Economic Determinants of Child Health in Pakistan

By
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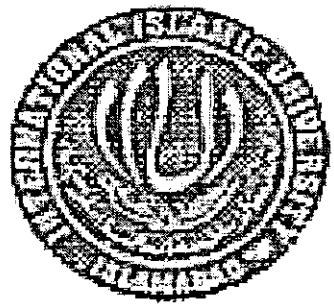

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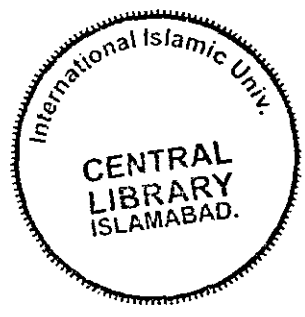

CERTIFICATE

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DADICATED TO R&D
AND PAKISTAN

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CHAPTER 1

INTRODUCTION

1.1. BACKGROUND AND MOTIVATION

Economic development requires equal focus on economic and social sectors. In Pakistan development policy however has been skewed in favor of economic sectors until late 1980s. Government started focusing on social sectors, particularly, health and education in the 1990s. Health is essential to wellbeing and economic development while education is essential for satisfying and rewarding life. Both sectors are also important for the enhancement of human capabilities which are essential for economic development.

Moreover health is a prerequisite for increase in productivity; successful education relies on adequate health. Thus both health and education which can also be seen as vital components of growth and development are used as an inputs to the aggregate production function. Their dual role as both inputs and outputs gives health and education their central importance in economic development (Todaro, 2002).

Child health is the focus of this study, and it has been assessed as the outcome of different socio-economic factors. Poverty plays a central role in almost all health related problems faced by the people of developing countries. It directly contributes to poor nutrition, which in turn results in poor school performance, reduced productivity, and even permanent disabilities and thus leaves little hope for economic advancement of the poor segment of the population. In Pakistan, poverty which declined rapidly in the 1980's because of high economic growth particularly in the agriculture sector and large inflow of remittances from the Middle East, increased again in the 1990s.

The rise in poverty was primarily the result of the slowing down of economic growth in the nineties, fluctuations in crop production (particularly cotton), and decline in remittances, draught, economic sanctions following Pakistan's nuclear explosions in 1998, and to some extent frequent changes in policies due to frequent changes in government. No effective policy could be designed and implemented in the nineties to protect real income of the poor and the vulnerable segments of the population against the continuous rise in prices of essential food, as well as non -food items.

Children are more vulnerable than adults and the household's poor economic status impacts child health adversely through malnutrition, poor hygienic conditions, lack of awareness and lack of health services. Poor child health can lead to morbidity. Since the turn of the twentieth century infant and child mortality in more developed countries has steadily declined and currently has been reduced to almost minimal levels. In contrast, although infant and child mortality has declined in the past three decades in most less developed countries; the pace of change and the magnitude of improvement vary considerably from one country to another (Mahmood, 2001). In Pakistan, this situation is not promising, infant mortality around 70 per 1000 live births in 2005-06, was considerably far short of the desired targets set for the Millennium Development Goals (MDGs).

To bridge this gap one first needs to determine the factors responsible for such high rates of infant and child mortality. World wide, large percentage of children under the age of five has died of acute respiratory infections and diarrhoea (Chakrabarti, 2003). Several factors such as age of the child, breastfeeding, measles immunization, and rainy seasons

may also be closely related with diarrhoea morbidity. Immunization may not be directly related to diarrhoea morbidity but measles immunization is likely to protect children against measles associated diarrhoea. Immunization is the most cost effective health intervention that reduces under- five child mortality. In Pakistan at the national level, the coverage of fully immunized children in the 12-23 month age increased from 53 in 2000-01 to 77 percent in 2004-05. However, it is low in relation to the national MDG target of greater than 90% coverage set for 2015.

Diarrhoel morbidity in the rainy season as compared with other seasons is usually higher. Diarrhoea is usually caused by the transmission of pathogens in the human body and this transmission may be water-borne, food borne, or direct. Water-borne transmission may occur when water contaminated by germs is used for drinking water. Direct transmission may occur when young children put their contaminated fingers in the mouth or the mothers contaminate food during its preparation process. However for the effective reduction of the transmission of pathogens which cause diarrhoea morbidity it is important to take measure for safe disposal of human excreta, provide uncontaminated source of drinking water, and encourage increased personal hygiene.

Also with more recent information available on child morbidity under five years of age, this paper aims to examine the prevalence of morbidity among children as mentioned by Mahmood and Mahmood (1995). The two diseases most prevalent among children in Pakistan are acute respiratory infections, indicated by cough with fast or difficult breathing and diarrhoea. Whereas according to Mahmood and Ali (2002) fever, malaria, viral diseases, respiratory infections and intestinal infection are more common among

children less than five years of age. However Ahmad (1990), reports that a relatively higher proportions of male children are affected by respiratory infections, diarrhoea and other diseases. Findings by Cebu (1992) study team showed that improper feeding practices by the mother, contamination caused via water or exposure to faeces and excreta, overcrowded living conditions and smoke pollution significantly increase the chances of an infant contracting diarrhoea, cough, cold and fever. However determinants differ according to the type of disease.

Historically, poverty has mainly concentrated in rural areas of the country, which are diverse in terms of climate, land fertility, availability of water for irrigation, level of integration with urban sector, population growth and skill levels (Arif and Munir, 2001). This study has made a useful contribution to existing literature in understanding the relationship between child health and economic determinants by focusing on variation across geographical zones, as these are different in terms of economic status or prevalence of poverty. The rise in poverty in Pakistan since the nineties is likely to have adversely influenced the nutritional status of children and their health, but little work has been done to study this phenomenon. The objective of this study therefore is to analyze the relationship between economic status and overall child health (morbidity). The specific research objectives are reported as follows:

1.2. RESEARCH OBJECTIVES

The overall objectives of this study are to examine the economic determinants of child morbidity. The objectives of this study are:

- To examine the health status of Pakistani children using two important indicators diarrhoea morbidity and illness.
- To examine the geographical variation in disease incidence that how child health varies across different ecological zones, which are different in term of economic status or poverty.
- To examine the relationship between child health and economic factors.
- To assess the impact of preventive health care especially child immunization on child morbidity (illness) and diarrhoea morbidity.

1.3. ECONOMIC DETERMINANTS OF CHILD HEALTH: A THEORATICAL FRAMEWORK

This section proposes a theoretical framework for the study of the economic determinants of child health in Pakistan, following the Mosley-Chen framework (1984). The economic determinants of child health is developed to study factors affecting child health (morbidity), and is based on the idea that the set of proximate determinants are influenced by economic determinants to affect a child's health (morbidity) as shown in

figure 1. Thus, this framework combines economic, demographic, environmental and geographical explanations of child health.

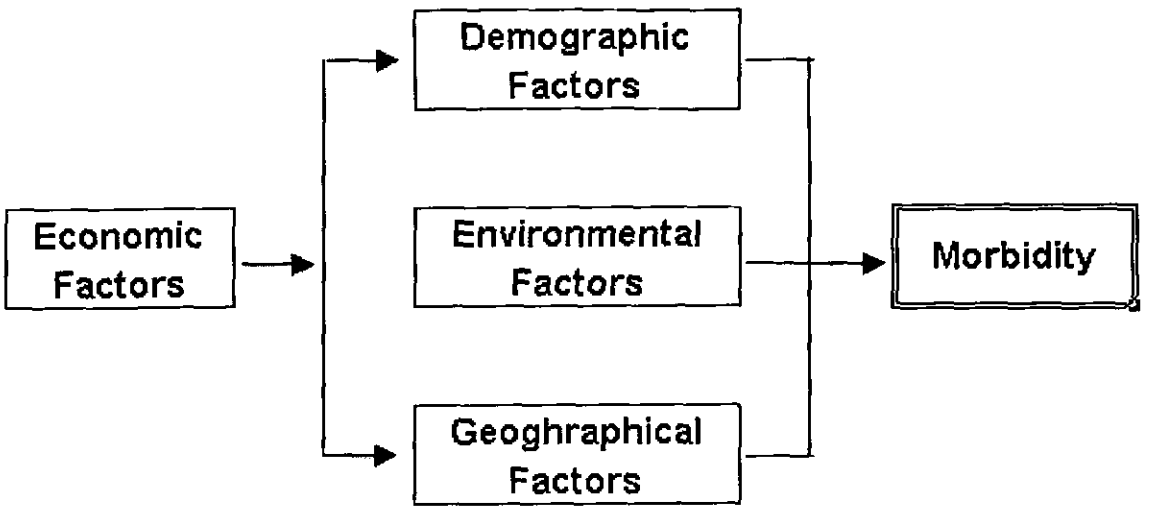

Figure1: Proposed Framework for Child health in Pakistan

Several factors such as gender, age of the child, breastfeeding practices and total number of children born may also be closely related with child morbidity. Generally the male children under 5 years of age show higher morbidity prevalence than their female counterparts (Ahmed,1990) and a large number of studies have analyzed how preference for sons can lead to discrimination in household's allocation of resources particularly food or even health inputs, for example, preventive care for children (Duraisamy et al. (1995). However, the value of gender preferences may also lead to the possibility of reporting bias. In other words, gender discrimination in resources allocation creates a link among economic resources, demographic factors and child health (figure 1).

The incidence of child morbidity is usually the highest at first two years of life (Martorell, 1995). It declines after the second birthday. Breastfeeding provides not only complete nutritional requirements of the child but also provides protection against infection (Jelliffe and Jelliffe, 1978). Similarly age, education and working status of mother is also very important to control child diseases. In general, mothers with at least primary school education tend to have healthier children than those of illiterate mothers.

There are many ways through which pathogens transmit what are known as the major causes of child diseases specially diarrhoea. According to Feachem (1984), this transmission may be water-borne, food-borne, or direct. Water-borne transmission may occur when water contaminated by germs is used for drinking water. Direct transmission may occur when persons (especially mothers) contaminate food in the preparation process for their children. So it can be expected that increased water availability of the uncontaminated water, personal hygiene, and safe disposal of human excreta may lead to a major reduction in transmission of many agents which badly affect child health. This link among economic factors, environmental factors and morbidity as shown in figure 1 can be broken with increased availability of economic resources which can ensure the provision of environmental services such as piped drinking water and sanitation facilities.

As a preventive measure, child immunization reduces the risk of illness and the role of child immunization in child mortality reduction in Pakistan is well established (Arif, 2004). Poor children with immunization are less likely to become sick than those who do not have immunization.

Several economic factors such as ownership of land, livestock and housing may also be closely related with child health. Both the ownership of land and livestock are means of livelihood in the rural areas and they contribute significantly, to better child health by increasing incomes of the household.

Rural regions however are not homogeneous; they tend to vary in terms of irrigation facilities, cropping patterns, economic status, infrastructure, and access to non-farm sources of income. These variations make some parts of the rural areas different from the others. These variations in geographical zones in turn may prove to be an important factor in explaining child health differentials in Pakistan. Poverty in some regions of rural areas, for example, barani Punjab, is lower than in other regions particularly cotton growing zones of Punjab and Sindh. A number of factors are attributed to the low levels of poverty in barani Punjab, which is relatively better in term of human capital, access to jobs in armed forces and civil departments located in Islamabad /Rawalpindi and integration with prosperous urban centers.

Similarly, availability of infrastructure investment has played an important role in reduction in poverty in the barani areas (Arif and Iqbal, 2008) which in turn lowers child morbidity. Ifzai and pernia, 2003 and Fan et al.2002 have argued that increased employment due to infrastructure investments directly benefit the poor more than the non-poor and also this can reduce poverty even faster by improving income distribution as well. The non availability of infrastructure in poor rural areas also prevents the poor to travel long distance to access health care units and hospitals. Therefore poor families faced with economic and social constraints, in most cases tend to resort to traditional healers and hakeems in nearby locations in villages for accessing health care services. A

substantial proportion of the population (46 percent) is reported as not using any health facility at all (National Institute of Population Studies, 1998). In short, these variations across geographical zones in economic factors may create a link with child health (morbidity).

1.4. RESEARCH HYPOTHESIS

The following hypotheses are presented as a basis for examining some important relationship.

- Variations in terms of economic status of geographical zones influence the child health.
- Improvements in environmental factors such as availability of safe drinking water supply and proper excreta disposal can prevent the young children from pathogens causing diarrhoea. This prevention can help to reduce diarrhoea morbidity rates.
- Preventive health care leads to improvement in health status of children.
- Better economic status of household helps to improve the health status of children.
- Mother's education can cause behavioral changes that can reduce the transmission of enteric pathogens and there by reduce diarrhoea morbidity rates.

1.5. ARRANGEMENT OF STUDY

The remaining portion of this study is organized as follows. Chapter 2 reviews the literature on the relationship between child health (morbidity) and economic status of households. Chapter 3 presents data, methodology and estimation technique. Chapter 4 presents sample characteristics and poverty among children. Chapter 5 presents diarrhoea morbidity while chapter 6 presents child morbidity. Finally chapter 7 concludes the study. Appendix, references and list of tables and figures are presented at the end of study.

CHAPTER 2

REVIEW OF LITERATURE

2.1. INTRODUCTION

In the various studies relationship to child health has been researched extensively using certain socio-economic, demographic and environmental covariates. This chapter reviews the existing literature on child health with specific focus on:

(a) Nutritional status of children; (b) Infant and child mortality; (c) Child morbidity

a) NUTRITIONAL STATUS OF CHILDREN

The basic causes of malnutrition in developing countries are related to the socio-economic status of the households. Poverty is pervasive in much of the third World, and the capacity of families to purchase and/or produce food is limited. Teresa (1984) pointed out that infections are more frequent in malnourished populations. Clinical evidence shows that infections are generally more severe in children from developing countries. This is confirmed by the evidence from field studies which showed that poor nutritional status, whether severe or moderate, predisposes children to more severe infections. On the other hand, nutrition intervention studies indicate that dietary improvements are associated with lower mortality rates during early childhood. Various types of data indicate that the determinants of infections in children with mild and moderate malnutrition are more closely related to the quality of the environment than to the nutritional status of children. However, once a child becomes infected, the severity and duration of the episode will depend on nutritional status.

The effect of birth order on child nutritional status is also very important issue as mentioned by Horton (1988) using sibling data and examines both current and long run nutritional status. The results for long run nutritional status show that child age is the most important factor, as expected nutritional status declines with age. The effect of gender is not significant in this case: However the results for current nutritional status are slightly different; the effects of age are smaller and less significant, while the gender variable becomes significant.

The results of this study also showed that effect of birth order on long run nutritional status for children is considerably greater than those observed in current nutritional status. This suggests that reason for birth order effect is not that parents discriminate among children of different birth orders when deciding on the allocation of current resources. Rather they are unable to allocate resources overtime in such a way as to offset the inevitable advantages accruing to children in earlier birth orders who are born when per capita resources are greater.

Garcia and Alderman (1989) found a strong evidence of a widespread negative impact of household size on both short run and long term nutritional indicators. Mother's education is found to have positive association at 1 percent level to standardized height measures, and it is hypothesized that such impact is largely a result of the woman's efficiency in household production and tastes. Girl's long term nutrition appears to be statistically better than boys in the sample. There were strong positive immediate as well as long term effects on the nutritional well being if the child was born in the hospital, even controlling for level of income. These effects perhaps capture the positive influence of good pre-natal care, and of the ability to acquire associated information on child care from the doctor,

clinic, or hospital. Quite surprisingly, vaccination was not a significant variable. This may be due to the ambiguous construction of the variable since it is composite of many types of immunization that cover DPT, measles, etc., and does not indicate whether the complete series was followed.

