badly affecting the health of workers. Physical factors like chemical pollution, noise pollution, air pollution, poor working condition, extreme heat, night shift work, extended working hours and physical work load are negatively associated with the health of workers and are the main causes of some diseases.

Both theoretical and empirical literature review suggest that residential environment plays a significant role in individual health status, as a wide variety of residential features influence the physical, social, and the mental well-being of occupants. Congested house, noise, crowding, insufficient ventilation and lighting, unhealthy sanitation facilities, toilet sharing, damp house, lack of sufficient drinking water, and insufficient income are identified as major causes that affect workers' health badly. The workers have suggested that their living condition can be improved by increasing awareness program about healthy environment and the monthly income of the workers so that they can enjoy an affordable housing.

The regression result of our study on this issue suggests a strong positive association between number of illness (in terms of ill days) and the residential environment of the workers implying for every 1 unit increase in toilet sharing increases the number of ill days of SMIE workers by 0.155 units.

9.1.7 We have found that the monthly mean productivity of the SMIE worker is Tk 9732 and Tk 7988 from workers' response and managers' response respectively. It is found slightly lower for the workers of Dhaka division than the workers of Chittagong and Khulna division and among the workers of bidi factory than the workers of other factory categories.

The study identifies a gap between wage and productivity of SMIE workers in Bangladesh. It estimates that wage is 63% and 56% of productivity from managers' and workers' response respectively. Hence, the wage gap is estimated as 37% to 44%. This gap was found as 16% in the manufacturing industries in Turkey (Elgin and Kuzubaş, 2012); 15% in the manufacturing industries in USA (Madeline Zavodny, 1999); 13% in the manufacturing sector of 31 OECD countries (Elgin and Kuzubaş, 2013).

9.1.8 We have estimated monthly mean lost productivity of SMIE worker due to illness is Tk 413 to Tk 708 from workers' response and Tk 466 to Tk 739 from managers' response based on wage and output respectively.

We have estimated lost productivity as 4% to 7% of productivity from workers' response and 6% to 9% of productivity from managers' response.

In the same way, Meerding et al.(2005) have shown that reduced work productivity at work due to health problems was prevalent among 5–12% of construction workers and industrial workers, with an estimated mean loss of 12–28% in productivity.

The average absenteeism rate due to illness among the SMIE workers is estimated to be 7.3%. This rate was 7% for trade workers in Netherlands. The inactivity rate (percentage of absent days due to illness) is found 7.5% which results 22 days lost per SMIE worker per year. This inactive rate was 3% for manufacturing workers in Canada resulting 7.5 days lost per worker in year.

We have found that monthly mean lost productivity of SMIE worker is 0.73 to 0.88 times of direct monthly mean medical expenses based on wages and 1.34 to 1.4

times based on output. Our figures compare well with Loeppke et al. (2007; 2009) who have found it as 2.3 times higher than direct medical cost faced by the firms.

9.1.9 Monthly mean lost productivity of total SMIEs in Bangladesh is estimated Tk 19.44 crore to Tk 33.13 crore from workers' response and Tk 19.81 crore to Tk 31.38 crore from managers' response on the basis of wage and output based monthly lost productivity respectively.

This lost productivity of total SMIE sector is estimated as 0.27% to 0.47 % of manufacturing GDP, 0.21 % to 0.37 % of SME's contribution to GDP, 8.3% to 14.2% of SME sector's loan, 0.05% to 0.09% of GDP, 2.5% to 4.2% of health sector's total budget and 0.12% to 0.20% of national total budget.

It is necessary to mention here that our estimated lost productivity of the total SMIE workers is undoubtedly underestimated. The reason behind this is that our estimation is based on the number and employment of SMIEs obtained from SMI report 2005-2006. From the year 2005, government of Bangladesh has taken various policies and steps to promote SME sector, hence it is reasonable to think that both the number and employment of SMIEs have certainly increased in the year 2012-13. But since the number and employment data on SMIEs after SMI report 2005-06 are not available from any public or private sources, we are not able to estimate the lost productivity for this increased number and employment of SMIEs. If we could do so then our estimated amount would have been much larger than the current estimated amount.

9.2 Conclusion

The study has assessed the relationship of health with the productivity of SMIE workers in Bangladesh. It finds that a good health of SMIE workers have a significant positive impact on workers' productivity. It suggests that labor productivity and wages are positively related; sometimes higher productivity determines higher wages and sometimes higher wages leads to higher productivity. It identifies a significant gap between wage and productivity of SMIE workers. It finds that bad working and residential environment of SMIE worker have considerable negative impact on workers' health. Ill health reduces workers healthy time available to work. At the firm level, unhealthy workers frequently miss work (absenteeism) or come to the work and operate at below normal productivity (presenteeism). Absenteeism of the worker reduces output per worker and the presenteeism reduces output per worker per hour. Due to poor knowledge about health related awareness program and preventive care, most of the SMIE workers are not used to seek health care services in public health care facilities when they become ill though its costs are very low. Moreover, due to insufficient expenditure on health care they become ill again and again and remain absent from work. So, there is a considerable amount of productivity loss due to illness of SMIE worker in terms of both absenteeism and presenteeism which decreases the GDP of Bangladesh.

