Socio-Economic Factors Affecting Child Health in Pakistan: A Cross-Sectional Analysis

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Dedication

To my loving Parents and a special feeling of gratitude to my family for their love, support, and words of encouragement.

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I thank Allah Almighty, my creator, my source of wisdom, knowledge, and understanding who empowered me to accomplish this task.

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ABSTRACT

This study examines the economic, socio-demographic, and housing factors affecting child health in Pakistan. This study employs a Household Integrated Economic Survey of Pakistan (2018-19) for the empirical findings. A total sample of 24809 families, having at least one child (under five years) is considered to explore the factors affecting child health and, in some cases, leading to child death. This study adopts a procedure of indirect relationships (mediation) among the variables that provide a new rationale for this research. This study develops two factors determining child health i.e. food insecurity and asset poverty, that strengthen its significance and broadens its scope. This study employs a Logistic regression model to gauge the empirical magnitudes of the variables and a binary outcome variable while Haye's process of mediation is for the deep insight of indirect nexus among variables. This study is aiming to assess the SDG of the United Nations by quantifying the critical socio-economic and demographic factors of child health on both national and provincial levels in Pakistan. The study concludes that expenditures on health strongly mediate the relation between adverse child health leading mortality in Pakistan. Economic factors like food security are one of the major factors that bring improvement in child health. In addition, rural-urban migration, house ownership, technical gadgets at home, and the type of fuel used for cooking deeply matter in reducing adverse child health conditions. This study draws the attention of the policymakers to understand the grass root level socio-economic factors of the household that plays a vital role in improving child health but are oversighted. Electricity, availability of clean drinking water, and toilet facility with proper sewerage system boosts the immune system of children and hence the ratio of child sickness and mortality rates are low in houses availing these facilities. In rural areas, a fuel other than natural gas for cooking or heating purpose adversely affects the health of children because of the emissions of hazardous gases. Generating income, motivation for utilizing health gadgets at home, knowledge, and attitude towards the positive use of mobile and internet facilities are suggested as appropriate measures to enhance the health status of mothers and children.

CHAPTER 1

INTRODUCTION

1.1 Introduction

A significant component of the health agenda is the assessment of child health and child mortality. The United Nations' Millennium Development Goals (MDGs) project's charter lists reducing the death rate of children under the age of five by raising health standards as one of its primary target factors. One of the issues raised by this study is that lower-middle-income countries are having a very difficult time monitoring child health reports and keeping track of child fatalities because there is a lack of appropriate legislation for data gathering (Abou Zahr, de Savigny, Mikkelsen, et al. 2015). For instance, censuses and other surveys are frequently carried out to provide a periodic estimate of the severity of child health issues. More recently, demographic analysis has become an increasingly important source of child health concerns in many nations throughout the world. However, many nations rely on international institutions for the provision of the estimates produced from statistical models of infant and children under-five mortality due to the cost and implications of such methods. Around the world, a wide range of demographic indicators is a crucial benchmark for assessing socioeconomic progress and general health. Census and other surveys have, for example, been frequently done to provide a periodic assessment of the degree of child health problems, and more recent demographic examination, data now become an increasingly important source of child health issues in many countries around the world. But many nations rely on international bodies to provide the estimates produced from statistical models of newborns and children under-five mortality because of the expense and implications of using such methods. Global assessments of socioeconomic development and general health are based on a wide range of demographic variables. The standard of infrastructure, including the provision of drinkable water, hygiene, and sanitation to families and the services that are available to them, such as educational and medical facilities (Mosley and Chen