Alderman, Beherman, Lavy and Menon (1997) use longitudinal data to investigate how children's health and nutrition effect school enrollment in rural Pakistan. The authors found that child nutrition is three times more important for enrolment. Mahmood (2001) has tried to assess the growth retardation for children 0-59 months of age. Maternal education is negatively associated with height for age of the children. As the year of maternal schooling increases, the odds of stunting decrease. It also shows that stunting of children is strongly related to father's education. The logistic regression shows that the source of drinking water, toilet facility and housing construction each has a significant effect on stunting both in bivariate and multivariate analysis.

The bivariate logistic regression shows that the children of the parents who have piped water in the residence and piped water on the property are at lower risk of stunting compared to the children of parents with a well as a source of drinking water. The children of those households depending on surface water have a significantly higher risk of stunting. In the multivariate model, when toilet facility and housing construction are included, the odds of stunting among children in households with surface water are fifty percent higher than the households with wells. Moreover the odds of stunting of children with public tap are 66 percent higher than the children depending on a well as the source of drinking water. The analysis also shows the effect of toilet facilities on stunting; the odds of stunting for children of households equipped with a flush toilet facility are 60%

lower than the households without any toilet facility. Maternal age at birth less than 20 years has a significant association with stunting in the bivariate model compared to maternal age at birth 20-29 years. It also shows that prematurely born children continue to be significantly stunted compared to full term children in bivariate logistic regression, while in multivariate logistic regression the association become very weak. However very small size babies experience a significantly higher risk of stunting compared to normal sized babies in the bivariate and multivariate logistic regression analysis. Result clearly indicates that children in families with shorter birth intervals and higher number of living siblings are at a higher risk of stunting.

Tarrozi and Mahajan (2005) found that child nutrition improved substantially in India during nineties but at the same time gender difference also increased; the nutrition status improved substantially for boys than for girls. For children living in the rural sector the results are less clear.

b) INFANT AND CHILD MORTALITY

Since World War II substantial declines in infant and child mortality rates have occurred in most developing countries, resulting both from improvements in standards of living and from national and international public health activity. Hill and Pebley (1989) conclude that the disparities in levels of child mortality between countries and regions of the developing world are very significant and appear to have widened over the period. Second, rates of child mortality decline in Africa seem to be slower than those in the Middle East, the Americas, and Asia. This study finds little evidence to support the

notion that public health intervention merely changes the causes of child death rather to prevent them.

Sathar (1991) describes the pattern of changes in mortality in Pakistan. Crude death rate of 11.0 was reported by the Population Growth Estimate (PGE) as far back as 1962-65 and the average crude death rate reported by the Pakistan Demographic Survey (PDS) (1984-88) is also 10.8 per 1000. The trend in the index of expectation of life does however reflect a gradual improvement in life expectancy. In fact expectation of life has increased by about nine years (50 to 59 years) over the period 1960-65 to 1984-86. Due to high mortality rate prevalence in Pakistan, larger proportions of deaths occur in the neonatal period.

Mortality rates in the post neo natal period declined to 48 per 1000 in1988 from 57 per 1000 in 1984. It is very important to note that the sex differential in infant mortality has always been higher for males compared to females in the neonatal period. Another important source of differentials in infant mortality is those based on education of parents. In Pakistan a strong negative association has been found between mother's education and infant mortality whereas father's education has no strong inverse impact. Moreover urban/rural differentials in mortality are attributed largely to the shortages of adequate health facilities in the rural areas. Data from the National Health Survey 1982-83 highlights the lack of facilities in the rural areas and the underutilization of government health facilities with preference for private clinics in both urban and rural areas.

According to Mahmood and Mahmood (1995) the two diseases most prevalent among children in Pakistan are acute respiratory infections, indicated by cough with fast or difficult breathing, and diarrhoea. An examination of past trends showed that infant and child mortality have declined. A simple comparison of the proportion dead by sex from the PDHS data suggests that boys experience the highest number of deaths in the first month of life. Greater risk of child death is experienced by younger, uneducated and rural mothers. This study suggests that immunization programmes are likely to be effective in reducing mortality in general.

Sathar (1992) has discussed the situation of child survival and changing fertility patterns in Pakistan, based on available evidence of trends in Pakistan. In most Asian countries which have experienced demographic transitions mortality and fertility have declined in close association. The case of Pakistan becomes particularly interesting as it is a country which has not experienced any notable declines in fertility despite an official population planning programme and substantial development accompanied by significant declines in overall mortality. A large family size is associated with close spacing of children, and most probably a concentration of a greater number of siblings at ages under 5 years or even under age 10. There is considerable evidence that mothers in 1991 are more likely to be educated and to work outside the home than was the case in the 1970s. Of course if women's status were to improve in Pakistan as a result of this likely expansion in roles this in turn will improve the chances of survival of their children. In the 1991 PDHS it is interesting to note that mothers with primary or more education were manifold more likely to receive tetanus toxic injections themselves and were also significantly more likely to have given all the vaccinations to their children aged 12-23 months.

Bennett (1999) revealed that sustained high level of child mortality was related to high fertility and other related factors. She has shown that the most significant variable correlated with child survival was the number of children ever born. Increase in the number of children within the household led to proportionate increase in child deaths. Demographic variables like the mother's age at birth, order of birth and birth interval between the proceeding and the succeeding child constitute some of the important associates of child mortality.

The finding in her study shows a strong independent correlation between children born after a short interval of one year and high death ratio, suggesting that children born after an interval greater than one year had a greater survival probability. Older mothers were more likely to use contraception than the younger mothers and as a result recent children born to older mothers were at a lower risk of dying than children born to younger mothers.

Children born to mothers in the age group 30-34 and 35-39 were 0.4418 and 0.2689 times less likely to die than children of younger mothers. All of the variables included in the study to measure the household's hygienic environment were significantly associated with child mortality. Children who belonged to households with an open garbage container were 1.57 times more at risk of dying than those who were living in households with a covered garbage bin. Overall this study provides strong evidence that the homes of educated scored better than those of the uneducated.

Mahmood (2002) has tried to identify the factors such as demographic factors, environmental factors, nutritional factors and health seeking behavior associated with neonatal and post neonatal mortality. The dependent variable used in the hazard model analysis is neonatal and post-neonatal survival time. It is measured as the duration starting from the infant birth to death. In this study father's education is a better predictor of post –neonatal mortality than maternal education.

Maternal education is associated with reduced post neonatal mortality in rural areas. Maternal education also play significant role in hygienically feeding bottle milk compared to their uneducated counterparts which improves the survival status after neonatal period. The results also show that families living in household connected with piped water in their houses have significantly lower post –neonatal mortality than those families who depend on wells for drinking water.

Among the demographic variables, it is observed that children of older women (30-49) are exposed to significantly higher neonatal and post neonatal mortality. Children born with shorter previous birth intervals are also at significantly higher risk of neonatal and post- neonatal mortality. Vaccination of BCG at birth is an important predictor of lower neonatal and post-neonatal mortality in Pakistan. The analysis also shows that child mortality can be significantly reduced if the interval between births can be expanded by 3-4 years.

c) CHILD MORBIDITY

Arif and Ibrahim (1998) have used the 1995-96 Pakistan Integrated Household Survey data to determine the socio-economic, demographic and environmental covariates of both prevalence and duration of diarrhoea among children under five in Pakistan. Child's age appears to be a strong determinant of both prevalence and duration of diarrhoea. Its association with these two measures of diarrhoea morbidity was negative. For both the males and females diarrhoea morbidity rate peaked at age 1. The rate in this age group is higher for males than for females. The effect of mother's education, however, was limited to those mothers who at least had 10 years of schooling and were residing in urban areas. Household income also appears to be a strong determinant of diarrhoea morbidity. Children living in household having piped water or motor pump inside the house were less likely to be sick than children in households having other sources of water including hand pump, well or river. Measles immunisation and season had independent effects on diarrhoea morbidity in most parts of the country.

Prevention and effective treatment of respiratory infection and diarrhoea under the age of five depends on individual, household and community level behavioral factors. Chakrabarti (2003) has tried to estimate the role played by such factors in determining the utilization of formal health care to cure diarrhoea and certain respiratory illness plaguing young children. He shows that the bivariate probit estimate of cough care and cough and diarrcare and diarrhoea correlation coefficient is positive. Other results in this study show that birth order has a significant impact, the ethnic and religious background of the child plays an important role, and educational attainment of the child's father has a significant negative impact on the child morbidity status.

Senauer and Kassouf (2000) have tried to analyze the effects of breast feeding on child health and the effect of health on the demand for medical care. For children up to 2 years old, the impact of current breastfeeding on the child's health is analyzed and for infants up to 6 months old, the effect of exclusive breast feeding is studied. Although the focus is on the impact of breast feeding, the analysis is multivariate. Binomial probit is used to estimate the equations in which the dependent variable is whether the child was ill during the previous two weeks.

In this study breastfeeding variable is significant and has beneficial effects on reducing illness and improving growth among infants and young children. Exclusive breastfeeding reduced the probability of illness by about 15% among infants age 0-5 months. The probability of illness was some 10% lower among currently breast-fed children age 0-20 months versus those who were not breast fed.

Jalan and Ravallion (2001) has analyzed whether child health gains from access to pipe water. Households living in larger villages, village with a high school, a pucca road, a bus stop, a telephone, a bank, and a market were more likely to have piped water. The results indicate that access to piped water significantly reduces diarrhoea incidence and duration. There are little overall differences in the impact on incidence of diarrhoea between households with piped water inside the home versus those using a public tap. However illness durations were nearly 40% higher where the source of drinking water is public tap rather than a tap within the household premises.

Mahmood and Ali (2002) have examined the disease incidence among different sub-groups of population. About 12 percent of the population is reported ill during the past two weeks preceding the survey and the incidence is higher among females (13.3percent) than males (10.5percent). The pattern of illness varies by age with younger children 0-4 years and older population 60+ exhibiting higher rates of morbidity. Male children under 10 years of age and older adults have shown higher disease incidence than their female counterparts. About 23 percent of those reported ill do not seek any health services with the two major reasons cited as 'no money' (44 percent) and 'no need '(33 percent) to visit a facility. This suggest that it is not merely the access or availability of services that affect people's health seeking behavior, it is more due to poverty that restrains them from visiting any health facility. Poverty closely associated with low levels of literacy, poor sanitation, and lack of awareness about the benefits of being healthy contribute towards non use of health care services even in case of suffering from some type of illness.

Arif (2004) has examined the health status of Pakistani children using two important indicators, morbidity and malnutrition measured for weight for age and height for age. Children who had immunization were less likely to be sick as compared to children who did not have immunization. Infants of working mothers were at greater risk of being sick probably these mothers have less time for child care. Distance to the nearest health facility had significantly negative influence on child morbidity, implying that longer the distance less the probability of being sick. Reporting of the incidence of child morbidity was based on the mother's perception. In the case of longer distance to nearest health facility, the child is less likely to be taken there unless he/she had some serious illness or the household had sufficient resources. This may in turn had influenced the reporting of

sickness. Children living in Balochistan were more likely to be sick than children living in the Punjab.

For the analysis of the determinants of child malnutrition, Z scores of two anthropometric measures, weight for age and height for age have been used as the dependent variables in the OLS regression. The effect of birth order is significant with children from later birth orders being worse nourished. Mother's education has a positive and significant effect on children's nutritional status, but father's education is not significant. The analysis shows that having access to flush toilet has a significant positive effect on the nutritional outcome of children perhaps due to smaller incidence of diseases. In their analysis demand for the medical care equation is also estimated. Immunized children's have lower odds of receiving medical care during two weeks preceding the survey. There is also a significant and negative relationship between the need for visiting health facility and availability of the piped water inside the residential house. The analysis also shows that larger the family size the lower the probability of visiting a health facility. It seems to be an issue of allocation of limited resources available to the household for the child's medical care.

It appears from this brief review of the recent literature that the relationship between child health (morbidity) and economic status of households has not been thoroughly measured except in one study by Arif (2004). The present study aims to examine the relationship between child health and economic, demographic, environmental and geographical factors. This study has two unique features that distinguish it from earlier literature. Firstly, this study has focused on the geographical variations in child

morbidity. Secondly, this study has introduced ownership of land, livestock and housing as economic variables. Both land and livestock are a means of employment and source of income for peoples of rural regions and housing represents better economic status of a household. Thus this study is a useful addition to the existing literature on child health.

CHAPTER 3

DATA, METHODOLOGY AND ESTIMATION TECHNIQUE

3.1. INTRODUCTION

This chapter describes data sources, data variables, methodology and estimation technique. Section 3.2 describes the data source while section 3.3 describes data variables and finally in section 3.4 the methodology used in this study is discussed.

3.2. DATA SOURCE

The present study is based on 'The Pakistan Social and Living Standard Measurement Survey 2004-05" conducted by Federal Bureau of Statistics. The PSLM Survey consists of Core Welfare Indicators Questionnaire (CWIQ) approach which intends to provide data for formulating the poverty reduction programme initiated under poverty Reduction Strategy Program (PRSP) and Medium Term Development Framework (MTDF) in the overall context of MDGs. For the present analysis, a child file is created and the sample is restricted to children under five years (0-4 years). PSLM has identified 13540 children in this age group covering both rural and urban areas.

children in this age group covering both rural and urban areas. Firstly, this study focused on diarrhoea morbidity. The term diarrhoea is defined in the PSLM 2004-05 as 'the discharge of three or more watery stools in any given day'. The reference period is 30 days prior to the survey. Secondly, this study focused on child morbidity. The reference period is past two weeks prior to survey.

For the present study, the 2004-05 PSLM sample is divided into different geographical zones of rural and urban areas. Rural areas are divided into nine agro-climatic zones: rice/wheat Punjab, mixed Punjab, cotton/wheat Punjab, low-intensity Punjab, barani Punjab, cotton/wheat Sindh, rice/other Sindh, NWFP and Balochistan while the urban sample is classified into two categories Major Urban Centers (MUCs) and Other Urban Centers (OUCs).

Nine agro-climatic zones of rural areas are based on the cropping pattern as discussed by Pinckney (1989). In the irrigated areas the two most important Kharif crops are rice and cotton. Table 1 shows that there are four distinct cotton or rice zones: cotton/wheat Punjab (zone 3), cotton/wheat Sindh (zone 6), rice/other Sindh (zone 7) and rice/wheat Punjab (zone 1). In the mixed zone no single crop dominates which is centered around Faisalabad (zone 2). Barani areas are considered as a separate zone because of their dependence on rainfall (zone 5). Having similar cropping pattern and climate, the D.I. Khan, district of NWFP is included in the low-intensity zone of Punjab (zone 4). This zone has relatively less developed irrigation facilities and low cropping intensities.