9.3 Recommendations of the Study

Based on the findings of the study, the followings are the recommendations to the owners/managers of SMIEs, the GOB and the workers of SMIEs in Bangladesh:

9.3.1 Recommendations to the Owners of SMIEs

The following measures are suggested to be undertaken by the owner of SMIEs to reduce the absenteeism and presenteeism due to illness of SMIE workers with the aim to reduce their lost productivity.

9.3.1.1 We find the average absenteeism rate due to illness among the SMIE workers is 7.3% which is 7% for trade workers in Netherlands. On the other hand, the inactivity rate (percentage of absent days due to illness) is estimated 7.5% which results 22 days lost per year per SMIE worker which is 3% for manufacturing workers in Canada resulting 7.5 days lost per worker in year. Hence, it is essential to reduce both the absenteeism and inactivity rate of SMIE workers due to illness with a view to reduce lost productivity.

In this respect, the owner of SMIEs should provide sufficient financial incentives such as significant amount of attendance bonus, legal overtime payment, motivation like counseling about health awareness and the official code of conduct with a view to induce the workers to remain less absent from work than before and thereby to reduce lost productivity .

Moreover, to reduce the absenteeism and presenteeism among the SMIEs workers, the owners should give special attention to the workers of RMG, cotton textiles and knitwear industries which contribute a prominent share in GDP, export earnings and employment creation. This can be achieved by providing some specific benefits like distinctive wage scheme maintaining international labor standard, accommodation for underprivileged workers, safety net program for female workers etc.

9.3.1.2 SMIE workers' monthly mean lost productivity is estimated as 4% to 7% of monthly mean productivity from workers' response from managers' response. This is found as 12% to 28% among the industrial workers in Netherlands. So, it is required to reduce the lost productivity of workers by improving their health condition while they become ill and hence there by decreasing their absenteeism and presenteeism.

In view of this, the owner of factory should provide primary medical facilities by appointing medical officers or medical assistants in the factory for the workers as well as for staffs. They should provide a health card to the workers so that they can seek treatment from modern facilities at lower cost or to introduce a health insurance scheme for the workers where the owner must bear a larger share of insurance premium. Moreover, the owners of 5/6 factories can arrange a modern health care facilities for their workers and staffs.

9.3.1.3 It is found that majority of the SMIE workers usually work 12 hours daily but occasionally their work time becomes more than 12 hours though internationally the daily working hour of workers is fixed as 8 hours. Besides, irritating sound of machine, dust of raw materials, congested office space, insufficient lighting and ventilation, continuous sitting, and weighty work at workplace are identified as main causes that affect workers health badly and thereby reduces their productivity.

In order to overcome this, the owner of SMIEs should ensure suitable working environment by increasing office space, providing sufficient lighting and ventilation, reducing noise at working place etc. Special emphasis is necessary to monitor the exact working hour of the worker and if the work hour is more than 8 hours extra payment for overtime work should be given perfectly.

9.3.2 Recommendations to the GOB

The study has the following recommendations to the GOB for reducing the wage-productivity gap of workers as well as the lost productivity of SMIE workers due to illness:

9.3.2.1 It is evident from our study that there exists a significant gap (around 40%) between wage and productivity of SMIE workers in Bangladesh. This gap was found as 16% in the manufacturing industries in Turkey (Elgin and Kuzubaş, 2012); 15% in the manufacturing industries in USA (Madeline Zavodny, 1999); 13% in the manufacturing sector of 31 OECD countries (Elgin and Kuzubaş, 2013).Hence it is required to reduce this wage –productivity gap among the SMIE workers in Bangladesh.

In order to reduce this gap, the GOB should upgrade the minimum wage of SMIE workers after a certain time period. Furthermore, increase in wage of SMIE workers would influence the workers to live in hyzeinic and healthy residence which consecutively reduces the illness of workers than before.

9.3.2.2 In order to increase the productivity as well as to reduce the illness of SMIE workers, the GOB should undertake skill development programs, awareness programs at factory and worker level.

9.3.2.3 Our study identifies that bad working condition is responsible for illness of workers. Therefore, to improve the existing work environment in the factory a strong monitoring cell is required to inspect the overall conditions of a factory that can improve the work environment.

9.3.2.4 In order to reduce the lost productivity of SMIE workers, the GOB should employ SMIE doctor like the industrial police, or should establish SMIE hospital like BGMEA hospital so that SMIE workers can get modern health facilities at low cost or without cost.