1984). These components create a biological factor mix that has a direct impact on a child's health by influencing the occurrence and progression of certain diseases or, in extreme cases, the possibility of death. Thus, by empirical population measurement, changes in family social situations and the impact of the larger environment on child health can be identified. Another demographic indicator, life expectancy, on the other hand, also highlights some comparable societal processes but differs in that it is a simulated indicator that is not only challenging to measure but also a derived function of various other variables. Since this ratio is typically greater among poorer households, child health determinants are also frequently used to highlight mortality gradients and show how health standards vary by geographic area (Wagstaff, Bustreo, Bryce, et al. 2004). Therefore, child mortality is a measure of poor health status and social disparities in socioeconomic and political conditions between countries, within countries, and even between different regions of the same country (province or district level). It is not unexpected that one of the Millennium Development Goals for monitoring progress toward reducing health disparities and enhancing population health is the issue of child health. Although it is clear from this program that kid supervision is a difficult task, particularly in underdeveloped nations. Child mortality is therefore viewed as an indicator to indicate poor health status and social disparities in health and the socioeconomic situation between countries, within countries, and even between different regions of the same country (province or district level). It is not unexpected that one of the Millennium Development Goals for monitoring and evaluating progress toward improving population health by reducing health inequities is the topic of child health. Even so, it becomes clear through this show that keeping an eye on a child is a difficult task, especially in low-income countries. The significant empirical disparities, lack of approach transparency, and challenges with data assessment faced by various research groups received particular attention. However, this resulted in the adverse effect of creating uncertainty for those economies that depended on estimates and data from international institutions (Graham and Adjei 2010). When considering socioeconomic determinants, infant and childhood deaths feature prominently in the field of social sciences. This is because, in addition, to be an essential indicator, the likelihood of dying before the age of five is crucial for calculating the life expectancy beginning at birth.

Finding the potential reasons of children's health disparities is vital because it is thought that sick children are in great danger. societal factors, Asif et al. (2022). A healthy environment and strong personal health are linked to a nation's well-being. Alma Ata's declaration from 1978 outlined the significance of health in public policy and the need for health sector reforms that have an impact on a nation's prosperity. However, an effective public policy's impact on the socioeconomic profile is likely to aid with the status of enhanced health. Shiell (1991). In all nations around the world, the topic of health is prevalent. A healthy youngster develops into an important member of the productive workforce. The "human" is now regarded as a "capital" in the sense that, if managed carefully and given the right knowledge and abilities, it will contribute significantly to the advancement of a nation. The 189 members of the United Nations (UN) adopted the Millennium Declaration, which outlines some important development issues, targets, and metrics for measuring progress, by this strategy back in September 2000.

They are referred to as MDGs or Millennium Development Goals. The deadline was supposed to be met by 2015, but only partially. In the recent literature, the concept of human development goals is not new. The literature of the 1980s approached development concerns via the fulfilment of a nation's citizens' most fundamental needs. According to Ali and Tahir (1999), eradicating poverty and achieving economic growth are necessary but insufficient prerequisites for achieving the MDGs, particularly in emerging nations. Along with gender equality, performance in the health and education sectors is crucial. The income per capita is the only one of the crucial inputs that contributed to the production function of the MDGs, according to Jayasuriya and Wodon (2003). Other connected challenges include how nations use their potential resources to accomplish these objectives. Here are the justifications for why the development is effective if they are not viewed in restricted dimensions. If the requirement of universal primary education attainment must be connected with a large investment in primary education, the policy would be ineffective. A developing country's primary education will rely heavily on improved transportation and road networks. Similarly to this, ensuring that children have access to clean drinking water is essential to reducing infant mortality. The role of multi-sectors includes maternal and child health intervention, nutrition, better infrastructural facilities, health facilities, safe drinking water, sanitation, and shelter issues nexus towards the

achievement of targets set by the United Nations Chong and Henschel (2003). Yet intra and inter-sectoral networks are habitually underplayed when designing determinants of development strategies. Therefore, new dynamics must be exercised on multisectoral determinants that affect the development goals of a country.

The Millennium Development Goals provide the time-circled objectives to eradicate extreme poverty and a basic approach to achieve significant socio-economic rights like education, health, and food security. Pakistan is on its way to achieving substantial improvement in the health sector. The issue of the unlike performance of this sector by Pakistan is due to a low budget allocation to the health sector. The rising population develops pressure accordingly. This has allowed the private sector to bridge the gap of imbalances of demand and supply of health care. The role of the private sector has increased by a huge amount in this regard. Out-of-pocket expenditure on health-related issues by the people is 98 per cent which depicts the picture that Pakistan is having the highest share of pocket payments relative to total health outlay (World Health Organization, 2010). Pakistan faces a double burden of disease coupled with parental conditions. The situation of the public health services shows an uneven spreading of health incentives between the rural-urban areas of the country. The rural dwellers specifically those with a lack of education are at a greater disadvantage in terms of primary health provisions i.e. the major dwellers of remote rural areas of Pakistan partially failed to get benefit from the public program of immunization of infants and children under 5 years of age. Although life expectancy, the standard of living, and other health statistics show an improvement but not steady. There exist clear disparities in health outcomes across the country. There is a high number of stunted children across South Asian countries, the ratio of which is recorded as 1 out of 5 children (United Nations Report 2014). According to a poverty Alleviation survey, about 1 % of the country's GDP is lost due to health deficiency in the country (Pakistan Alleviation Fund, 2010). Pakistan, being a signatory of the United Nation's MDGs should be seriously striving toward the achievement of the targets set.