Table 1
Agricultural zone in Pakistan

Agro-climatic Zones (Rural)	**Districts**
1.Rice/wheatPunjab	Sialkot, Gujrat, Gujranwala, Sheikhupura, Lahore and Kasur
2. Mixed Punjab	Sargodha, Khushab, Jhang, Faisalabad, Okara and Toba Tek Singh
3.Cotton/wheatPunjab	Sahiwal, Bahawalpur, Bahawalnagar, Rahim Yar Khan, Multan, Vehari and Khanewal
4.Low-intensity Punjab	Dera Ghazi Khan, Rajanpur, Muzaffargarh, Leiah, Mianwali, Bhaker and Dera Ismial Khan.
5. Barani Punjab	Attock, Jhelum, Chakwal, Rawalpindi and Islamabad
6. Cotton/wheat Sindh	Sukkur, Khairpur, Nawabshah, Hyderabad, Tharparkar and Sanghar
7. Rice/other Sindh	Jacobabad, Larkana, Dadu, Thatta, Badin, Shikarpur, Nasirabad and Karachi
8. NWFP	Swat, Dir, Peshawar, Kohat, Karak, Mansehra, (Except DI Khan) Abbottabad, Kohistan, Mardan and Bannu
9. Balochistan	Quetta, Sibi, Kalat and Mekran (Except Nasirabad)
Urban Centers	
1. MUCs	Islamabad, Lahore, Gujranwala, Faisalabad, Rawalpindi, Multan, Bahawalpur, Sargodha, Sialkot, Karachi, Hyderabad, Sukkur Peshawar and Quetta, have been considered as large sized cities.
2.OUCS	The remaining urban population in each district in all the provinces has been considered as other urban centers.

Source: For rural agro-climatic zones Pinckney (1989) and for urban classification PSLM 2004-05.

The remaining districts in NWFP and Balochistan are included in the last two zones (zone 8 and zone 9). The classification of urban areas has been made on the basis of population size. Islamabad, Lahore, Gujranwala, Faisalabad, Rawalpindi, Multan, Bahawalpur, Sargodha, Sialkot, Karachi, Hyderabad, Sukkur, Peshawar and Quetta, have been considered as large sized cities (MUC), whereas the remaining urban population in

each district in all the provinces has been considered as Other Urban Centers (OUC) as shown in Table 1.

Among 4762 urban children 1921 are located in the MUCs and 2841 are located in the OUCs. Out of 8778 rural children 733 are located in rice/wheat Punjab, 697 in mixed Punjab, 1061 in cotton/wheat Punjab, 443 in low-intensity Punjab, 241 in barani Punjab, 1077 in cotton/wheat Sindh, 1046 in rice/other Sindh, 2200 in NWFP and 1280 in Balochistan as shown in Table 2 .

It appears from this reclassification that the 2004-05 PSLM sample is widely spread across the agro-climatic zones of rural and urban areas. This division is made in order to see any variation in morbidity across different ecological zones, which differ in climate, environmental setting, and socio economic factors. These agro-climatic zones show economic status of different areas as well because there is a link between poverty and agro-climatic zones.

Poverty in some regions of rural Pakistan, say barani Punjab is lower than in other regions particularly cotton growing zones of Punjab and Sindh. This low level of poverty is largely attributed to certain socio-economic characteristics of the region such as integration of rural areas with the prosperous urban centers.

Arif and Nasir (2008) have discussed that different rural agro-climatic zones have different infrastructure investment. Rich regions of rural areas are also better-off than poor regions in term of infrastructure and infrastructure investment has also profound

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Table 2

Distribution of under –five children identified in the 2004-05 PSLM, by Province and type of rural and urban areas.

Urban/Rural	Urban Areas			Rural Areas										Total Sample
Province	MUCs	OUCs	All	Rice wheat Punjab	Mixed Punjab	Cotton Wheat Punjab	Low Intensity Punjab	Barani Punjab	Cotton wheat Sindh	Rice-other Sindh	NWFP	Balochistan	All	
Punjab	952	933	1885	733	697	1061	443	241	-	-	-	-	3175	5060
Sindh	594	517	1111	-	-	-	-	-	1077	1046	-	-	2123	3234
NWFP	255	868	1123	-	-	-	-	-	-	-	2200	-	2200	3323
Balochistan	120	523	643	-	-	-	-	-	-	-	-	1280	1280	1923
Pakistan	1921	2841	4762	733	697	1061	443	241	1077	1046	2200	1280	8778	13540

Source: computed from PSLM 2004-05

impact on poverty reduction in these regions. However there is strong evidence from other developing countries that infrastructure investments in rural areas lead to higher farm and non farm productivity, employment and income opportunities, and increased availability of wage goods with lower prices, thereby reducing poverty by raising income and consumption (Kwon, 2000).

3.4.2. Data limitations

In data limitation three things are very important to mention. Three caveats of the data set are as follows: First, this study is based on the self reported morbidity and there are several limitations of the self reported morbidity. Women's self reported morbidity generally tends to exaggerate the presence of infection compared to etiological diagnosis Nayab (forthcoming).

Secondly, the PSLM has identified 1823 children which have different types of child illnesses/injuries but it has not clearly mentioned the kinds of diseases included in child illness.

Finally, in the PSLM questionnaire reference period for child illness and for diarrhoea are different. For diarrhoea, reference period is past 30 days whereas for child illness, it is past two weeks. It has also identified 693 children of the diarrhoel infection which are also included in child morbidity. It is not known whether these children had only a single episode of diarrhoel infection or were also affected with some other common child episodes such as respiratory infection. This study has included these children in the models of child morbidity on equal footing, ignoring the differences in reference period.

With respect to the prevalence of diarrhoea morbidity, mothers were asked in the PSLM: Has the child (name) diarrhoea during the last 30 days? Whereas with respect to prevalence of child morbidity, mothers were asked in the PSLM: whether the child had any illness/injury during the past two weeks? Illness is a dichotomous variable and logit model is used for illness. This answer is used to compute the rates of diarrhoea and child illness. It is also used as the dependent variable in multivariate analysis since it is binary; the multivariate approach is the logistic regression.

3.4.3. The Models

Just like in linear regression we assume that some set of X variables is useful for predicting the Y values, but we are claiming that this set predicts the probability that Y=1 (assuming we have coded the dependent variable as [0,1]). The basic formula for estimating Y=1 consists of transforming the regression equation to look like equation 1.

$$P(Y=1) = 1/1+\exp [-(\alpha + \beta 1X1 + \beta 2X2 + \ldots\ldots\ldots + \beta kXk] \qquad (1)$$

The whole function is called the logistic distribution function and it is estimated by maximum likelihood (ML) techniques. An advantage of this function is that it guarantees that the probability ranges from 0 to 1 as the regression equation predicts values from negative infinity to positive infinity [Gujrati, (1995), Cameron and Trivedi, (2005)]. Another name for the logit is log-odds so we can also write logistic function as

$$\text{Logit } [p(y=1)] = \alpha + \beta 1X1 + \beta 2X2 + \ldots\ldots\ldots + \beta kXk \qquad (2)$$

$$\text{Where the logit } [p(y=1)] = \log_e | p(y=1)/1-p(y=1)| \text{ i.e. log-odds} \qquad (3)$$

This fits the model

$$\text{Ln}\,[(p)/(1-P)] = a + \sum bixi \qquad (4)$$

Where p is the probability of a child having the diarrhoea illness during the 30 days preceding the survey, a and bi are estimated regression coefficients, and xi are the background characteristics, consisting of child's age and gender, his/her mother's age and educational attainment, sources of drinking water, toilet facilities, measles immunization, and ecological zones. As stated earlier, the main objectives of the present study is to determine the covariates of prevalence in both diarrhoea and child morbidity. To accomplish this purpose this study has constructed several models both in diarrhoea and child morbidity. Model 1, which is the full model, includes all the children less than five years selected for the present study. Model 2 to 12 has been estimated separately by focusing on geographical zones of rural areas and classifications of urban areas. All models are additive and has been summarized through odd ratios both in diarrhoea and child morbidity.

CHAPTER 4

SAMPLE CHARACTERISTICS AND POVERTY AMONG CHILDREN

4.1. INTRODUCTION

Poverty is widespread in Pakistan, and is predominantly a rural phenomenon. Nearly two thirds of the population lives in rural areas, and majority of the rural poor depend on agriculture for their livelihoods. Most rural poor people depend on agriculture for their livelihoods. Many have inadequate access to basic services such as safe drinking water, primary health care, education and other social services. Rural areas are diverse in terms of cropping patterns, land fertility, availability of water for irrigation, infrastructure, economic status, population growth and skill levels.

Most of the studies relating to poverty have focused on rural /urban disparities, but quite a few studies have looked at the variations in poverty incidence among the rural areas. There is a consensus in studies carried out during the last two decades that poverty in some regions of rural Pakistan, say barani Punjab is lower than in other regions particularly cotton growing zones of Punjab and Sindh.

This low level of poverty is largely attributed to certain socio-economic characteristics of the region such as integration of rural areas with the prosperous urban centers, relatively better human capital, access to jobs in armed forces and civil departments located in Islamabad/Rawalpindi and long tradition of overseas migration. In contrast, people in poor regions of the country lag behind in human capital, depend heavily on the farm sector for their livelihood, job opportunities outside agriculture are limited and migration

within the country or overseas is not a common phenomenon in these areas of the country.

This Chapter describes the sample characteristics and estimate poverty incidence for children less than five year of age, using the 2004-05 PSLM. The arrangement of this chapter is as follows. Section 4.2 describes sample characteristics. Section 4.3 describes the estimated poverty incidence of children under- five year 2004-05. Section 4.4 describes rural infrastructure and regional poverty. Finally section 4.5 presents the conclusion.

4.2. SAMPLE CHARACTERISTICS

Information on age and gender of the selected children, their mother's characteristics, the proportion of children being immunized, sanitation facilities, source of drinking water, poverty status, ownership of agricultural land and animals, and geographical zones is reported in Table 3. An operational definition of these variables is also presented in Appendix Table A1.

Selected children were evenly distributed; about 16 percent of them were less than one year old when PSLM was conducted, while 17 percent of the children had completed their first birthday. The share of 2-year old children was about 22 percent, for the 3-year old it was 23 percent and for 4-year old it was 21 percent.

Table 3 shows more than 68% of children born to mothers aged between 20 and 35 years, and only16% born to mothers aged between 35 to 39 years. Another 11% of children born to mothers above 40 years of age. A large proportion of mothers were illiterate

(73%) and a considerable proportion (45%) of the mothers of the sampled children gave birth to more than five children. Coverage of immunization was somewhat universal: about 78 percent of children had received child immunization while 19% of children had not received child immunization. Similarly proportion of children who received measles immunization was 68% while 22% of the respondents did not respond to this question.

Only thirteen percent of the selected children lived in a household that had the facility of toilet with flush system. Sixty percent of children lived in households which had different types of toilet facilities such as, flush connected to open drain, pit latrine etc., Forty six percent of the children lived in a household that had the facility of piped water or motorized pump and 53 % of children belonged to households who has other sources for drinking water like hand pump etc., (Table 3).

Table 3 also sets out data on economic characteristics. It shows that 71% of children belong to non poor household and 28% of children belong to poor households while sixty four percent of the children belong to households who owned agriculture land, another sixty two percent of the children belong to households who owned livestock.

Distribution of children by different geographical zones has also been presented in Table 3. Eight percent of children belong to rice/wheat Punjab zone, 7 percent belong to areas of mixed Punjab, 12 percent belong to areas of cotton/wheat Punjab, 5 percent belong to areas of low-intensity Punjab, 2 percent belong to areas of barani Punjab, 12 percent children belong to areas of cotton/wheat Sindh, 11 percent children belong to areas of rice/other Sindh, 25 percent children belong to areas of NWFP and 14 percent children belong to areas of Balochistan. Urban cities were classified into Major Urban Centres

(MUCs) and Other Urban Centres (OUCs). Fourteen percent of children belong to households who were residing in MUCs and 21 % of children belong to household who were residing in OUCS.

Table: 3
Percentage (%) Distribution of under-five children by selected characteristics

Characteristics	N	(%)
Child's Characteristics		
Child's Gender		
Female	6675	49.3
Male	6865	50.7
Child's Age		
<1	2146	15.8
1	2355	17.4
2	3002	22.2
3	3112	23.0
4	2925	21.6
Mother's Characteristics		
Mother age at the time of birth		
15-19 years	248	1.8
20-24 years	2535	18.7
25-29 Years	3537	26.1
30-34 years	3203	23.7
35-39 years	2195	16.2
> 40 Years	1616	11.9
No Response	205	1.5
Mother Education		
Illiterate	9826	72.6
Primary	1906	14.1
Matric and above	1603	11.8
No Response	205	1.5
Mother's working status		
No	11680	86.3
Yes	1860	13.7
Total No of Children born		
1-2	3165	23.4
3-4	4563	33.7
5-6	3428	25.3
7 and more	2084	15.4
No Response	300	2.2
Immunization		
Child Immunization		
Yes	10595	78.2
No	2624	19.4
No response	321	2.4
		continued

Characteristics	N	(%)
Measles Immunization		
No	1294	9.6
Yes (immunization card)	4791	35.4
Yes (memory)	4415	32.6
Do not Know	95	0.7
No response	2945	21.8
Environmental Characteristics		
Type of Toilet Facility		
No toilet in house	3581	26.4
Flush system(B)	1784	13.2
Others	8175	60.4
Source of Drinking Water		
Others	7280	53.8
Piped water within the House / Motorized Pump	6241	46.1
Economic Characteristics		
Poverty Status		
Non Poor	9642	71.2
Poor	3898	28.8
Own Agriculture Land		
No	8752	64.6
Yes	4788	35.4
Own Animals		
No	8398	62.0
yes	5142	38.0
Ecological Zones (Rural)		
Rice Wheat Punjab	733	8.4
Mixed Punjab	697	7.9
Cotton-wheat Punjab	1061	12.1
Low Intensity Punjab	443	5.0
Barani Punjab	241	2.7
Cotton Wheat Sindh	1077	12.3
Rice-other Sindh	1046	11.9
NWFP	2200	25.1
Balochistan	1280	14.6
Urban Areas		
Major Urban Centres	1921	14.2
Other urban Centres	2841	21.0

Source: computed from 2004-05 PSLM

(A) Primary category include primary and middle (till 8th class)

(B) The Flush system includes flush system connected to public sewerage

4.3. POVERTY STATUS OF CHILDREN UNDER FIVE YEAR 2004-05.

The present analysis is restricted to children under five years of age and the 2004-05 PSLM identified 13540 children in this age group covering both rural and urban areas. Data on the poverty incidence presented in this chapter is based on the official poverty line with a threshold of 2350 calories per adult equivalent per day.

The aggregate of household expenditure includes food items, frequent non food expenses (clothing, housing, health, education, transportation and recreation). More precisely, food and non food expenditures are added up to get the poverty lines. Based on the official poverty line Table 4 gives the poverty incidence in 2004-05 for the sampled children.

Table: 4
Prevalence rate (%) of poverty Incidence in 2004-05 for the sampled children

Agro-climatic zones	Poverty Headcount
	2004-05
Rural Areas	**33.0**
Rice/wheat Punjab	24.7
Mixed Punjab	34.1
Cotton/Wheat Punjab	45.9
Low-Intensity Punjab	34.3
Barani Punjab	9.1
Cotton/wheat Sindh	27.5
Rice/other Sindh	28.7
NWFP	37.9
Balochistan	29.9
Urban Areas	**21.1**
MUCs	14.3
OUCs	25.7

Source: computed from PSLM 2004-05.

Table 4 shows that overall children in rural areas are poorer than children in urban areas. Within urban areas the poverty incidence is higher for Other Urban Centers (OUCs) than for Major Urban Centers (MUCs). Across the rural areas poverty among children is higher in cotton wheat Punjab zone (45.9%) followed by NWFP (37.9%), low-intensity Punjab (34.3%) and mixed Punjab (34.1%). Child poverty is observed to be lowest in barani Punjab (9.1%). In other words, according to Table 4, Cotton/wheat zone of Punjab, low-intensity zone of Punjab and NWFP as the poorest zones while barani Punjab is the richest zone. Other zones particularly cotton/wheat Sindh, rice/wheat zones of Punjab and Sindh are relatively better off than the poorest zones. Mixed Punjab has the medium level of poverty. Balochistan is also among the poor zones.