Opening a SME health corner in every public hospital like the SME desk in different banks can help the SME workers to acquire modern heath care facilities easily.

Moreover, the GOB should introduce of health insurance scheme for SMIE workers where both government and owner of factory will share the insurance premium.

Furthermore, the GOB should increase the national budget for health care expenditure especially for preventive care so that it can increase the health stock of all SMIE workers and thereby decreases their lost productivity.

9.3.3 Recommendations for the Worker of SMIEs

Introduction of health insurance scheme where the tripartite say the GOB, owner of factory and the worker itself would share the insurance premium, and self awareness building program for health among the SMIE workers could increase the health stock of SMIE workers. The increase the health stock of SMIE workers would reduce the lost productivity of SMIE workers which in turn will increase its share to the GDP in Bangladesh.

APPENDICES

APPENDIX A: QUESTIONAIRE FOR THE SMIE WORKERS

APPENDIX B: QUESTIONAIRE FOR THE SMIE OWNERS/MANAGERS

APPENDIX C: LIST OF 44 FACTORIES

APPENDIX D: APPENDIX TABLES

APPENDIX A

QUESTIONNAIRE FOR THE SMIE WORKERS

Section A: Identification of the worker

Date:

101. a). Name:……………………… b) Type of work:

102. Work address:

Name of the establishment:……………………………..

Address of the factory site:…………………………………

Road no……………………House no……….

Area:……………………………….

P.O……………. Upazila: …………………..

Zila:………………………

☐☐☐☐

SICC

103. Residential Address:………………….

Road no………………… House no ……………

Area:………………………

P.O………… …. Upazila: ……………………… Zila:……..................

104. ID No…………………………

Section B: General Information of Workers:

201. Age : ....Years

202. Gender : ☐ Male ☐ Female

203. Religion : ☐ Muslim ☐ Hindu ☐ Buddhist ☐ other

204. Marital Status: ☐ Married ☐ Single

☐ Widowed ☐ Separated

205. Educational Qualification: ☐ Illiterate ☐ Signature

☐ Primary (class …)

☐ Lower Secondary (class ……) ☐ SSC

☐ HSC ☐ Graduate ☐ Others (specify………)

206. Height: :……………….. meter and Weight …………Kg

Section C: Information on Worker's Income

301. What is your main source of Income : ☐ Service ☐ Business ☐ Others (Specify…………)

302. What are the other sources (Please Specify) :…………………………….

303. Total amount of average monthly Income : …………………………….

Income	Amount (Tk)
a. main source	
b. other sources	
Total income (a+b)	

Section D: Information on workers' productivity

401. During the past 4 weeks, did you miss any time from your job because of your illness?

☐ Yes ☐ No

402. How many full work days did you miss during the past 4 weeks because of your llness?

☐ 1 ☐ 2-3 ☐ 4-5 ☐ 5+

403. Did you receive your regular pay for the days that you missed? The motive of payment received:

☐ Full ☐ Partly ☐ None

404. a) Did the authority compensate your missed output by hiring another one when you were absent due to illness?

☐ Yes ☐ No

b) If yes, did the authority cut down your salary?

☐ Yes ☐ No

c) If yes then how much?………Tk or ..... .% of total monthly salary

405. How much output do you produce daily/monthly?

Quantity……………Tk…………….

406. Can you roughly estimate the amount of output that you couldn't produce due to absenteeism during last 4 weeks?

☐ Quantity ☐ Tk

407. During the past 4 weeks, were there days that you did some work at a job but put in fewer hours than usual because of your illness?

☐ Yes ☐ No

408. Think about the days you worked but put in fewer hours than usual during the past 4 week period. For example, you came in late, left early or took time out in the middle of the workday due to illness. What was the total number of hours you missed over the 4 week period?

☐ Hours

409. Can you estimate how much output couldn't you produce due to presenteeism?

☐ Quantity ☐ Tk

410. What are the steps did the authority take to reduce the absenteeism and presenteeism?

- Hires expert doctor in the factory
- Providing free medicine
- Gives incentive for full attendance

Section E: Information on Health seeking behavior of workers

501. a) Did you suffer from any diseases in the last 6 months?

☐ Yes ☐ No

b) If yes, specify the the diseases

Name of the diseases	Duration of sufferings (days)
1. 2. 3.	1. 2. 3.

502. a) Did you suffer from any diseases in the last month?

☐ Yes ☐ No

b) If yes, name of the diseases:

c) How many days did you suffer from those diseases?

☐ 1-2 ☐ 3-5 ☐ 6-9 ☐ 10+

503. What did you do for treatment of illness during the last month?

☐ Did nothing

☐ Traditional home remedy

☐ Modern home remedy

☐ Factory based doctor/Clinics

☐ Qualified MBBS

☐ Paramedics

☐ Kabiraj/Hakim

☐ Others, specify……………………..