According to the World Health Organization (WHO) report, Pakistan does not reach the Health targets of the WHO's program. There is an improvement over the past 65 years but lagging in important health indicators in comparison to other developed countries. Health reforms are in the transition phase to empower the

provinces of Pakistan to achieve sustainable targets despite several challenges like fiscal deficit, clarity of vision in the local government system, overall economic condition, accountability, and law, and order situation. Pakistan has a public-private partnership organization of health. Low government spending in the health sector companies by private sector weak policies increases the number of problems in the health sector of Pakistan. the role of the government is very effective in the provision of basic health facilities to the people. Local governments can also adopt some effective policies to assist the central government to achieve the desired target in the health sector. The government realizes the importance of health and its role in the economic development of a country, therefore, the allocation of health resources is increasing in sequential budgets allocated health expenditures for health were 0.69% (as a per cent of GDP) in 2013-14, 0.73% in 2014-15, 0.77% in 2015-16, 0.91% in 2016-17 and 1.12% in 2017-18 (Pakistan Economic Survey, 2017-18).

This is the right time to assess the progress of Pakistan on the implications of the health policies. This study uses the micro-level data of individuals which are collected by the government of Pakistan.

The United Nations Millennium Development Goals is comprised of eight broad goals. 189 United Nations members agree upon the achievement of the desired goals by the year 2015. These goals include the eradication of extreme poverty and hunger, lessen down infectious diseases, reducing the illiteracy rate, and environmental degradation, women empowerment, improving child health, improving maternal health, and developing worldwide partnerships for development. The goals of the United Nations agenda directly or indirectly influence health while on the other side, health affects all the defined goals. For instance; better health conditions make children able to learn while making adults in the country earn. Equality in gender-based activities is very important for achieving better health. Poverty reduction, hunger, and ecological degradation positively affect the health of the people of the country.

Millennium Development Goal 4 is about reducing child mortality in the region. This goal covers three target points.

a. Achieving a target of reducing under-five mortality rates.
b. Achieving a target of reducing the infant mortality rate.

c. The proportion of one-year-old children immunized against diseases to improve child health.

The latest estimates (2015, after MDGs were converted to SDGs) of under-five mortality show a decline by 49% across the globe i.e. from 90 deaths per 1,000 live births in 1990 reduces to 46 deaths in 2013. As a result of this decline, the collective number of under-five deaths per 1,000 live births across the world reduces from 12.7 million in 1990 to 6.3 million in 2013. About 17,000 fewer children die per day in 2013 compared to deaths in 1990. However, it is still showing a pace of deaths of nearly 17,000 children under the age of five every day in the year 2013. All regions except the sub-Saharan African region and Oceania have comparatively more than halved the under-five-year mortality rate. Eastern Asia, Latin America and the Caribbean, and Northern Africa have already shown a decline in the under-five mortality rate by more than two-thirds since 1990 and have achieved goal 4 of the Millennium Development targets of the UN. Western Asia, with a decline of 61%, and South-eastern Asia, 59%, are also close to the target of achieving goal 4, (UN report 2015). Currently, the world is reducing under-five mortality faster than at any other time during the past two decades. However, the current rate of decline remains insufficient for those regions that still fall short of achieving the two-third reduction target by the year 2015.

South Asia has made remarkable progress in reducing the rate of child deaths, but the region continues to have a high rate of under-five mortality rate in aggregate i.e. 55 deaths per 1,000 live births recorded in the year 2013, and about one among three under-five deaths still takes place in the region. Two-thirds of under-five mortality in South Asia occurs in India, which is the highest number of deaths in this category in the world i.e. 1.3 million deaths in 2013.

Despite the child health problem in the country, neonatal health issues are also very vulnerable because this period comprises the first 28 days of life of a newborn and is a critical time for a child's survival. Taking a neonatal death rate into consideration is important not only because the proportion of under-five deaths that occur during the neonatal period is increasing but also because of a reason that health interventions are needed to address the major causes of neonatal deaths. These are generally different from those needed to be addressed to other under-five deaths and are closely linked to maternal health. However, in comparative analysis, a decline in

the neo-natal death rate from 1990 to 2013 is more sluggish than that of 2013 i.e. 40 per cent compared to 56 per cent in Pakistan (UN Report, 2014).