The estimated poverty figures for the sampled children are very close to poverty estimates for the whole population, as carried out by earlier studies. For example Malik (1992) found the highest incidence of poverty in cotton/wheat Punjab, followed by Balochistan and low-intensity Punjab in 1984-85 (Table 5). This order, according to Malik changed to low-intensity Punjab followed by cotton/wheat Punjab and rice/other Sindh in 1987-88. Arif and Ahmed (2001) estimated that cotton/wheat Sindh and rice/wheat Punjab as the poorest regions in 1993-94 whereas Balochistan as the poorest region in 1998-99. According to the recent findings of Irfan (2008), based on the 2004-05 PSLM data and official poverty line, cotton/wheat zone of Punjab was the poorest region followed by NWFP and low-intensity Punjab, presented in column 5 of Table 5.

Table: 5
Poverty headcount and change in the incidence of poverty by agro-climatic zone

Agro-climatic zones	Poverty Headcount				
	1984-85	1987-88	1993-94	1998-99	2004-05
Rural Areas					-
Rice/wheat Punjab	14.3	8.2	33.1	47.7	20.4
Mixed Punjab	22.7	15.9	21.1	31.4	29.6
Cotton/Wheat Punjab	29.3	22	25.4	36.5	36.5
Low/Intensity Punjab	28	27.1	2.2	32.6	29.5
Barani Punjab	5.7	3.9	13.8	27.5	7.2
Cotton/wheat Sindh	20.5	18.9	34.1	39.4	24.4
Rice/other Sindh	24.3	20.6	26.9	36.8	23.1
NWFP	9.1	8.2	28.7	28.2	34.1
Balochistan	28.5	8	21.9	54.4	28.8

Source: For column 1 and 2 Malik (1992); column 3 and 4 Arif and Ahmed (2001); column 5 Irfan (2008).

Why poverty level varies across the rural zones? The earlier studies have particularly focused on consistently low levels of poverty in barani Punjab and have attributed it to certain socio-economic characteristics of the barani areas including relatively high levels of literacy, particularly among females; the lowest dependency ratio probably because of low fertility; and lowest number of unpaid family workers (Arif and Iqbal, 2008).

Rural areas of barani districts are well integrated with the prosperous urban centers with strong linkages to the services sectors and this factor has also attributed for lower level of poverty in these areas. Only 28 percent of the employed rural labor force is involved in agricultural activities. Many people of the region have opportunity to work in both armed forces and government sector. Due to the high incidence of overseas migration, remittances contribute a significant proportion of the total household income in barani areas of Punjab (Amjad, Arif and Mustafa, 2008).

According to the recent finding of Arif and Iqbal, (2008), rural infrastructure has played role for poverty differential across the rural zones. There seems to be negative relationship between poverty and infrastructure investment. Rural regions with low levels of poverty like barani Punjab, rice/wheat Punjab and mixed Punjab have better access to metalled roads. In contrast regions with high poverty levels have less access to roads.

Table 6
Physical Infrastructure by rural zones

Zones	Electricity(whole village)	Soling of streets	Drinking water piped	Drain
Barani Punjab	72.4	33.5	11.5	20.5
Rice/wheat Punjab	88.4	50.4	3.7	47.9
Mixed Punjab	70.2	30.2	7.6	28.0
NWFP	71.2	14.1	23.3	11.3
Balochistan	21.7	0.5	7.7	0.5
Rice/Other Sindh	16.9	2.1	3.6	2.3
Cotton/wheat Punjab	53.7	13.7	7.9	10.0
Low/intensity Punjab	23.1	4.2	5.0	2.6
Cotton/wheat Sindh	32.2	1.7	2.3	3.0

Source: Arif and Iqbal, (2008)

Data on other physical infrastructure across the zones are presented in Table 6 including electricity, street soling, and availability of piped drinking water and drain system. The table shows clear differences across the regions in term of existence of these infrastructures. In term of electricity, for example, 72.4 percent mouzas (villages) in Barani Punjab, 88.4 percent of rice/wheat Punjab and 70.2 percent of mixed Punjab have access to electricity for whole mouza. These are relatively better-off regions within the rural areas. Figures presented in the Table 6 by Arif and Iqbal (2008) show that the regions with medium poverty have medium level of access to electricity, while the

regions with high poverty have low access to electricity like only 23.1 percent mouzas of low-intensity Punjab zone have access to electricity. The poor regions are even worse in the case of 'soling of streets', 14 percent in cotton/wheat Punjab zone and only 4 and 2 percent respectively in low-intensity Punjab and cotton/wheat Sindh zones. The situation of piped drinking water and drains across regions is also not very different; the poor regions are clearly at a disadvantage (Table 6).

Like physical infrastructure, similar differences across the rural regions are found in access to education and health facilities. Education is one of the important factors that contribute to poverty reduction. The existence of educational institutions in rural regions shows that 47 percent of mouzas in the barani Punjab have the facility of educational institutions for boys and 43 percent have the facility of educational institutions for girls (Table 7). Access to girl's institutions is very poor in the poor regions of the country.

Table 7
Number of Mouzas (Villages) by distance from education Institutions

Agro-climatic zones	Education Institutions for boys	Education Institutions for Girls
NWFP	61.7	45.5
Barani Punjab	46.9	42.5
Cotton/wheat Sindh	44.2	29.0
Mixed Punjab	43.0	38.6
Rice/wheat Punjab	39.9	37.6
Cotton/wheat Punjab	38.2	32.9
Low intensity Punjab	35.6	26.2
Rice/Other Sindh	35.1	22.1
Balochistan	30.9	12.0

Source: Arif and Iqbal, (2008)

4.4. CONCLUSION

This chapter has focused on regional differences in poverty incidence of children under-five years of age. Estimated poverty figures of the present study by using PSLM 2004-05 while controlling for sampled children is very close to the figures computed for full sample size presented by Irfan (2008). Cotton/wheat zone of Punjab, low-intensity zone of Punjab and NWFP are the poorest zones while barani Punjab is the richest zone.

Other zones particularly cotton/wheat Sindh, mixed Punjab, rice/wheat zones of Punjab and Sindh are relatively better off than the poorest zones. Balochistan is also among the poor zones. According to the recent findings of Arif and Iqbal (2008) infrastructure has a profound impact on poverty in rural areas of Pakistan. The whole analysis indicates that in term of physical infrastructure, access to roads and availability of electricity has significant impact on poverty reduction.

Rural regions with low levels of poverty like barani Punjab, rice/wheat Punjab and mixed Punjab have better access to infrastructure e.g. roads, electricity, soling of street, access to piped water, drain underground, access to educational institutions and health facilities. Rural regions with medium poverty have medium level of infrastructure while the regions with high poverty have low access to infrastructure. Investing more in rural infrastructure and provision of education, roads and health services is thus key to an increase in overall income of rural population and hence to reduce the poverty.

CHAPTER 5

DIARRHOEA MORBIDITY IN PAKISTAN: INCIDENCE AND DIFFERENTIALS

5.1. INTRODUCTION

Diarrhoea is among those diseases which are most prevalent among children in Pakistan (Mahmood and Mahmood, 1995). About two-thirds of total annual deaths in Pakistan are currently among children under the age of five years, and diarrhoea is considered to be one of the major contributors to these deaths. Diarrhoea is usually caused by one of the number of food borne or water borne pathogens. Improvements in environmental factors such as supply of adequate and clean drinking water, improvements in sanitation facilities, and personal hygiene thus can play an important role in reducing the incidence of diarrhoea. Similarly mother's education can cause behavioral changes that can reduce the transmission of enteric pathogens and can be helpful in reducing diarrhoea morbidity rates (Chakrabarti, 2003).

Although the focus of study is on economic variables and child health, the impact of other socio-demographic, environmental and geographical factors of diarrhoea morbidity have also been considered. In this chapter diarrhoea morbidity is used as an indicator of child health, focusing on variations across geographical zones because, as discussed in Chapter 4, these zones are different in terms of economic status or the prevalence of poverty. Some zones of rural and urban areas are rich and some are poor, therefore this study has tried to examine how diarrhoea morbidity for the sampled children varies across different ecological zones. This chapter also examines the impact of preventive

health care especially measles immunization on diarrhoea morbidity. Immunization may not be directly related with diarrhoea morbidity but measles immunization is likely to protect children against measles –associated diarrhoea (Arif, 1998).

The arrangement of this chapter is as follows. Section 5.2 describes diarrhoea morbidity and its differentials by environmental, economic and demographic factors, while section 5.3 describes results of logistic regression model. Finally section 5.4 summarizes the main findings.

5.2. DIARRHOEA MORBIDITY DIFFERENIALS.

5.2.1. Gender differentials across zones

The prevalence rate of diarrhoea morbidity among the sampled children while controlling for gender and zones are shown in Table 8. The overall diarrhoea morbidity rate for children in 2004-05 is 16 percent. The overall diarrhoea morbidity rate is higher for males than for females in both rural and urban areas, but the overall rate for rural areas is higher than for urban areas. The diarrhoea morbidity rate while controlling for gender in all geographical zones of rural areas is higher for males than for females except in low-intensity Punjab zones. This pattern is also observed in OUCs; the highest prevalence rate of diarrhoea morbidity is found in the zone of cotton/ wheat Punjab, followed by cotton/wheat Sindh zone. These two zones are among the poorest regions of the country.

Table: 8
Prevalence rate (%) of diarrhoea morbidity rate by geographical Zones and gender

Geographical zones	Male	Female	Total
Rice/wheat Punjab	17.1	13.8	15.4
Mixed Punjab	18.7	16.6	17.6
Cotton/wheat Punjab	24.4	15.8	20.1
Low intensity Punjab	17.7	18.0	17.8
Barani Punjab	10.8	10.5	10.7
Cotton/ wheat Sindh	21.1	18.5	19.8
Rice/other Sindh	18.9	16.5	17.7
NWFP	17.6	17.3	17.5
Balochistan	13.4	9.8	11.0
Overall rural areas	18.3	15.6	16.9
Urban Areas			
MUCs	12.8	13.7	13.2
OUCS	16.1	14.1	15.2
Overall Urban areas	14.8	13.9	14.4
All areas	17.0	15.0	16.0

Source: computed from PSLM 2004-05

5.2.2. Age-Gender Differentials.

The age/gender –specific morbidity rates of the sampled children are shown in Table 9. The gender differentials fluctuated considerably between the age groups. Diarrhoea morbidity rates for males peaked at age 1 and for females, diarrhoea morbidity rate peaked at below 1 year. The rate in this age group is higher for males than for females. After age 1 it declined steadily for both sexes.

Table: 9
Prevalence rate (%) of Diarrhoea Morbidity among children under five, By Age Controlling for Gender

Child's Age (years)	Male	Female	Total
<1	22.9	22.5	22.7
1	25.9	22.0	23.6
2	19.0	15.3	17.1
3	12.7	10.9	11.8
4	9.0	7.5	8.3

Source: computed from PSLM 2004-05

These findings regarding the age pattern of diarrhoea morbidity are consistent with studies conducted in other developing countries, which showed relatively higher diarrhoel disease in the first two years of life (Yohannes, 1992). This outcome could be due to exogenous factors such as reduction of breastfeeding along with increase in food supplementation in the second year of life. The supplementary food can become contaminated in the preparation process under poor hygienic conditions. Therefore continuing breastfeeding of children and maintaining personal hygiene by those who prepare food for children can also play an important role in reducing the incidence of diarrhoea.

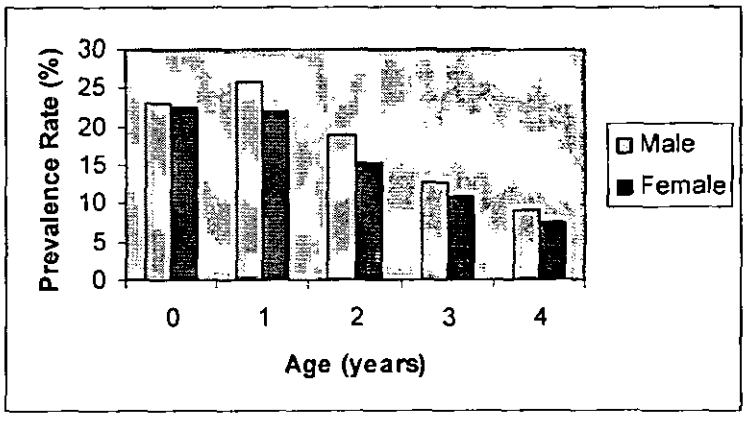

Figure: 2. Prevalence rate (%) of Diarrhoea Morbidity by Age controlling for Gender

In 1995-96 the overall prevalence rate of diarrhoea morbidity among children under five years of age was 19.8; it was 20.2 and 19.4 for males and females respectively (Arif, 1998). If we make a comparison with the figures presented in Table 8, we see that overall the diarrhoea morbidity rate has modestly declined for both males and females during the last one decade. The increase in female education and awareness campaigns against diarrhoea in print and electronic media may also have contributed to this reduction.

Table: 10
Prevalence Rate (%) of Diarrhoea morbidity by gender and age while controlling for rural zones

Child age	Rice Wheat Punjab		Mixed Punjab		Cotton Wheat Punjab		Low Intensity Punjab		Barani Punjab	
years	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<1	25.0	23.0	28.6	16.9	30.5	22.2	3.4	29.2	12.5	22.2
1	27.6	18.8	19.0	25.4	42.7	29.4	33.3	25.0	16.7	20.8
2	18.5	15.8	21.9	16.9	25.0	14.3	23.9	16.3	17.9	9.1
3	9.1	6.6	9.9	13.2	14.5	11.4	17.5	13.0	3.4	-
4	4.3	6.8	14.1	10.8	14.3	4.4	10.9	5.0	4.3	3.2
Child age	Cotton/ Wheat Sindh		Rice /Other Sindh		NWFP		Balochistan		Total (RURAL)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<1	27.0	26.2	26.0	25.4	20.5	20.4	11.5	22.0	22.9	22.5
1	37.2	28.7	24.3	24.4	25.9	24.0	17.3	15.2	27.8	23.8
2	14.8	19.0	21.4	15.3	21.2	18.7	18.4	13.0	20.3	16.2
3	19.3	16.4	18.9	14.7	13.2	14.8	12.1	5.4	14.2	11.8
4	13.6	6.2	8.6	9.3	9.8	9.5	7.4	2.3	10.2	6.8

Source: computed from PSLM 2004-05

Table: 11
Prevalence Rate (%) of Diarrhoea morbidity by gender and age while controlling for urban zones

Child age	MUCS		OUCS		Urban	
(years)	Male	Female	Male	Female	Male	Female
<1	21.2	21.4	23.9	23.7	22.9	22.6
1	15.2	18.1	24.4	18.6	20.5	18.4
2	16.1	12.9	17.2	14.2	16.8	13.7
3	9.1	9.8	10.4	8.5	9.9	9.0
4	4.7	8.0	8.0	9.4	6.6	8.8
Total	12.8	13.7	16.1	14.1	14.8	13.9

Source: computed from PSLM 2004-05

The age/gender diarrhoea morbidity rates of the sampled children for rural zones are shown in the Table 10, the gender differentials fluctuated across age groups. Diarrhoea morbidity is higher for children belonging to age group of less than one year. After age 1 diarrhoea morbidity rates declined steadily for both males and females almost in all rural zones. However, total rural sample shows that diarrhoea morbidity rate for both males and females peaked at the age of one year and declined steadily therefore for both sexes. Similar pattern of morbidity decline is also observed in the two classifications of urban areas: MUCs and OUCs (Table 11).