504. How many times did you visit doctor for illness in the last month?

…………………………………….

505. Total expenses for treatment in the last month:

Name of the diseases	Doctor's fee(Tk)	Diagnosis and medicine(Tk)	Transportation(Tk)	Others cost (Tk)	Total Cost(Tk)
1. 2. 3.					
Total					

506. a) Did your organization bear any expense from it?

☐ Yes ☐ No

b) If yes then how much (%)?

……………………

c) If the answer is no, how did you manage it?

☐ Taking loan

☐ Selling land

☐ Personal savings

☐ Other source, specify………..

507. a) Did this expense affect your other family expenditure on food, clothing, children's education etc?

☐ Yes ☐ No

b) If yes then how does it affect?..........................

508. a) Do you think that you become ill due to un-hyzeinic working or living condition?

☐ Yes ☐ No

b) If yes what can you do to improve your living condition?

-
-

Section F: Information on Workers working condition/ environment

601. How long are you working here?
…………………(Years)…………days

602. a) Did you work anywhere before here? Yes ☐ No ☐

b) If yes then how many days? ....

603. How many hours do you have to work daily:

☐ 8 hrs ☐ More than 8 hrs

604. a) If you work more than 8 hrs, do you get extra payment?

☐ Yes ☐ No

b) If yes then how much per hour? Tk____________ 1 hour.

605. What type of wage do you receive?

☐ Monthly ☐ Fortnightly ☐ daily

606. a) Does the authority give any interval for rest or taking meal?

☐ Yes ☐ No

b) If yes, then how much time?

☐ Less than 1 hour ☐ 1 hour

607. Do the floors of every work-room clean at least once in every week by washing?

☐ Yes ☐ No

608. Does there exist adequate ventilation in every work-room for the circulation of fresh air?

☐ Yes ☐ No

609. a) Does the authority try to maintain temperature in every work room?

☐ Yes ☐ No

b) If yes, how it maintains it?

a. By insulating and screening outside walls or roofs or windows
b. By increasing space
c. by raising the level of the roof,
d. by providing sufficient fan
e. by other methods (specify if…………)_____________

610. Do you think that the room you work is

a. Congested
b. Somewhat congested
c. Not congested

611. Does the authority provide and maintain sufficient lighting in the work or passing room?

☐ Yes ☐ No

612. Does the authority provide drinking water for all workers?

☐ Yes ☐ No

613. a) Does your authority provide sufficient wash room?

☐ Yes ☐ No

b) If yes, then is it provided separately for male and female workers?

☐ Yes ☐ No

c) Are the wash rooms adequately lighted and ventilated?

☐ Yes ☐ No

614. a) Do the wash rooms clean with suitable detergents and disinfectants?

☐ Yes ☐ No

b) If yes, how frequently?

☐ Daily ☐ Weekly ☐ Monthly ☐ Twice a day

615. a) Do you wash your hands with soap after you use toilet?

☐ Yes ☐ No

b) If no, why (specify the reasons)?…… ………………

616. In your opinion how working condition of your factory affects your health?

☐ Good effect ☐ somewhat good effect ☐ Bad effect

☐ fatally bad effect ☐ No effect

617. If it affects you badly or fatally bad, how(Specify)

-

618. What are your suggestions to improve the existing working environment?

-

Section G: Information on workers Residential condition

701. Type of your house you live

☐ Kacha ☐ pucca ☐ Semi pucca ☐ Semi kacha

702. How long do you live here?

☐ Less than 3 months ☐ 3-6 months ☐ More than 1 year

703. Where did you live before here?

…………………………………….

704. Number of your family members

☐ 2 ☐ 3-4 ☐ 5 and above

705. What is the main source of drinking water in your house?

- [ ] Piped Water
- [ ] Public Tap/Standpipe
- [ ] Tube Well Or Borehole
- [ ] Rainwater
- [ ] Bottled Water
- [ ] Others, specify

706. What is the main source of water used by your household for other purposes such as cooking and hand washing?

- [ ] Piped Water
- [ ] Others, specify
- [ ] Public Tap/Standpipe
- [ ] Tube Well Or Borehole
- [ ] Rainwater

707. a) Do you do anything to the water to make it safer to drink?

- [ ] Yes
- [ ] No

b) If yes what do you usually do to make the water safer to drink?

- [ ] Boil
- [ ] Use Purify Tablet
- [ ] Use Water Filter
- [ ] Others, specify……….

708. What kind of toilet facility do members of your flush or pour flush toilet Your household usually use?

- [ ] Flush or pour flush toilet
- [ ] others, specify
- [ ] Flush to septic tank
- [ ] Pit latrine
- [ ] Bucket toilet
- [ ] Hanging toilet

709. a) Do you share this toilet facility with other households?