The United Nations adopts a new phase of the agenda known as the sustainable development Goals to bring peace and prosperity to mankind after the MDGs' goal completion date of 2015 passed. The United Nations member nations are tasked with achieving and effectively implementing 17 Sustainable Development Goals (SDGs). "The Sustainable Development Goals (SDGs) include eradicating poverty, achieving zero hunger, promoting good health and wellbeing, high-quality education, gender equality, access to clean energy, industry innovation, and infrastructure, reducing inequality, creating sustainable cities and communities, and taking action on climate change. They also include life above and below the ocean, life on land, and peace and justice. 2030 is the intended year for achieving these objectives.

The United Nation Sustainable Development Goals (SDGs) serves as the main platform for the betterment of mankind. Among the SDGs, Health is number three. A healthy life ensures welfare to mankind and is very important for the sustainable growth and development of a country. Initial health care starts from the birth of a child. Therefore significant steps are made to increase life expectancy. It is followed by various steps that are taken by the government in the reduction of child mortalities (United Nations Report 2015). Pakistan is one of the struggling countries in the health sector. The government of Pakistan is aware the initials about the importance of early-age vaccination for children through the media. The struggle toward health improvement also requires drawing attention to passive factors that play an important role in health. these passive factors include access to safe drinking water, proper sanitation, proper vaccination of infants, etc. The focal point of this study is child health which might lead to child death.

1.2 Sustainable Development Goals: Pakistan’s Perspective

The focus of this study is to assess the third goal of SDGs of health and welfare in a country. This target includes the crucial progress towards multiple goals of commitment to ending the epidemics of diseases caused by touch and infections, with special attention to child health that includes the proper provision of early vaccinations, availability of safe water, access to basic needs, and proper

infrastructure of roads and education. Pakistan tries to take serious policy measures to improve child health. Child health is improving by targeting its determinants like proper sanitation and clean drinking water, which are also a point of worry in the future for Pakistan because. Pakistan needs more dams to meet the increasing demand for safe drinking water. Economic Growth is a critical part of the SDGs. Human capital and efficient labour are key factors to achieve economic growth. The good health of a child leads to producing an effective and efficient labour force. To meet this target, Pakistan has built a strategy of public-private partnership to achieve the growth of efficient human capital.

Several issues need to be highlighted and answered regarding the impact of poor child health on the economic outcomes of a country. According to the economic theory of welfare, the goal of a consumer is to maximize utility which is made possible by the consumption of a household of a basket of goods and services. Child health is one of the consumable items in a consumer basket of goods. Health contributes the consumer utility in three different ways for example a person prefers to be more healthy than sick, which means that health directly affects the utility of a consumer. Secondly, the consumption of goods and services is partially prejudiced by health conditions i.e. additional utility extracted from the consumption bundle is a partial function of the health status of a consumer. Thirdly, and noteworthy point is that without having good health at an early age, objectives like earning income that later equips an individual with a high consumption power, stand to be compromised (Sen 1985). Unlike common goods and services, health being a consumer good yields indirect welfare to a consumer, therefore, people do not prefer to pay these expenses in terms of money and time, but they do believe that health expenses safeguard their economic activities in the future.