5.2.3. Environmental Factors and Diarrhoea Morbidity

The relationship between diarrhoea morbidity among children under five and the environment related variables i.e., sources of drinking water and types of toilet facility are shown in Table 12. Children living in households having piped water or motor pump inside the house are less likely to become sick than children in households having other sources of water including hand pump, well or river. This pattern of diarrhoea morbidity remains same across zones except in three zones, low-intensity Punjab, cotton/wheat Sindh and NWFP. This is the expected pattern since piped water is normally assumed to be less contaminated than other sources. Jalan and Ravallion (2001) indicate that access to piped water significantly reduces diarrhoea incidence and duration.

Table 12 also shows that the prevalence of diarrhoea among children who lived in households with a flush toilet connected to sewerage is substantially lower than among those who lived in household with other types of flush system.

Table 12
Prevalence rate (%) of diarrhoea morbidity among children under five, by environmental conditions controlling for rural/urban and ecological zones

Economic Characteristics	Urban Areas			Rural Areas										Total Sample
	MUCs	OUCs	All	Rice/ wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low-Intensity Punjab	Barani Punjab	Cotton /wheat Sindh	Rice/ other Sindh	NWFP	Balochistan	All	
Water source														
Piped water within house/Motor pump	12.1	13.8	13.0	15.3	15.5	14.9	21.1	9.5	20.2	11.7	18.7	11.0	16.0	14.3
Others	18.1	18.2	18.2	15.5	19.0	23.2	16.7	11.8	19.7	18.5	16.8	11.7	17.3	17.5
Toilet Facility														
No	11.7	18.2	16.4	11.8	20.5	23.4	17.8	16.4	12.3	14.5	21.8	12.9	17.5	17.4
Flush to Sewerage	12.6	14.3	13.0	20.0	25.0	24.1	18.2	16.7	28.6	8.0	21.2	13.0	19.6	13.8
Others	14.6	15.0	14.9	17.9	14.7	15.4	17.9	4.5	22.6	19.0	15.8	10.5	16.4	15.9

Source: computed from PSLM 2004-05

This difference persisted even when controlling for urban classifications (MUCs/OUCs). On the other hand, quite surprisingly in rural areas and in different geographical zones of rural areas prevalence rate is higher in the households having toilet with flush connected to sewerage system than households with other sources of toilet facilities. This might be due to poor sanitation facilities or non- use of toilet facilities by the sampled children in these areas.

5.2.4. Mother's Age, Education and Diarrhoea Morbidity

Table 13 shows no consistent relationship between the occurrence of diarrhoea and the age of mother. In fact there is a great fluctuation in the morbidity rates across different age groups of mothers. The level of maternal educational attainment, however, did show an association with diarrhoea morbidity. The prevalence of diarrhoea decreased with higher education, particularly for mothers with a matriculate or higher level of education. This pattern of morbidity decline remained unchanged when this relationship is observed for the classification of urban areas MUCs/OUCs and in several rural zones, as discussed latter in this chapter. It has recently been investigated that how mother's education influences the child health. Handa (1999) argues that mother's education helps to understand how to manage nutrition and disease most effectively, and increases the knowledge of appropriate sanitary behavior.

Table 13
Prevalence rate (%) of diarrhoea morbidity among children under five, by mother's characteristics controlling for rural /urban areas and ecological zones

Mother's Characteristics	Urban Areas			Rural Areas										Total Sample
	MUCs	OUCs	All	Rice /wheat Punjab	Mixed Punjab	Cotton /Wheat Punjab	Low-Intensity Punjab	Barani Punjab	Cotton/ wheat Sindh	Rice/other Sindh	NWFP	Balochistan	All	
Mother's age														
15-19	16.7	36.8	29.0	16.7	55.6	30.4	30.0	-	33.3	9.1	20.0	3.6	20.9	23.0
20-24	18.0	16.2	16.9	20.0	21.1	24.1	25.9	11.4	28.7	18.6	17.6	15.7	20.1	19.0
25-29	13.1	16.0	14.7	15.9	14.5	19.5	17.7	12.7	19.0	18.9	19.1	10.9	16.8	16.0
30-34	12.1	12.9	12.5	12.3	19.3	21.8	16.2	10.8	17.6	17.7	16.7	7.6	15.9	14.6
35-39	8.6	16.1	13.4	16.2	16.4	20.3	10.6	7.7	18.9	17.1	18.4	13.1	16.9	15.6
40 and above	14.3	13.6	13.8	6.8	15.6	11.9	16.9	-	15.5	15.7	12.6	14.0	13.6	13.7
No Response	14.3	3.0	8.2	50.0	-	4.5	12.5	50.0	15.4	23.8	34.3	5.3	19.7	16.1
Mother's Education														
Illiterate	14.3	15.4	15.0	13.5	19.0	21.7	17.6	7.8	18.7	17.6	17.4	11.7	16.8	16.4
Primary	13.7	18.4	16.3	16.0	13.7	17.0	17.4	17.4	23.5	20.0	15.9	12.1	16.8	16.5
Matric and above	11.6	11.8	11.7	21.3	18.8	11.4	25.0	6.3	42.9	10.0	15.0	9.5	17.7	13.4
No Response	14.3	3.0	8.2	50.0	-	4.5	12.5	50.0	15.4	23.8	34.3	5.3	19.7	16.1

Source: computed from PSLM 2004-05

5.2.5. Economic Factors and Diarrhoea Morbidity

The relationship between diarrhoea morbidity among children under five and economic factors including ownership of agriculture land and ownership of livestock controlling for rural/urban areas and ecological zones is shown in the Table 14. Children living in households which owned agricultural land were less likely to become sick from diarrhoel infection than children in households with no ownership of agricultural land. This relationship holds even after controlling for zones except in the low-intensity Punjab zone, barani Punjab zone and Balochistan.

Table 14 also shows that prevalence of diarrhoea among children who lived in rural households that own animals was lower than among those who lived in households without animals. But this relationship does not hold for mixed Punjab, barani Punjab, rice /other Sindh and Balochistan.

In rural areas ownership of land and livestock is a means of employment. Increased employment due to the ownership of land and livestock directly benefits the poor more than the non-poor as it can reduce poverty by raising income and consumption of the poor households. Thus ownership of land and animals plays an important role to improve the economic position of household; as the economic position of household improves it helps in many ways to protect child from diarrhoea morbidity.

Better economic position of a household can improve the sanitary condition of a household. Increased availability of uncontaminated drinking water and personal hygiene can play a major role to protect child from diarrhoel infection. Similarly better economic status of a household improves nutritional status of child and it can also protect him from

diarrhoel disease. To see the independent impact of different economic, environmental, demographic and geographical factors on child health, multivariate technique is applied in the next section.

Table 15
Logistic regression effects of predictors on diarrhoea morbidity among children under five, 2004-05 PSLM (Odd Ratios)

Characteristics	Model 1 (Full)	Model 2 Rice/ Wheat Punjab	Model 3 Mixed Punjab	Model 4 Cotton/wheat Punjab
Child Characteristics				
Child's Gender				
Female	1.00	1.00	1.00	1.00
Male	1.181*	1.341	1.043	1.825*
Child's Age				
<1	1.00	1.00	1.00	1.00
1	0.965	1.698**	1.193	1.192
2	0.658*	1.109	0.958	0.547**
3	0.399*	0.432**	0.532**	0.286*
4	0.294*	0.302*	0.660	0.268*
Total No of Children born				
1-2	1.00	1.00	1.00	1.00
3-4	0.926	1.045	0.766	0.993
5-6	0.986	1.171	0.830	0.979
7 and more	1.184**	1.209	1.182	1.305
Mother's Characteristics				
Mother's age	0.992**	0.968**	0.960*	0.979**
Mother's education				
Illiterate	1.00	1.00	1.00	1.00
Primary	0.994	0.901	0.639**	0.832
Matric and above	0.850**	1.695**	0.887	0.583
Mother's working status				
No	1.00	1.00	1.00	1.00
Yes	1.038	0.881	1.040	1.249
Immunization				
Measles Immunization				
No	1.00	1.00	1.00	1.00
Yes	0.979	0.348*	0.742	1.013
Environmental Characteristics				
Type of Toilet Facility				
No toilet in house	1.00	1.00	1.00	1.00
Flush system(B)	1.035	2.437	3.308*	1.214
Others	0.972	1.772**	0.969	0.771
Source of Drinking water				
Others	1.00	1.00	1.00	1.00
Piped water within the House / Motorized Pump	0.807*	0.682	1.113	1.228
				continued

Characteristics	Model1 Full	Model 2 Rice/ Wheat Punjab	Model 3 Mixed Punjab	Model 4 Cotton/wheat Punjab
Economic Characteristics				
Own Agriculture Land				
No	1.00	1.00	1.00	1.00
Yes	0.907**	0.838	1.089	1.017
Own Animals				
No	1.00	1.00	1.00	1.00
yes	0.981	0.691**	1.221	1.037
Material used in roof of House				
Others	1.00	1.00	1.00	1.00
RCC/RBC	0.831*	0.640**	0.598**	1.090
Material Used in walls				
Others	1.00	1.00	1.00	1.00
Brick	0.987	1.592	0.719	0.822
Source of Light				
Others	1.00	1.00	1.00	1.00
Electricity	1.101	1.600	0.569**	1.228
Geographical zones				
Ecological Zones (Rural)				
Rice wheat Punjab	1.00	-	-	-
Mixed Punjab	1.168	-	-	-
Cotton Wheat Punjab	1.492*	-	-	-
Low Intensity Punjab	1.210	-	-	-
Barani Punjab	0.676**	-	-	-
Cotton Wheat Sindh	1.794*	-	-	-
Rice Other Sindh	1.139	-	-	-
NWFP	1.145	-	-	-
Balochistan	0.949	-	-	-
Ecological zones (urban)				
MUCS	0.961	-	-	-
OUCS	1.102	-	-	-
N	10096	616	570	850

SOURCE: Computed from the 2004-05 PSLM

(A)Primary category include primary and middle (till 8th class)

(B)The flush system includes Flush system connected to Public Sewerage.

* Shows significance at 5 percent or lower level of confidence.

** Shows significance at 10 percent or lower level of confidence.

The gender variable has a positive and significant effect (at 5 percent level of confidence) on the probability of getting diarrhoea morbidity, suggesting that males under five are more likely than females to get diarrhoea. It may primarily be attributed to biological differences (Khan, 1994). Table 15 shows that total number of children born to a mother has a positive association with child morbidity, as the number of children born increases it exerts strong and significant pressure on child sickness but significance has been shown only for high parity women (children 7 and more).

This adverse impact on child health with an increase in number of children reflects relatively less attention of mother on each child's health requirement. Moreover physical resources such as housing space, food, clothing and health care are therefore spread over a larger number of children. The risks of infection are exacerbated when a large number of young children bathe, sleep and eat together (Sathar, 1992). For instance, in urban Pakistan it was found that families where there were one or two children aged under five, 18 percent of them had infectious diseases as compared to 24 percent of children of families where there were two or more children aged under five (Omran,1981).

Age and education of children's mother did show significant and negative effect on the diarrhoea morbidity (Arif and Ibrahim, 1998) as shown in Table 15 whereas mother's working status did not show a significant relationship. Children having measles immunization are less likely to become sick due to diarrhoea, but the relationship does not turn out to be significant. Children who belong to households having relatively safe source of drinking water, piped/motorized-pump inside the house, have shown significant negative association with diarrhoea morbidity (hypothesis 3). Incidence and duration of

diarrhoea among children under five in rural India are significantly lower on average for families with piped water than for observationally identical household without piped water (Jalan and Ravallion, 2001). Surprisingly children living in household having "latrine with flush system" do not show any association with diarrhoea morbidity. It probably may be due to the fact that presence in a household of a latrine does not necessarily mean that a child uses it. In many communities, even where basic sanitation facilities exist and adults use them, young children are often permitted to defecate indiscriminately (Arif and Ibrahim, 1998). So it is not easy to hypothesise whether it is the availability of sanitation facilities or it is the usage pattern of latrine in the home that transmits pathogens causing diarrhoea.

Model 1 in Table 15 shows that, children who belong to households who own agricultural land, has a significant and negative relationship with diarrhoea morbidity. Similarly children who belong to household with ownership of animals are less likely to become sick than children who belong to households who have no ownership of animals.

We have taken material used in housing as an indicator of economic factors. Model 1 shows that children who belong to households where material used in the roof of the house is RCC/RBC are less likely to become sick than children who belong to households where other type of material is used in the roof of house e.g., wood /bamboo etc and it has also shown significant association with diarrhoea morbidity. Probably roof material (RCC/RBC) represents better economic position of household. It appears that overall housing has a significant impact on diarrhoea morbidity (Mahmood, 2001).

Access to electricity has a positive but insignificant influence on the probability of being sick as shown in Model 1 (Arif, 2004). Model 1 shows that within rural ecological zones highest odd of diarrhoea morbidity is in the cotton /wheat Sindh zone and the lowest odd of diarrhoea morbidity is in the barani Punjab zone. Model 1 has also shown that pattern of morbidity risk is higher for children living in Other Urban Centres (OUCs) than Major Urban Centers (MUCs). All geographical zones except barani Punjab zone, Balochistan and MUCs have shown positive relationship with diarrhoea morbidity.

The results of Models 2-12, which examined the likelihood of children being sick for residing in rice/wheat Punjab zone, mixed Punjab zone, cotton/wheat Punjab zone, low-intensity Punjab zone, barani Punjab, cotton/wheat Sindh zone, rice/other Sindh zone, NWFP, Balochistan, MUCs and OUCS separately are presented in Tables 15, 16 and 17. Results of these Models reveal some important points. Child gender is positively associated with diarrhoea morbidity in all the geographical zones of rural areas whereas in the urban areas it is positively associated only in the OUCs (Mahmood and Mahmood, 1995; Sathar 1994). Child age is negatively associated with diarrhoea morbidity in all the geographical zones of rural and within classification of urban areas (Boerma and Ginneken (1996).

Total number of children born exerts a negative pressure on child health (Bennett.1999; Preston, 1978) only in rural zones. Mother's age appears to be negatively associated with diarrhoea morbidity (Hobcraft et al, 1985) in geographical zones of rural and urban areas except in barani Punjab, rice/other Sindh, Balochistan and OUCs. Mother's working status appears to be positively associated with probability of children being sick (Arif,

2004) except in rice/wheat Punjab, barani Punjab, cotton/ wheat Sindh, rice/other Sindh, NWFP and MUCs. Mother's education appears to be a very important determinant to control diarrhoea morbidity (Caldwell, 1979). In classification of urban areas mother's education has shown significant negative association. In rural geographical zones the corresponding impact is in general insignificant; but surprisingly it is significant and positive in two zones such as barani Punjab and cotton/wheat Sindh. It is hard to explain this positive relationship between mother's education and child morbidity in these two zones. This is unexpected since the barani zone is economically better-off than other zones and educational level of adult population is also better in this zone. Krupnick et al (1996) also showed that mother's educations, unlike other studies, were found to have no impact on morbidity.

Measles immunization in the classification of urban areas is not of much importance whereas in the geographical zones of rural areas it seems very helpful to reduce diarrhoea morbidity although it is not significant at many places (Pande, 2000). Relatively safe sources of drinking water, piped/motorized pump appears to be strong determinants of diarrhoea morbidity and it is helpful to reduce diarrhoea morbidity in rural as well as urban areas (Jalan and Ravallion, 2001).