☐ Yes ☐ No

b) How many households use this toilet facility?

☐ 1 household
☐ 2-5 households
☐ Others, specify

710. a) Do you wash your hands with soap/chi mati after defecation?

☐ Yes ☐ No

b) Do you wash your hands with soap before you take your meal?

☐ Yes ☐ No

711. What type of fuel does your household mainly use for cooking?

☐ Electricity
☐ Natural gas
☐ Biogas
☐ Kerosene
☐ Wood
☐ Others, specify…………………………

7.12. Do you think that your living condition affect your health?

☐ Yes ☐ No

b) if yes, how much?

7.13. Give yours suggestions to improve the existing living environment

....

APPENDIX B

QUESTIONNAIRE FOR THE SMIE OWNERS/MANAGERS

1. Name: ………………………………… Date:

2. Designation:…………………………………..

3. Factory's address:

Name of the factory:…………………….. Area:……………………..

4. How many days do you work here? ………………..years…………….days

5. No of employees in the factory: workers' (no)………Others (no.)……………

6. a) Actual output in a year:

Quantity ☐ Tk ☐

b) Cost of intermediate goods (raw materials) per month: Tk …….
c) Cost of capital per month or per year: Tk ……………..

OR

Number of machineries	Longevity of machineries	Current price of machineries (Tk)	Depreciation

d) Office maintenances per month/overhead per month:…Tk…………….

e) Total wage bill in a month: Tk…………….

7. Monthly rate of absenteeism among workers' …………. Percent

8. What was the rate in the last month?................... Percent

9. What is the Monthly missed work day among the workers due to illness.....

10. What is the Monthly presenteeism rate (hrs) among workers' ......

11. a) What are the reasons for absenteeism among workers?..........................

b) What are the diseases the workers of your factory usually suffer from?

i)…………………………....

ii)…………………………...

iii)……………………..

12. When some of your employees become absent due to illness how you do cover the lost output ?

☐ Hire another worker ☐ cut down the salary of absent worker

☐ others (Specify)

13. If the workers come late and leave early due to illness what measures do you usually take to compensate the lost output?

…………………………….

14. Do your organization maintain any registrar/record book for workers presence?

☐ Yes ☐ No

15. What are the measures do you undertake to reduce this absenteeism and presentism?

a) Measures for absenteeism	b) Measures for presenteeism
………………………	....
…………………………	....