Surprisingly, unlike other studies, toilet facility with flush system connected to sewerage which is used as an indicator of sanitation facilities appears to be positively associated with diarrhoea morbidity except in the rural zones of rice/other Sindh, NWFP and Balochistan. As stated earlier, it could be due to poor sanitation facilities or due to non-use of toilet facilities by the sampled children.

Housing conditions (material use in roof of house and material used in walls of house) has shown importance for the zones of rural areas and within urban classifications to control diarrhoea morbidity. In housing condition, material used in the roof of house seems to be more important than material used in the walls of house across zones and it has also shown significant association for several rural zones. It might be possible that housing represents better economic condition of household which helps to improve child health. Electricity appears to be positively associated with diarrhoea morbidity except in mixed Punjab, barani Punjab, Balochistan, MUCs and OUCs. Again it is an unexpected association.

Ownership of agricultural land is important determinant of diarrhoea morbidity especially at the poor zones of urban and rural areas, for example, OUCs, low-intensity Punjab, cotton/wheat Sindh, rice/other Sindh and NWFP although the corresponding negative impact has shown significant association only for NWFP. Similarly ownership of livestock has shown negative association with diarrhoea morbidity in rural zones, for example, rice/wheat Punjab, low-intensity Punjab, barani Punjab, cotton/wheat Sindh, rice/other Sindh and NWFP although the corresponding impact has shown negative association only for rice/wheat and barani zone of Punjab.

As it has been already mentioned in the chapter 4 of this study that poverty incidence of each geographical zone differs with each other. Infrastructure investment varies across the rural regions probably this might be the reason that the importance of different variables for diarrhoea morbidity varies across the regions.

Table 16
Logistic regression effects of predictors on diarrhoea morbidity among children under five, by rural ecological zones, 2004-05 PSLM (Odd Ratios)

Characteristics	Model 5	Model 6	Model 7	Model 8
	Low/intensity Punjab	Barani Punjab	Cotton /wheat Sindh	Rice/ Other Sindh
Child Characteristics				
Child's Gender				
Female	1.00	1.00	1.00	1.00
Male	1.027	1.203	1.329**	1.233
Child's Age				
<1	1.00	1.00	1.00	1.00
1	1.740	0.317	1.626	0.914
2	0.777	0.298	0.744	0.508**
3	0.527	0.054*	0.565**	0.372*
4	0.311*	0.101*	0.305*	2.52*
Total No of Children born				
1-2	1.00	1.00	1.00	1.00
3-4	0.598	1.181	0.629**	0.846
5-6	1.027	0.408	0.828	0.831
7 and more	2.975**	1.386	1.386	1.008
Mother's Characteristics				
Mother's age	0.946*	1.020	0.999	1.012
Mother's Education				
Illiterate	1.00	1.00	1.00	1.00
Primary	1.566	2.609**	0.955	1.089
Matric and above	2.491**	1.449	2.691*	0.593
Mother's working Status				
No	1.00	1.00	1.00	1.00
Yes	1.438	0.848	0.763	0.663
Immunization				
Measles Immunization				
No	1.00	1.00	1.00	1.00
Yes	0.637	0.852	1.786**	1.231
Environmental Characteristics				
Type of Toilet Facility				
No toilet in house	1.00	1.00	1.00	1.00
Flush system(B)	1.610	1.860	1.423	0.383
Others	0.886	0.094*	3.082*	1.749**
Source of Drinking water				
Others	1.00	1.00	1.00	1.00
Piped water within the House / Motorized Pump	2.376*	0.422	0.602**	0.692
				continued

Characteristics	Model 5	Model 6	Model 7	Model 8
	Low/intensity Punjab	Barani Punjab	Cotton /wheat Sindh	Rice/ Other Sindh
Economic Characteristics				
Own Agriculture Land				
No	1.00	1.00	1.00	1.00
Yes	0.757	1.723	0.821	0.923
Own Animals				
No	1.00	1.00	1.00	1.00
yes	0.731	4.043**	0.789	0.874
Material used in roof of House				
Others	1.00	1.00	1.00	1.00
RCC/RBC	0.368*	1.583	0.975	0.341*
Material Used in walls				
Others	1.00	1.00	1.00	1.00
Brick	0.401*	2.679	0.960	1.952*
Source of Light				
Others	1.00	1.00	1.00	1.00
Electricity	2.125**	0.594	1.131	1.969*
N	340	201	587	686

SOURCE: Computed from the 2004-05 PSLM

(A)Primary category include primary and middle (till 8th class)

(B)The flush system includes Flush system connected to Public Sewerage.

* Shows significance at 5 percent or lower level of confidence.

** Shows significance at 10 percent or lower level of confidence.

Table 17
Logistic regression effects of predictors on diarrhoea morbidity among children under five, by ecological zones, 2004-05 PSLM (Odd Ratios)

Characteristics	Model 9	Model 10	Model 11	Model 12
	NWFP	Balochistan	MUCs	OUCs
Child Characteristics				
Child's Gender				
Female	1.00	1.00	1.00	1.00
Male	1.020	1.496**	0.928	1.180**
Child's Age				
<1	1.00	1.00	1.00	1.00
1	1.375**	0.566	0.539*	0.740**
2	1.040	0.669	0.430*	0.517*
3	0.710**	0.255*	0.320*	0.274*
4	0.430*	0.169*	0.160*	0.268*
Total No of Children born				
1-2	1.00	1.00	1.00	1.00
3-4	1.183	0.621**	1.013	1.007
5-6	1.145	1.502	0.988	0.885
7 and more	1.516**	1.568	1.003	0.857
Mother's Characteristics				
Mother's age	0.989	1.003	0.955	1.003
Mother's Education				
Illiterate	1.00	1.00	1.00	1.00
Primary	0.978	2.153	0.811	1.128
Matric and above	0.860	0.851	0.740**	0.666*
Mother's working Status				
No	1.00	1.00	1.00	1.00
Yes	0.748	1.201	0.842	1.055
Immunization				
Measles Immunization				
No	1.00	1.00	1.00	1.00
Yes	0.784	0.607	1.800*	1.049
Environmental Characteristics				
Type of Toilet Facility				
No toilet in house	1.00	1.00	1.00	1.00
Flush system(B)	0.849	0.234**	1.386	1.149
Others	0.544*	0.745	1.401	1.049
Source of Drinking water				
Others	1.00	1.00	1.00	1.00
Piped water within the House / Motorized Pump	1.208**	1.044	0.590*	0.708*
				continued

Characteristics	Model 9	Model 10	Model 11	Model 12
	NWFP	Balochistan	MUCs	OUCs
Economic Characteristics				
Own Agriculture Land				
No	1.00	1.00	1.00	1.00
Yes	0.696*	1.017	1.124	0.827
Own Animals				
No	1.00	1.00	1.00	1.00
yes	0.907	1.276	1.374	1.171
Material used in roof of House				
Others	1.00	1.00	1.00	1.00
RCC/RBC	0.893	0.572	0.863	0.866
Material Used in walls				
Others	1.00	1.00	1.00	1.00
Brick	1.071	0.328**	0.826	0.968
Source of Light				
Others	1.00	1.00	1.00	1.00
Electricity	1.071	0.990	0.336*	0.799
N	1616	636	1637	2357

SOURCE: Computed from the 2004-05 PSLM

(A)Primary category include primary and middle (till 8th class)

(B)The flush system includes Flush system connected to Public Sewerage.

* Shows significance at 5 percent or lower level of confidence.

** Shows significance at 10 percent or lower level of confidence.

5.4. SUMMARY

This chapter reveals some important dimensions of diarrhoea morbidity. As each geographical zone has different type of infrastructure and it has also played a profound role for poverty differential in each geographical zone of rural and urban areas, probably this might be the reason that importance of different variables varies across the regions. Although importance of different variables for diarrhoea morbidity varies across the geographical zones but still we are in a position to stress for the importance of some factors which may be helpful to control diarrhoea morbidity.

Child's own characteristics (gender and age), total number of children born, mother's characteristics (age and education), environmental characteristics (sources of drinking water), economic characteristics (ownership of agriculture land and housing) and geographical zones are very important factors to explain diarrhoea morbidity among children. Moreover in the multivariate analysis, except barani Punjab, Balochistan and MUCs, rural zones and classification of urban areas have shown positive association with diarrhoea morbidity. The present study also found a negative association between measles immunization and occurrence of diarrhoea morbidity but its impact was more profound in rural zones.

The focus of the present study is on economic variables and has found a relationship between diarrhoea morbidity and economic factors particularly the ownership of land, livestock and housing conditions. Importance of this relationship, however, varies across the regions. For example, cotton/ wheat Punjab, NWFP, mixed Punjab, low-intensity Punjab and Balochistan, the housing condition is much more important than ownership of

land and livestock. In Sindh all economic variables (land, livestock and housing) are important. In rich zones (rice/wheat Punjab and Barani Punjab) land, livestock and material used in roof are important to diarrhoea morbidity.

CHAPTER 6

CHILD MORBIDITY IN PAKISTAN: INCIDENCE AND DIFFERENTIALS

6.1. INTRODUCTION

This chapter examines the health status of Pakistani children using child sickness as an indicator of child health. Child health has been measured by whether the child has been ill during the past two weeks. It excludes diarrhoea morbidity discussed in the previous chapter. The main data source used in this study is the 2004-05 PSLM, which provides sufficient information on child sickness/injuries.

Although the focus of study is on economic variables and child health, the impact of other socio-demographic, environmental and geographical factors of child morbidity has also been considered. While assessing the factors related to child sickness, this chapter focuses on variations across geographical zones because, as discussed in chapter 4, these zones are different in terms of economic status or the prevalence of poverty.

This chapter also examines the impact of preventive health care especially child immunization on child morbidity. The arrangement of this chapter is as follows. Section 6.2 describes child morbidity and its differentials by environmental, economic and demographic factors, while section 6.3 describes results of logistic regression model. Finally section 6.4 summarizes the main findings.

6.2. CHILD MORBIDITY DIFFERENTIALS.

6.2.1. Gender differentials across zones.

The prevalence rate of child morbidity among the sampled children while controlling for gender and zones are shown in Table 18. The overall child morbidity or sickness in 2004-05 is 13.5 percent. Like the diarrhoea sickness, the overall child morbidity rate is also higher for males than for females in both rural and urban areas. This pattern persists while controlling for gender in all geographical zones of rural areas except in Balochistan (Table18). The rate for rural areas is higher than for urban areas. This pattern also remained unchanged when gender morbidity rate is controlled by classification of urban areas. The highest prevalence rate of child morbidity in the rural geographical zones is found in the zone of barani Punjab.

Table: 18
Prevalence rate (%) of child morbidity by geographical zones and gender

Geographical zones	Male	Female	Total
Rice wheat Punjab	9.6	8.2	8.9
Mixed Punjab	6.6	5.5	6.0
Cotton wheat Punjab	12.0	9.5	10.7
Low intensity Punjab	13.1	13.1	13.1
Barani Punjab	23.2	19.8	21.6
Cotton wheat Sindh	18.1	13.6	16.0
Rice other Sindh	16.8	15.9	16.3
NWFP	16.8	14.6	15.7
Balochistan	11.6	13.3	12.4
Overall rural areas	14.3	12.6	13.4
Urban Areas			
MUCs	14.1	13.2	13.7
OUCS	14.5	12.2	13.4
Overall urban areas	14.4	12.6	13.5
All areas	14.3	12.6	13.5

Source: computed from PSLM 2004-05

This is unexpected since the barani zone is economically better- off than other zones and the education level of adult population is also better in this zone. There could be several reasons, but it could largely be attributed to better awareness and reporting of child sickness in barani zone.

6.2.2. Age/Gender Differentials

The age/gender-child morbidity rates of the sampled children are shown in Table 19. The gender differentials fluctuated across age groups. Child morbidity rates for males peaked at age 1 and for females, child morbidity rate peaked at less than 1 year. As with the diarrhoea morbidity, the rate in this age group is also higher for males than for females, but after age 1 it declined steadily for both sexes (Table 19). These findings regarding the age pattern of morbidity are consistent with studies conducted in Pakistan as well as other developing countries, which showed relatively high prevalence of illness in the first two years of life[(Martorrell (1995), Gragnolati (2003) and Arif(2004)].

Table 19
Prevalence rate (%) of child morbidity among children under five, by age controlling for gender

Child's Age (years)	Male	Female	Total
<1	19.9	18.0	19.0
1	20.5	16.1	18.3
2	14.0	13.9	14.0
3	12.4	9.3	10.9
4	8.0	7.7	7.8

Source: computed from PSLM 2004-05

There could be several reasons for it such as reduction of exclusive breastfeeding in the second year of life. It is well established that breast-feeding provides young children protection against several diseases. Print and electronic media have been used in Pakistan in this regard to encourage mothers to breast-feed their babies for two years.

The age/gender child morbidity rates of the sampled children for rural zones are shown in Table 21. The gender differentials fluctuated considerably between the age groups. In several zones child morbidity peaked at the age of 1 for both males and females. After age 1 child morbidity rate declined steadily for both males and females almost in all rural zones. Same pattern was observed when total rural sample is taken into account. In urban areas for both males and females child morbidity rate peaked at below 1 year of age and after age 1 it declined steadily for both sexes. Same pattern is observed separately in MUCs/OUCs (Table 20). Younger children particularly under the age of two are more vulnerable than older children to different types of infections. As discussed previously breast feeding provides protection against child illness so efforts should be made to encourage mothers to breast-feed their children for the first two years of their life.

Table: 20
Prevalence rate (%) of child morbidity by child gender and age while controlling for urban zones

Child age	MUCS		OUCS		Urban	
years	Male	Female	Male	Female	Male	Female
<1	21.7	20.6	20.8	19.7	21.2	20.1
1	18.4	12.1	20.3	14.2	19.5	13.4
2	13.2	13.3	14.2	15.6	13.8	14.7
3	12.8	10.6	11.4	7.3	12.0	8.6
4	7.2	10.0	8.3	6.7	7.9	8.0
Total	**14.1**	**13.2**	**14.5**	**12.2**	**14.4**	**12.6**

Source: computed from PSLM 2004-05

Table: 21
Prevalence rate (%) of child morbidity by child gender and age while controlling for rural zones

Child age	Rice Wheat Punjab		Mixed Punjab		Cotton Wheat Punjab		Low Intensity Punjab		Barani Punjab	
years	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<1	14.1	9.3	10.0	10.4	18.2	8.2	13.8	13.7	18.8	36.8
1	17.1	11.4	13.6	4.2	19.1	15.4	24.2	19.5	33.3	20.8
2	9.0	9.2	5.4	3.8	11.8	13.0	15.2	11.6	28.6	17.4
3	6.0	4.4	2.8	7.2	9.0	8.4	10.5	13.0	23.3	15.8
4	1.4	7.9	4.1	2.6	4.9	3.4	7.1	7.3	11.1	12.9
Child age	Cotton/ Wheat Sindh		Rice/ Other Sindh		NWFP		Balochistan		Total (RURAL)	
years	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<1	26.3	24.2	25.7	23.4	19.9	16.4	19.2	31.4	19.1	16.7
1	24.0	19.8	28.2	24.7	22.9	20.7	14.5	16.5	21.1	17.4
2	14.5	16.3	14.0	19.8	19.2	12.1	11.0	15.3	14.1	13.5
3	18.8	7.5	14.6	9.9	12.7	13.6	14.0	8.7	12.6	9.7
4	11.9	6.1	9.8	8.3	11.2	11.3	5.1	7.1	8.0	7.5

Source: computed from PSLM 2004-05

6.2.3. Environmental factors and Child Morbidity

The relationship between child morbidity among children under five and the three indicators of environment; sources of drinking water, types of toilet facilities and telephone facility are shown in Table 22. Children living in households having piped water or a motor pump are less likely to be sick than children in households having other sources of water including hand pump, well or river.