APPENDIX C: LIST OF 44 FACTORIES

1. SP Thread Ltd.
   61/7, Shah Ali Bag,
   Mirpur-2, Dhaka.

2. Sinha Group(Madler Garments)
   4, Darus salam Road, Section-1,
   Mirpur-1, Dhaka.

3. Sweater Dale Ltd.
   71, Siddik Khan super market,
   Ghior, Manikganj, Dhaka.

4. Sun Rice Mill
   Baniazuri Bus stand,
   Gheor, Manikganj, Dhaka.

5. Jonopriyo Bakery and Confectionary
   23, Utalipara, Manikganj, Dhaka.

6. Regal Knitwear Ltd,
   16/2, MM Roy Road,
   Tanbazer, Narayanganj, Dhaka.

7. Papyrus fastQ (BD) Ltd
   22/E/5/A, Tejgaon, Dhaka.

8. Zannath Fashion Pvt. Ltd.
   12, Tanbazar, Narayanganj,
   Dhaka.

9. ABBA Garments
   Sena Kollayan Commercial Complex,
   Tongi, Gazipur, Dhaka.

10. Virgin Knit Fashion Ltd.
    Chowdhury Mansion,
    26 Kutipara, Road,
    Tanbazar, Naryangangj, Dhaka.

11. Manikgonjer khabor,
    13, Rofiq Sharok,
    Manikganj, Dhaka.

12. Asiatic Laboratories Ltd.
    253, Tongi I/A, Gazipur, Dhaka.

13. P. M. Dyeing (Pvt) Ltd
    57, A. C Dhar Road, Kalir Bazar,
    Narayanganj, Dhaka.

14. P. M. Apparels (Pvt) Ltd
    56, A. C Dhar Road, Kalir Bazar
    Narayanganj, Dhaka.

15. P. M. Knitting (Pvt) Ltd
    55, A. C Dhar Road, Kalir Bazar
    Narayanganj, Dhaka.

16. Mithun Knitting Ltd.
    Plot: 43-46, Sector 4. CEPZ Area,
    Chittagong.

17. Formen Garments
    68, Uttor Badda, Dhaka.

18. Chowdhury Spinning Mill Ltd.
    23, Bathuli, Dhamrai, Dhaka.

19. Howra Bakery Ltd.,
    2/E, Lower Jessore road,
    Khulna.

20. Mongla Knitwear Ltd.
    Mongla EPZ, Mongla,
    Bagherhat, Khulna.

21. Somoyer Khabor
    71, Khanjahan Ali Khan Road,
    Khulna.

22. The Daily Dainandin,
    Cox's Bazar, Chittagong.

23. Beauty Bidi factory
    Jagir, Manukganj, Dhaka.

24. Gopal Bidi factory
    Baintola, Zabusha, Rupsha
    Khulna.

25. Azmoth Fashion
    117, Rupnagar, Mirpur-6, Dhaka.

26. Howlader Rice Mill
32, Chokoria, Chittagong.

27. Joshna Rice Mill
11, BK Main Road, Khulna.

28. APC Pharmaceuticals Ltd.
Digraj, Mongla,
Baghehat, Khulna.

29. Royal Pharmaceuticls Ltd.
110, Chatleswary road,
Dampra, Chittagong.

30. Shapla Garments
11, Newmooring, Chittagong.

31. Lucky Garments
24, CDA Area, Chittagong.

32. Mita Garments
24/E, Moddho Badda, Dhaka.

33. Target sweater factory
19, Uttor Badda, Dhaka.

34. Toba garments
67, Uttor Badda, Dhaka.

35. Time garments
Hossen Market
Moddh badda, Dhaka.

36. Beauty Garments
Hossen Market,
Uttor Badda, Dhaka.

37. Pacific Auto bricks
3rd Bridge ghat, Chittagong.

38. Shammi Auto Bricks
Bathuli, Dhamrai, Dhaka.

39. Bonoful and Company Ltd.
93, Nasirabad Industrial Area,
Chittagong.

40. World Ye Dress Pants Ltd.
    Plot: Fs-02, Road no. 2,
    CEPZ, South Halishahor, Chittagong.

41. Metro Bricks Ltd
    Sambaghat, Fakirhat,
    Bagherhat, Khulna.

42. Super fine Spinners and Knitters Ltd.
    Fs-2, Factory Bay Area
    CEPZ Area, Chittagong.

43. Ajanta Garments
    24, New Mooring,Chittagong.

44. Siraj Bidi factory,
    Banshkhali,Chittagong.

APPENDIX D

APPENDIX TABLES

Table 1: Distribution of workers by sources of income

Source of income	Percentage of worker (%)
Service	100
Business	0
others	0

Table 2: Distribution of 3-digit manufacturing industries in terms of employment share and establishment share

Sl. No.	BSIC	Industry Category	Total establishments	Percentage of total establishment (%)	Production related workers in total manufacturing establishments (persons)	Percentage of total production related workers (%)
1	141	Quarrying of stone and clay	2	0.01	40	0.00
2	151	Food manufacturing	440	1.27	16602	0.67
3	152	Manufac of dairy products	92	0.27	1048	0.08
4	153	Animal feed	4174	12.03	42114	2.44
5	154	Manu of other food products	1815	5.23	60269	2.29
6	155	Beverage manuf	27	0.08	3530	0.41
7	160	Tobacco manuf	242	0.70	15655	1.68
8	171	Manuf of textiles	11778	33.93	541789	17.41
9	172	Manuf of other textiles	323	0.93	38331	1.25
10	173	Manuf of knitted	636	1.83	476510	13.84

11	181	Wearing of apparel	4532	13.06	1303192	40.68
12	191	leather	283	0.82	118142	0.57
13	192	Foot wear	470	1.35	15072	0.80
14	201	Saw mill	308	0.89	2099	0.09
15	202	wood	45	0.13	892	0.04
16	210	Manuf of paper	384	1.11	1959	0.52
17	221	publishing	467	1.35	42650	1.79
18	222	printing	610	1.76	10883	0.45
19	231	pertolium	13	0.04	147	0.01
20	232	Pet and refining	2	0.01	8	0.00
21	241	chemical	85	0.24	4311	0.28
22	242	Other chem	700	2.02	39233	2.30
23	243	Other chem	40	0.12	4578	0.26
24	251	rubber	131	0.38	7125	0.30
25	252	plastic	653	1.88	14076	0.51
26	261	Glass	23	0.07	927	0.03
27	269	Non metallic	3063	8.82	124006	7.40
28	271	Iron steel	281	0.81	21636	0.80
29	272	Non metal	7	0.02	72	0.00
30	273	Casting of metal	29	0.08	574	0.02
31	281	Metal	633	1.82	9187	0.36
32	289	Other fabricated	333	0.96	7473	0.29
33	291	Manf of general	74	0.21	2605	0.09
34	292	Manuf of special	127	0.37	2793	0.09