In urban areas the prevalence of morbidity is less in households having piped water than in households having other sources of water. This difference has also been observed when urban areas are classified into MUCs and OUCs. This difference persisted in the rural areas though at a relatively lower scale. This difference is also observed at rice/ wheat Punjab, cotton/wheat Punjab and barani Punjab zone when rural areas are further divided into different geographical zones of rural areas.

The prevalence of illness among children who lived in households that had a flush connected to sewerage is lower than among those who lived in households with other sources of toilet facility (Table22). This difference persisted when controlling for urban areas and MUCs/OUCs whereas quite surprisingly in rural areas prevalence rate is almost same in both flush toilet connected to sewerage and in other sources of toilet facility and this difference fluctuated among different zones of rural areas. In cotton/wheat Punjab zone the children who belong to households having flush toilets connected to sewerage are less likely to become sick than children who belong to households with other sources for sanitation. In rice wheat Punjab zone, barani Punjab, cotton/wheat Sindh, rice/other Sindh and Balochistan the children who belong to households having flush toilet connected to sewerage were more likely to become sick. It might be due to poor sanitation conditions in these areas.

Table 22
Prevalence Rate (%) of child morbidity among children under five, by environmental conditions controlling for rural/urban and ecological zones

Environmental Characteristics	Urban Areas			Rural Areas										Total Sample
	MUCs	OUCs	All	Rice/ wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low/ Intensity Punjab	Barani Punjab	Cotton /wheat Sindh	Rice /other Sindh	NWFP	Balochistan	All	
Water source														
Piped water within house/Motor Pump	13.0	13.2	13.1	7.5	6.6	9.1	13.7	21.1	22.6	17.4	16.3	12.5	13.0	13.1
others	17.0	14.0	14.8	10.8	5.6	11.8	12.9	22.3	14.5	16.2	15.4	12.4	13.6	13.8
Toilet Facility														
None	10.4	13.4	12.6	8.9	6.6	12.8	12.1	17.5	14.2	15.6	14.0	13.5	12.6	12.6
Flush to Sewerage	13.0	12.0	12.7	16.7	4.2	1.9	9.1	33.3	42.9	28.0	15.2	13.0	13.7	12.8
Others	15.4	13.7	14.1	8.3	5.7	9.2	15.1	24.3	16.4	16.2	16.3	11.6	13.9	14.0

Source: computed from PSLM 2004-05

6.2.4. Mother's Age, Education and Child Morbidity

Table 23 shows no consistent relationship between the occurrence of child sickness and the age of mother. Similarly the level of maternal educational attainment does not show much association with child morbidity. The prevalence of sickness incidence is almost same for both primary and higher maternal education. When prevalence rate of sickness is observed in the rural areas, children of mothers with higher education were less likely to become sick than children of uneducated or less educated mothers. Similar pattern has been observed in the geographical zones of rural areas except in mixed Punjab, low-intensity Punjab and cotton wheat Sindh zone. In urban areas prevalence rate of child morbidity is almost same for children having mothers either with primary/middle or higher education. The same pattern is observed when the urban areas are further classified into MUCs and OUCs.

The most likely reason seems to be that an educational difference causes behavioral differences that affect the transmission of enteric pathogens. But there is also the possibility that mothers with a lower educational attainment or higher educational attainment in urban areas may be those with poor housing and worse sanitary facilities. These confounding variables can promote the transmission of enteric pathogens. Thus, to see the independent effect of mother's education and other variables on the occurrence of Sickness in children, the confounding variables must be controlled.

Table: 23

Prevalence rate (%) of child morbidity among children under five, by mother's characteristics controlling for rural /urban areas and ecological zones

Mother's Characteristics	Urban Areas			Rural Areas										Total Sample
	MUCs	OUCs	All	Rice/ wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low/ Intensity Punjab	Barani Punjab	Cotton/ wheat Sindh	Rice/other Sindh	NWFP	Balochistan	All	
Mother's age														
15-19	34.6	28.2	30.8	-	33.3	8.7	10.0	100.0	22.2	6.1	26.1	10.7	16.4	20.2
20-24	11.3	15.3	13.7	9.0	9.9	12.2	12.2	13.5	20.4	19.2	14.2	14.2	14.5	14.2
25-29	14.9	13.1	13.9	10.4	2.1	9.5	7.3	27.4	12.9	16.3	15.7	15.1	13.0	13.3
30-34	14.3	12.1	13.0	9.9	9.1	10.3	19.3	21.1	17.2	15.1	17.8	8.9	14.2	13.7
35-39	10.6	15.2	13.5	7.0	2.2	11.4	13.4	22.5	10.2	20.1	16.3	11.9	12.5	12.8
40 and above	13.2	10.0	11.0	6.8	6.4	10.9	10.6	-	18.1	9.9	12.7	11.1	11.9	11.6
No Response	20.7	5.6	12.3	-	16.7	12.0	25.0	50.0	21.4	27.3	13.9	9.5	16.5	15.2
Mother's Education														
Illiterate	16.0	12.5	13.5	10.5	6.0	11.6	13.0	11.0	15.2	16.0	15.7	12.2	13.5	13.5
Primary	11.9	15.4	13.8	6.8	5.7	8.6	10.6	32.4	20.7	16.9	16.9	23.7	13.3	13.5
Matric and above	11.8	15.4	13.3	4.4	6.0	2.2	15.0	30.0	22.9	16.7	14.8	9.5	12.1	13.0
No Response	20.7	5.6	12.3	-	16.7	12.0	25.0	50.0	21.4	27.3	13.9	9.5	16.5	15.2

Source: computed from PSLM 2004-05

6.2.5. Economic Factors and Child Morbidity

The relationship between child morbidity among children under five and the economic factors, ownership of agricultural land and ownership of livestock controlling for rural /urban areas and ecological zones is shown in Table 24. The children living in households owning agricultural land are less likely to become sick than children living in households without owning agricultural land.

This difference persisted in different zones of rural areas except in cotton/wheat Punjab and low-intensity Punjab zone. This is the expected pattern because ownership of land represents economic position of households; as the economic position of a household improves, there are less chances of child sickness because better economic position of households improves nutritional status of children and it further provides protection against several infections in children. It also helps to afford the expenses of medical care, signaling the importance of the availability of resources and confirming the relationship between poverty and child health.

Table 24 also shows that children living in households who owned animals were less likely to become sick than children living in households that did not own animals. This difference persisted when controlling for rural areas except in low-intensity Punjab zone, barani Punjab and Balochistan. The ownership of livestock, like the agricultural land, could be the source of better resources available to provide better nutrition to children.

Table: 24

Prevalence rate (%) of child morbidity among children under five, by economic characteristics controlling for rural /urban Areas and ecological zones

Economic Characteristics	Urban Areas			Rural Areas										Total Sample
	MUCs	OUCs	All	Rice/ wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low /Intensity Punjab	Barani Punjab	Cotton/ wheat Sindh	Rice /other Sindh	NWFP	Balochistan	All	
Have You own an Agriculture land														
Yes				8.1	4.6	11.4	15.2	16.8	13.0	16.4	13.7	12.6	12.6	12.3
No				9.4	7.1	10.3	9.8	25.0	18.1	16.3	18.6	12.2	14.2	14.1
Have You own an Animal														
Yes				7.8	5.4	9.1	13.3	22.9	14.3	16.4	14.2	13.7	12.7	12.7
No				9.9	6.9	12.4	12.4	20.6	18.8	16.2	17.6	11.7	14.2	14.0

Source: computed from PSLM 2004-05

6.3. CHILD MORBIDITY DIFFERENTIAL: LOGISTIC REGRESSION ANALYSIS.

The relative influence of different variables on the probability of a child being sick in the two weeks prior to the 2004-05 PSLM is assessed in this section by multivariate techniques. The logit equation specified in section 3.4 of chapter 3 provides the basis for this assessment. Child morbidity is defined as a dichotomous variable (had or had not a child sickness during the reference period).

Several explanatory variables (child's age and gender, its mother's age, education and working status, total no of children born, sources of drinking water, toilet facilities, child immunization, ownership of animals, agricultural land, electricity, material used in the roof of house, material used in the walls of house and ecological zones) discussed in section 4 are used in the analyses. Model 1, which is the full model, includes all the children less than five years age selected for the present study. Several other models are estimated separately for different zones and classification of rural and urban areas respectively. All models are additive and have been summarized through odd ratios in Table 25-27.

Results of the Model 1 show the child's age to be strongly associated with child morbidity. There is a steady decline in the odds of child morbidity with child's age (Yohannes et al, 1992): three year old children are 49 percent less likely than infants to become sick, and this percentage further declined to 34 percent for four year old children.

Table 25
Logistic regression effects of predictors on child morbidity among children under five, 2004-05 PSLM (Odd Ratios)

Characteristics	Model 1 (Full)	Model 2 Rice/ Wheat Punjab	Model 3 Mixed Punjab	Model 4 Cotton/wheat Punjab
Child Characteristics				
Child's Gender				
Female	1.00	1.00	1.00	1.00
Male	1.174*	1.154	1.436	1.474**
Child's Age				
<1	1.00	1.00	1.00	1.00
1	0.933	1.574	1.133	1.259
2	0.679*	0.829	0.579	0.863
3	0.492*	0.422**	0.437**	0.524**
4	0.348*	0.449**	0.403**	0.259*
Total No of Children born				
1-2	1.00	1.00	1.00	1.00
3-4	0.942	0.829	1.485	0.961
5-6	1.053	0.535**	1.895	0.892
7 and more	1.027	0.232*	2.215	2.366*
Mother's Characteristics				
Mother's age	0.997	1.016	0.965	0.983
Mother's Education				
Illiterate	1.00	1.00	1.00	1.00
Primary	0.985	0.479**	0.948	0.718
Matric and above	0.912	0.324*	1.392	0.191**
Mother's working Status				
No	1.00	1.00	1.00	1.00
Yes	1.190*	1.138	1.736**	1.076
Immunization				
Child Immunization				
No	1.00	1.00	1.00	1.00
Yes	1.135**	0.836	0.488**	1.060
Environmental Characteristics				
Type of Toilet Facility				
No toilet in house	1.00	1.00	1.00	1.00
Flush system(B)	0.903	2.439**	1.069	0.136*
Others	0.976	1.517	1.011	0.696**
Source of Drinking water				
Others	1.00	1.00	1.00	1.00
Piped water within the House / Motorized Pump	0.964	0.659	1.520	0.884
				continued

Characteristics	Model1 Full	Model 2 Rice/ Wheat Punjab	Model 3 Mixed Punjab	Model 4 Cotton/wheat Punjab
Economic Characteristics				
Own Agriculture Land				
No	1.00	1.00	1.00	1.00
Yes	0.839*	0.912	0.688	1.297
Own Animals				
No	1.00	1.00	1.00	1.00
yes	0.898**	0..848	0.882	0.589*
Material used in roof of House				
Others	1.00	1.00	1.00	1.00
RCC/RBC	0.940	1.091	0.786	1.116
Material Used in walls				
Others	1.00	1.00	1.00	1.00
Brick	1.209*	1.656	1.136	1.567**
Source of Light				
Others	1.00	1.00	1.00	1.00
Electricity	1.279*	0.896	0.605	1.028
Geographical zones				
Ecological Zones (Rural)				
Rice wheat Punjab	1.00	1.00	1.00	1.00
Mixed Punjab	0.680**	-	-	-
Cotton Wheat Punjab	1.336**	-	-	-
Low Intensity Punjab	1.868*	-	-	-
Barani Punjab	3.016*	-	-	-
Cotton Wheat Sindh	2.524*	-	-	-
Rice Other Sindh	2.683*	-	-	-
NWFP	2.267*	-	-	-
Balochistan	2.073*	-	-	-
Ecological zones (urban)				
MUCS	1.678*	-	-	-
OUCS	1.692*	-	-	-
N	12729	701	642	985

SOURCE: Computed from the 2004-05 PSLM

(A)Primary category include primary and middle (till 8th class)

(B)The flush system includes Flush system connected to Public Sewerage.

* Shows significance at 5 percent or lower level of confidence.

** Shows significance at 10 percent or lower level of confidence.

The gender variable has a positive and significant (at 5 percent level of confidence) effect on the probability of child illness suggesting that males under five are more likely than females to get sick (Sathar,1994; Ali, 2000). The total number of children born to mothers of sampled children has a positive effect on the probability of the child being sick, suggesting that as the total number of children born increases it exerts negative pressure on children's health as parents finds less time for child care (Saksena and Srivastava, 1984). But this association is not statistically significant.

Table 25 shows that mother's age has negative relationship with probability of child being sick, suggesting that as mother's age increase, probability of child being sick decrease. Alam and Cleland (1984) established a strong association between the age of the mother and child mortality in Pakistan. Although mother's education show negative association with child morbidity but this association is almost the same for children having mother either with primary or higher education. It has been argued that education of mother is presumed to exert its influence through greater autonomy on the part of women, to more effectively take care of their children's health (Caldwell and Caldwell, 1988). Mother's working status show significant and positive effect on child morbidity suggesting that working mothers face greater risk of child's illness because they do not have enough time for the proper care of children (Arif, 2004).

Quite surprisingly child immunization is significant (at 10 percent level of confidence) but with positive effect on child morbidity, suggesting that children having immunization are more likely to become sick than children who are not being immunized. This may be due to ambiguous construction of the variable since it is composite of many type of

immunizations i.e., DPT, Polio, BCG etc and does not indicate whether the complete series was followed (Garcia and Alderman, 1989). Furthermore it is also possible that households which have reported for child vaccination are misreporting.

The toilet facility and relatively safe source of drinking water piped/ motor pump inside the house, which are used as environmental factors, do not show significant association with child morbidity, although they bear the expected negative sign (Mahmood, 2001). It may be the quality and usage pattern of water in home, not the purity of water at its source that largely determines the impact on morbidity (Arif and Ibrahim, 1998). This is also worth noting to mention that the set of exogenous variables that emerge as significant determinants differ across the diseases (Cebu study team, 1992). In models for diarrhoea morbidity, source of dinking water showed a very strong and significant association with diarrhoea morbidity. It might be possible that source of drinking water has closer association with diarrhoea disease.

The ownership of agricultural land proved to be a very strong determinant of child morbidity. Ownership of agricultural land has shown significant negative effect on child morbidity suggesting that households with ownership of agriculture land probably have more resources for child care so odds of child morbidity declined. The other economic factor entered into the model the ownership of livestock did show a negative and significant association with child morbidity. Material used in the roof of house has shown negative association with child morbidity although it was not significant. Surprisingly material used in the walls of house and access to electricity have shown significant but positive association with child morbidity.

Finally, all zones except mixed Punjab zone show positive relationship with child morbidity, highest odds of child morbidity is in barani Punjab zone, whereas lowest odds of child morbidity is in mixed Punjab zone. This is unexpected since the barani zone is economically better-off than other zones and educational level of adult population is also better in this zone.

The results of Models 2-12, which examined the likelihood of children being sick for residing in rice/wheat Punjab zone, mixed Punjab zone, cotton/wheat Punjab zone and low-intensity Punjab zone, barani Punjab, cotton/wheat Sindh zone, rice/other Sindh Zone, NWFP, Balochistan, MUCs and OUCS separately are presented in Table 25, 26 and 27.