		product				
35	293	Domestic	58	0.17	3327	0.11
36	300	Machin	2	0.01	44	0.00
37	311	Elc motr	35	0.10	825	0.03
38	312	Manuf of trans	31	0.09	315	0.01
39	313	Insulted wire	45	0.13	1883	0.07
40	314	Batteries	33	0.10	1320	0.04
41	315	Elc lamp	6	0.02	117	0.00
42	319	Other elc	47	0.14	470	0.02
43	321	Elc devices	22	0.06	1036	0.03
44	322	Radio	36	0.10	8764	0.28
45	331	Scientific	14	0.04	157	0.01
46	332	Photograph	8	0.02	66	0.00
47	333	photo	4	0.01	58	0.00
48	341	Motr	10	0.03	256	0.02
49	342	Bodies	20	0.06	360	0.01
50	343	Parts	34	0.10	1056	0.04
51	351	Other trns	125	0.36	606	0.17
52	359	Trns	17	0.05	4522	0.14
53	361	Furniture	963	2.77	24610	1.01
54	362	Other ind	122	0.35	1129	0.07
55	369	Manuf of nec	250	0.72	4446	0.16
56	371	Recycle	1	0.00	34	0.00
57	372	Non-metal	5	0.01	60	0.00
N			34710	100%	2984949	100.00

Source: Author’s compilation from SMI report 2005-06

Table .3: Distribution of 3-digit SMIEs by establishment share and employment share

Sl. No.	BSIC	Industry Category	Total no. of SMIEs	Industry category wise SMIEs as percentage of total SMEs	Total employment in SMEs	Industry category wise employment as percentage of total SMIE employment
1	141	Quarrying of stone and clay	2	0.01	40	0.00
2	151	Food manufacturing	407	1.35	6370	0.72
3	152	Manufac of dairy products	91	0.30	980	0.11
4	153	Animal feed	4101	13.57	40113	4.56
5	154	Manu of other food products	1627	5.38	27905	3.18
6	155	Beverage manuf	2	0.01	30	0.00
7	160	Tobacco manuf	281	0.93	14322	1.63
8	171	Manuf of textiles	10059	33.29	154905	17.63
9	172	Manuf of other textiles	276	0.91	12555	1.43
10	173	Manuf of knitted	547	1.81	61998	7.06
11	181	Wearing apparel	4165	13.78	349585	39.78
12	191	leather	366	1.21	8360	0.95
13	192	Foot wear	426	1.41	6690	0.76
14	201	Saw mill	134	0.44	1921	0.22
15	202	wood	40	0.13	788	0.09

(Continued Table 3)

16	210	Manuf of paper	228	0.75	1805	0.21
17	221	publishing	546	1.81	26195	2.98
18	222	printing	571	1.89	7087	0.81
19	231	pertolium	11	0.04	123	0.01
20	232	Pet and refining	2	0.01	8	0.00
21	241	chemical	54	0.18	1350	0.15
22	242	Other chem	645	2.13	18920	2.15
23	243	Other chem	29	0.10	930	0.11
24	251	rubber	126	0.42	2055	0.23
25	252	plastic	373	1.23	5940	0.68
26	261	Glass	13	0.04	495	0.06
27	269	Non metallic	2334	7.72	78680	8.95
28	271	Iron steel	130	0.43	3265	0.37
29	272	Non metal	5	0.02	75	0.01
30	273	Casting of metal	29	0.10	765	0.09
31	281	Metal	470	1.56	7350	0.84
32	289	Other fabricated	329	1.09	6900	0.79
33	291	Manf of general	72	0.24	1790	0.20
34	292	Manuf of special	122	0.40	2830	0.32
35	293	Domestic	43	0.14	1840	0.21
36	300	Machin	2	0.01	60	0.01
37	311	Elc motr	33	0.11	990	0.11
38	312	Manuf of trans	30	0.10	315	0.04
39	313	Insulted wire	38	0.13	1450	0.17
40	314	Batteries	30	0.10	675	0.08
41	315	Elc lamp	5	0.02	117	0.01

(Continued Table 3)

42	319	Other elc	47	0.16	398	0.05
43	321	Elc devices	18	0.06	405	0.05
44	322	Radio	26	0.09	600	0.07
45	331	Scientific	12	0.04	124	0.01
46	332	Photograph	6	0.02	66	0.01
47	333	photo	4	0.01	56	0.01
48	341	Motr	8	0.03	150	0.02
49	342	Bodies	20	0.07	231	0.03
50	343	Parts	32	0.11	815	0.09
51	351	Other trns	104	0.34	560	0.06
52	359	Trns	8	0.03	270	0.03
53	361	Furniture	757	2.51	11345	1.29
54	362	Other ind	119	0.39	989	0.11
55	369	Manuf of nec	257	0.85	4085	0.46
56	371	Recycle	1	0.00	34	0.00
57	372	Non-metal	5	0.02	60	0.01
Total manufacturing SMEs			30218		878760	

Source: Author's calculation from SMI report 2005-06

Note: Industry category wise employment figure of manufacturing SMEs are not directly available in SMI report 2005-06. But industry category wise numbers of SMIE establishments are available at employment size. Therefore, I have estimated the industry category wise (at 3-digit) SMIE employment by multiplying each category wise number of establishment with average number of employment from respective employment size (say, for a employment size 10-19 persons, 15 persons is considered as average number of employment).