These models reveal some important points. Child gender and age appears to be an important determinant of child morbidity. Child's gender is positively associated with the child morbidity when urban areas are further classified into MUCs and OUCs; male children are more likely to become sick than females. The same pattern is also observed in the geographical zones of rural areas except in the low-intensity Punjab and Balochistan zone of rural areas. Child's age is negatively associated with the child morbidity in all the zones of rural and urban areas (Marotell, 1995; Marini and Gragnolati, 2003). Similarly the total number of children born to mothers of the sampled children has much more importance for the geographical zones of rural areas than the urban areas, suggesting that as the total number of children born increases in a household, child morbidity also increases, particularly in rural areas (Sathar and Kazi, 1987; Cochrane et al, 1990; Trussell and Pebley, 1984)

Mother's age is negatively associated across geographical zones (Trussell and Pebley, 1984) except in rice/wheat Punjab, low-intensity Punjab, cotton/wheat Sindh and OUCs. Mother's education is important for the zones of rural areas but within urban areas only MUCs have shown strong importance for mother's education (Cochrane, 1980; Alam and Cleland, 1984). Mother's working status is positively associated with child morbidity except in zones of cotton/wheat Sindh and rice/other Sindh (Arif, 2004). When we have analyzed importance of child immunization across the geographical zones of rural and urban areas then it is observed that it is relatively more important for the geographical zones of rural areas (Arif, 2004; Arif and Ibrahim, 1998).

Relatively safe source of drinking water is negatively associated with child morbidity only in rice/wheat Punjab, cotton/wheat Punjab, MUCs and OUCs but it does not show any significant relationship.

The ownership of agriculture land has negative relationship with child morbidity across zones except in cotton/wheat Punjab, low-intensity Punjab, rice/other Sindh and Balochistan and the corresponding negative impact has also shown significant relationship for several regions. Similarly the ownership of livestock has shown negative relationship with child morbidity across zones except in barani Punjab, rice/other Sindh, Balochistan and MUCs but the corresponding negative impact is in general insignificant. Finally, Housing conditions (material used in roof of house and material used in walls of house) has also shown negative relationship with child morbidity across geographical zones although the corresponding impact is in general insignificant (Mahmood, 2001). In

housing condition material used in the roof of house is much more important than material used in the walls of house.

Better economic position of household improves nutritional status of children and it also provides protection against several infections in children. Besides, it also helps to afford the expenses of medical care to protect child for relatively longer episodes of infections, signaling the importance of the availability of resources and confirming the relationship between economic status and child health.

Table 26
Logistic regression effects of predictors on child morbidity among children under five, by rural ecological zones, 2004-05 PSLM (Odd Ratios)

Characteristics	Model 5	Model 6	Model 7	Model 8
	Low/intensity Punjab	Barani Punjab	Cotton /wheat Sindh	Rice/ Other Sindh
Child Characteristics				
Child's Gender				
Female	1.00	1.00	1.00	1.00
Male	0.938	1.030	1.414*	1.179
Child's Age				
<1	1.00	1.00	1.00	1.00
1	1.477	0.808	1.031	0.977
2	0.785	0.364**	0.626**	0.618**
3	0.560	0.542	0.495*	0.395*
4	0.358**	0.244*	0.312*	0.310*
Total No of Children born				
1-2	1.00	1.00	1.00	1.00
3-4	0.997	0.452**	0.979	0.991
5-6	1.508	0.729	0.794	1.060
7 and more	0.903	1.182	1.385	0.866
Mother's Characteristics				
Mother's age	1.003	0.980	1.003	0.996
Mother's Education				
Illiterate	1.00	1.00	1.00	1.00
Primary	0.654	3.934*	1.248	0.922
Matric and above	0.863	2.730**	1.151	1.035
Mother's working Status				
No	1.00	1.00	1.00	1.00
Yes	3.813*	2.735**	0.895	0.739
Immunization				
Child Immunization				
No	1.00	1.00	1.00	1.00
Yes	0.700	0.630	1.589*	1.115
Environmental Characteristics				
Type of Toilet Facility				
No toilet in house	1.00	1.00	1.00	1.00
Flush system(B)	1.810	1.914	2.906	2.361**
Others	1.790**	1.625	1.074	1.006
Source of Drinking water				
Others	1.00	1.00	1.00	1.00
Piped water within the House / Motorized Pump	1.064	1.331	1.495**	1.114
				continued

Characteristics	Model 5	Model 6	Model 7	Model 8
	Low/intensity Punjab	Barani Punjab	Cotton /wheat Sindh	Rice/ Other Sindh
Economic Characteristics				
Own Agriculture Land				
No	1.00	1.00	1.00	1.00
Yes	1.349	0.415*	0.749**	1.032
Own Animals				
No	1.00	1.00	1.00	1.00
yes	0.633	1.519	0.786	1.150
Material used in roof of House				
Others	1.00	1.00	1.00	1.00
RCC/RBC	0.390*	0.784	0.998	0.781
Material Used in walls				
Others	1.00	1.00	1.00	1.00
Brick	1.673**	0.891	0.669**	1.102
Source of Light				
Others	1.00	1.00	1.00	1.00
Electricity	1.081	0.724	1.469**	1.418**
N	416	226	1030	986

SOURCE: Computed from the 2004-05 PSLM

(A)Primary category include primary and middle (till 8th class)

(B)The flush system includes Flush system connected to Public Sewerage.

* Shows significance at 5 percent or lower level of confidence.

** Shows significance at 10 percent or lower level of confidence.

Table 27
Logistic regression effects of predictors on child morbidity among children under five, by ecological zones, 2004-05 PSLM (Odd Ratios)

Characteristics	Model 9	Model 10	Model 11	Model 12
	NWFP	Balochistan	MUCs	OUCs
Child Characteristics				
Child's Gender				
Female	1.00	1.00	1.00	1.00
Male	1.176**	0.839	1.109	1.235**
Child's Age				
<1	1.00	1.00	1.00	1.00
1	1.309**	0.578**	0.685**	0.796**
2	0.976	0.474*	0.522*	0.681*
3	0.759**	0.350*	0.491*	0.390*
4	0.637*	0.193*	0.322*	0.307*
Total No of Children born				
1-2	1.00	1.00	1.00	1.00
3-4	0.889	0.889	1.143	0.816**
5-6	1.188	1.684*	1.195	0.803**
7 and more	1.005	0.946	1.038	0.724**
Mother's Characteristics				
Mother's age	0.991	0.993	0.995	1.008
Mother's Education				
Illiterate	1.00	1.00	1.00	1.00
Primary	0.969	2.434*	0.645*	1.188
Matric and above	0.758	0.681	0.690*	1.162
Mother's working Status				
No	1.00	1.00	1.00	1.00
Yes	1.330	1.100	1.131	1.108
Immunization				
Child Immunization				
No	1.00	1.00	1.00	1.00
Yes	1.176	0.985	1.070	1.132
Environmental Characteristics				
Type of Toilet Facility				
No toilet in house	1.00	1.00	1.00	1.00
Flush system(B)	0.862	1.065	1.630**	0.784
Others	0.937	0.740**	1.699**	0.951
Source of Drinking water				
Others	1.00	1.00	1.00	1.00
Piped water within the House / Motorized Pump	1.044	1.011	0.839	0.907
				Continued

Characteristics	Model 9	Model 10	Model 11	Model 12
	NWFP	Balochistan	MUCs	OUCs
Economic Characteristics				
Own Agriculture Land				
No	1.00	1.00	1.00	1.00
Yes	0.704*	1.069	0.626**	0.747**
Own Animals				
No	1.00	1.00	1.00	1.00
yes	0.849	1.185	1.081	0.895
Material used in roof of House				
Others	1.00	1.00	1.00	1.00
RCC/RBC	0.815	1.242	1.117	0.885
Material Used in walls				
Others	1.00	1.00	1.00	1.00
Brick	1.370*	1.335	0.999	1.176
Source of Light				
Others	1.00	1.00	1.00	1.00
Electricity	1.857*	1.180	1.449	1.241
N	2037	1201	1808	2697

SOURCE: Computed from the 2004-05 PSLM
(A)Primary category include primary and middle (till 8th class)
(B)The flush system includes Flush system connected to Public Sewerage.
* Shows significance at 5 percent or lower level of confidence.
** Shows significance at 10 percent or lower level of confidence.

6.4. SUMMARY

This chapter reveals some important dimensions of child morbidity. Although importance of different variables for child morbidity varies across geographical zone of rural areas and within classification of urban areas (MUCs and OUCs) but still we are in a position to stress for the importance of some factors which may be helpful to control child morbidity. Child's own characteristics (gender and age), mother's characteristics (education and working status), economic characteristics (ownership of agriculture land, livestock and material used in roof) and geographical zones are very important to understand child morbidity. In the multivariate analysis, independent effect of geographical zones has shown positive association with child morbidity except in mixed Punjab zone. The highest odds of child morbidity are in barani Punjab zone, whereas lowest odds of child morbidity are in mixed Punjab zone. This is unexpected since the barani zone is economically better-off than other zones and educational level of adult population is also better in this zone.

CHAPTER 7

SUMMARY & CONCLUSION

The present study used the 2004-05 PSLM Survey to determine the economic, demographic, environmental and geographical factors of both diarrhoea and child morbidity among the sampled children. This sample is restricted to children under five years of age (0-4) years and the PSLM has identified 13540 children in this age group. For the present study, the 2004-05 PSLM sample is divided into nine agro-climatic zones of rural areas and it also includes two classifications of urban areas: MUCs and OUCs. Beside, rural-urban differentials the rural areas also vary in term of irrigation facilities, cropping pattern, economic status, infrastructure and access to non-farm sources of income. These variations are responsible for significant differences among the rural areas of Pakistan. This study has examined the child morbidity differentials by focusing on the rural geographical zones and classifications of urban areas.

This study makes a useful contribution to the existing literature in understanding the relationship between child health (morbidity) and economic status of households by focusing on variations across geographical zones. Housing construction material especially roof material appears to be an important determinant of child health. Housing represents better economic condition of household and its positive impact on diarrhoea morbidity has been witnessed in poor geographical zones of rural areas. Ownership of agriculture land appears to be strong determinant of child health and its positive impact can clearly be seen in relatively better, rich geographical zones of rural areas and within the two classifications of urban areas. Ownership of livestock is also a very important

determinant of child health. In models of diarrhoea morbidity its positive impact has been assessed only at the relatively better and rich zones of rural areas. In models of child morbidity, the ownership of animals comes across as a very significant variable in all geographical zones of rural areas, whereas in the urban areas, only OUCs have shown importance of ownership of livestock with respect to child morbidity. The other major findings of this study are as follows:

Overall diarrhoea and sickness rate for children in 2004-05 is 16% and 13.5% respectively. Diarrhoea morbidity rate has modestly declined during the last one decade. The gender and age of the children appear to be the most important determinants of diarrhoea and child morbidity across all geographical zones of rural areas and within both classifications of urban areas; male children are more likely to become sick than females, however as the age of the child increases the morbidity risk tends to decrease.

Mother's education appears to be a very important determinant to explain diarrhoea and child morbidity across rural geographical zones and within classifications of urban areas. Mother's education is seem to be helpful in improving child health, however in some models of diarrhoea and child morbidity its impact was not significant.

Total number of children born has an impact on the diarrhoea and child morbidity, particularly in rural areas. Similarly, immunization appears to be helpful in geographical zones of rural areas of the country.

Relatively safe source of drinking water appears to be a strong determinant of diarrhoea morbidity. Its availability proved to be very helpful in reducing diarrhoea morbidity across rural geographical zones and within classifications of urban areas.

The findings of this study have confirmed the positive role of several economic factors including land, livestock and housing with respect to child health. By and large all these economic variables are important for child health in all zones of rural areas and within urban classifications which are different in term of economic status. Increased access to ownership of land, livestock and housing directly benefit the poor. Both the ownership of land and livestock are means of livelihood for the people of rural areas. They contribute to better child health by increasing incomes of the households. Similarly housing represents the better economic position of the households. As the economic position of a household improves the chances of child sickness are reduced considerably. Better economic position of a household improves nutritional status of children and it further provides protection against several infections in children. Besides, it also helps to afford the expenses of medical care to take measures to protect child from relatively longer episodes of infections, signaling the importance of the availability of resources and confirming the relationship between economic status and child health.

Policy guidelines

- Different diseases have different sets of exogenous variables which emerge as significant determinants (Cebu, study team 1992). The implication of this becomes important while formulating polices. Particularly if the polices are programme specific then it will be a useful measure to target any particular disease.

- Provision of safe drinking water should be given the highest priority in the social sector polices.
- Government of Pakistan may take measures to increase ownership of land and livestock in rural regions to improve child health, a sort of proxy for preventive health care.
- To reduce diarrhoea infection government of Pakistan should take measures to improve housing and sanitation conditions especially in poor rural areas.
- Government of Pakistan may take measures to decrease poverty incidence of poor rural regions by increasing infrastructure investment. Equal economic status in term of geographical variations may be helpful to focus on important determinants of child health.
- Finally, it is true that the 2004-05 PSLM has generated useful data regarding the levels and patterns of diarrhoea illness. However its main shortcoming was the use of 'one month-long reference period' for diarrhoea morbidity. To reduce the recall errors and to make the results comparable with studies conducted in other developing countries, a reference period of two weeks should be used in future surveys. There is also need to add a few more questions in the future surveys concerning breast feeding practices, which will be helpful in further research (Arif, 1998).

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Appendix

Table A1

Definition of Variables

Variables	Definitions
Child's Gender	
Female	Reference category
Male	=1,otherwise
Child's Age	
0	Reference category
1	=1,otherwise 0
2	=1,otherwise 0
3	=1,otherwise 0
4	=1,otherwise 0
Total No of Children born	
1-2	Reference category
3-4	=1,otherwise 0
5-6	=1,otherwise 0
7 and more	=1,otherwise 0
Mother Education	
Illiterate	Reference category
Primary	=1,otherwise 0
Matric and above	=1,otherwise 0
Mother working Status	
No	Reference category
Yes	=1,otherwise 0
Child Immunization	
No	Reference category
Yes	=1,otherwise 0
Measles Immunization	
No	Reference category
Yes	=1,otherwise 0
Type of Toilet Facility	
No toilet in house	Reference category
Flush system(B)	=1,otherwise 0
Others	=1,otherwise 0
Source of Drinking Water	Reference category
Others	=1,otherwise 0
Piped water within the House / Motorized Pump	

Poverty Status	Reference Category
Non Poor	=1,otherwise o
Poor	
Own Agriculture Land	
No	Reference category
Yes	=1,otherwise 0
Own Animals	
No	Reference category
Yes	=1,otherwise 0
Material used in roof of House	
Others	Reference category
RCC/RCB	=1,otherwise 0
Material used in walls of house	
Others	
Brick	Reference category
	=1,otherwise 0
Source of light	Reference category
Others	=1,otherwise 0
Electricity	
Ecological Zones (rural)	
Rice wheat Punjab	Reference category
Mixed Punjab	=1,otherwise 0
Cotton wheat Punjab Low Intensity	=1,otherwise 0
Punjab	=1,otherwise 0
Barani Punjab	=1,otherwise 0
Cotton wheat Sindh	=1,otherwise 0
Rice Other Sindh	=1,otherwise 0
NWFP	=1,otherwise 0
Balochistan	=1,otherwise 0
MUCs	=1,otherwise 0
OUCs	=1,otherwise 0
Child Sickness	
No	Reference category
Yes	=1,otherwise 0
Diarrhoea Morbidity	
No	Reference category
Yes	=1,otherwise 0