Table 4: List of top ten 4-digit manufacturing industries in terms of employment share

Sl. No.	BSIC (3-digit)	Industries	Total Employment share (%)	BSIC	Sub sector Industries	Total Employment Share (%) and the employment share of sub sector industries (%)
1	181	Wearing of Apparel	40.7	1811	ReadyMade Garments (woven)	39.7 (97)
2	171	Manufacture of textiles	17.4	1711	Cotton textile except handloom	4.1 (23)
3	173	Manufacture of knitted and Croch. Fabric.	13.9	1730	Knitwear	13.8 (100)
4	269	Non metallic mineral product	7.4	2692	Bricks & Tiles	5.7 (77)
5	153	Animal feeds and by-products	2.4	1535	Rice Milling	2.2 (91)
6	242	Other chemical products	2.3	2423	Pharmaceuticals	1.8 (80)
7	154	Manufacturing of other food products	2.3	1541	Bakery products	0.8 (35)
8	221	Publishing	1.8	2212	Printing and publication of newspaper	1.7 (94)
9	160	Tobacco Manufacturing	1.7	1601	Cigarettes	0.5 (28)
10	172	Manufacture of other textiles	1.3	1724	Manufacturing of spooling and thread ball	0.5 (43)
N			3375319 (91%)			2396477 (71%)

Source: Authors calculation by using report on SMI 2005-06

Table 5: Factory category wise lost productivity as percentage of total productivity from workers response						
Monthly Mean Lost Productivity due to Illness	Monthly mean productivity	Lost productivity Based on Wage* (TK)	Lost productivity as % of productivity	Lost productivity Based on Output(TK)	Lost productivity as % of productivity	N
RMG (woven)	9871	498	5	860	9	91
Cotton textile	9804	534	5	880	9	24
Knitwear	8847	419	5	684	8	36
Bricks	8666	266	3	445	5	18
Rice milling	8305	296	4	536	6	18
Pharmaceuticals	14083	36	0	68	0	12
Bakery	8811	371	4	660	7	18
Newspaper	13000	392	3	723	6	18
Bidi factory	7655	348	5	614	8	18
Manufac. Of threat ball	10616	518	5	852	8	6
Total	9732	413	4	708	7	259

Table 6: Factory category wise lost productivity as percentage of total productivity from managers response						
Monthly Mean Lost Productivity due to Illness	Monthly mean productivity	Lost productivity Based on Wage (TK)	Lost productivity as % of productivity (based on wage)	Lost productivity Based on Output(TK)	Lost productivity as % of productivity (based on output)	N
RMG (woven)	7914	458	6	712	9	15
Cotton textile	8803	535	6	936	11	4
Knitwear	8745	463	5	808	9	6
Bricks	7960	392	5	554	7	3
Rice milling	6099	404	7	521	9	3
Pharmaceuticals	6812	313	5	521	8	3
Bakery	8094	501	6	743	9	3
Newspaper	7542	520	7	823	10	3
Bidi factory	8006	474	6	834	10	3
Manufac. Of threat ball	8529	649	8	941	10	1
Total	7988	466	6	739	9	44

Table 7: Inflation rate, nominal wage indexes of manufacturing workers (Tk), and GDP (Tk in crore) at current and constant prices from 2005-06 to 2012-13								
	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Inflation (base year :95-96)	7.17	7.22	9.93	6.66	7.31	8.80	10.62	7.7
Nominal Wage index (base year :1969-70)	4293	4636	5197	6128	6620	6778	7221	7693
GDP constant price (base: 1995-96)	280699	299989	319784	3,401,96	3,608,44	3,850,50	4,090,53	4,337,20
GDP at current price	415728	472477	545822	6,147,95	6,943,24	7,967,04	9,181,41	10,379,86

Sources: Bangladesh Economic Review, 2009, 2010, 2013

Note: it is seen that from financial year 200-06 to 2012-13, nominal wage index for manufacturing industries is increased by 79%; within the same period GDP at constant price has increased by 54% ,and the GDP at current price is increased by 149%.

Table 8: Distribution of monthly mean presenteeism (in hours) of workers by divisions from workers' response

Monthly presenteeism	Dhaka	Chittagong	Khulna	Total
Mean (Hours)	0.47	1.19	0.90	0.73
N	149	70	40	259

Table 9: Yearly Absenteeism due to illness of workers in terms of BMI

BMI Range	Absenteeism in Days (Yearly)
<18.5 and above 24.9	24
18.5 to 24.9	20
N	259

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