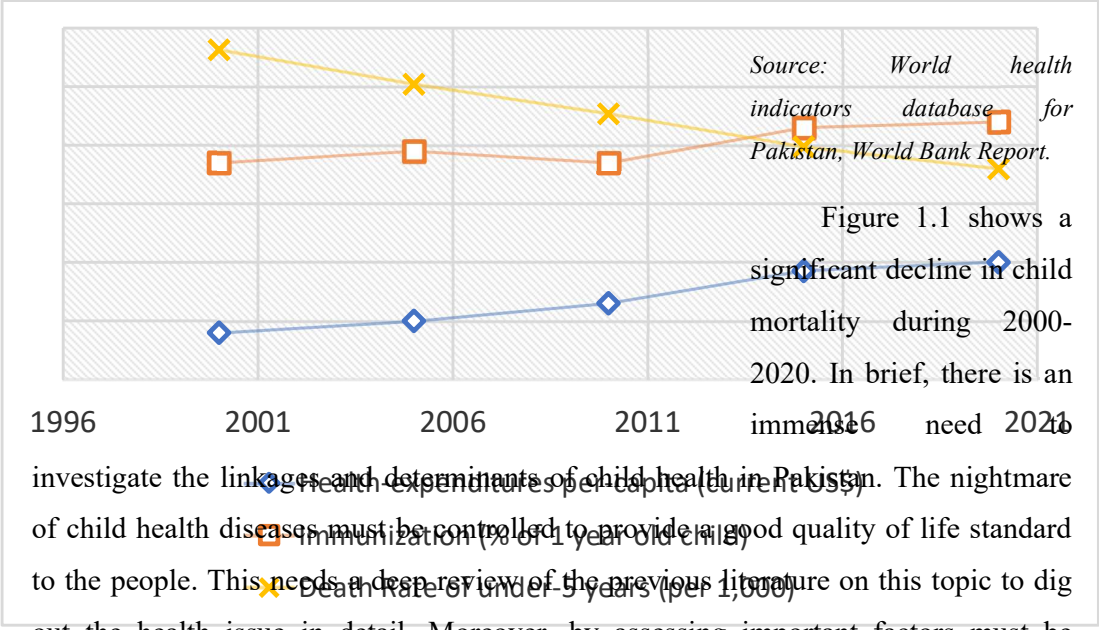
Reduction in child health is an important indicator of population welfare from the 20th century onwards across the world. Pakistan has under-five mortality of 86 per 1000 live births. This ratio was 96 in 2007 and 117 in 1986. About 50% of the global child mortality is observed in 5 countries the world namely Pakistan, China, Congo, India, and Nigeria. High child mortality shows sluggish improvement in socio-economic health development (Anderson et. al 2002). It bears social and economic costs as the country losses a significant part of its GDP due to adverse child health leading to child deaths (Bloom and Williamson 1998).

This study discusses the loopholes and critical determinants of child health which cause some serious problems to society from a social and economic perspective. The socio-economic problems of developing countries are relatively similar across the globe with a slight change in demography. However, this study encircles child health in Pakistan. The government of Pakistan has spent Rs. 4.06 trillion since 2012 yet it fails to achieve the Millennium Development Goals, especially in health, education, and social welfare (World Bank Report,2017). According to the Planning Commission of Report Pakistan (2018), the government has spent Rs. 206.7 billion on sanitation services, Rs. 2.58 trillion on the education sector, around Rs. 974.3 billion on health services, and Rs. 244.9 million on the social sector. Despite a huge investment in the health sector the unsuccessful planning of the government fails to achieve the desired target that is in line with the United Nations' goals of development. Therefore it is needed to investigate the issue in detail along with the empirical assessment so that it concludes with some fruitful policy recommendations to the policymakers. The progress of Pakistan on poverty reduction is slow. Moreover, food inflation is high and the global fuel prices shocks and global financial instability also retards the development progress of the country. In the education sector, Pakistan is still a long way off from guaranteeing the completion of elementary-level education for the population. The most important point is that early-age education in children is linked with the good physical and mental health of school-going children. According to the United Nations Report 2017, Pakistan lags in the provision of safe and clean drinking water to the masses. Strong political will and policies are needed to determine the factors associated with the betterment of health problems so that the failures to achieve development goals are directed to success in the new agenda of the United Nations' Sustainable Development Goals by 2030.

Figure 1 indicates that in Pakistan per capita, health expenditures rise from the year 2000 to 2020. This rise in health expenditure means that people are more conscious about health. More consumption of health services does not mean frequent visits to doctors rather it also indicates the provision of advanced medical facilities acquired by the people. Early childhood medication makes children stronger and healthy leads to an effective workforce in a country and enhances economic performance. The table shows a decline in the level of child adverse health as health expenses increase. The major reason is the proper health treatment of the child in

his/her childhood. Health treatment in childhood includes proper and timely vaccination which positively affects the immune system of a child against various diseases. Child immunization along with expenditure on other health factors like diet, safe drinking water, and a clean environment pushes down child mortality in Pakistan.

Figure 1.1
Child Mortality, Health Expenditure, and Immunization in Pakistan During 2000-2015, an overview of Past Trends in the Health Sector



Source: World health indicators database for Pakistan, World Bank Report.

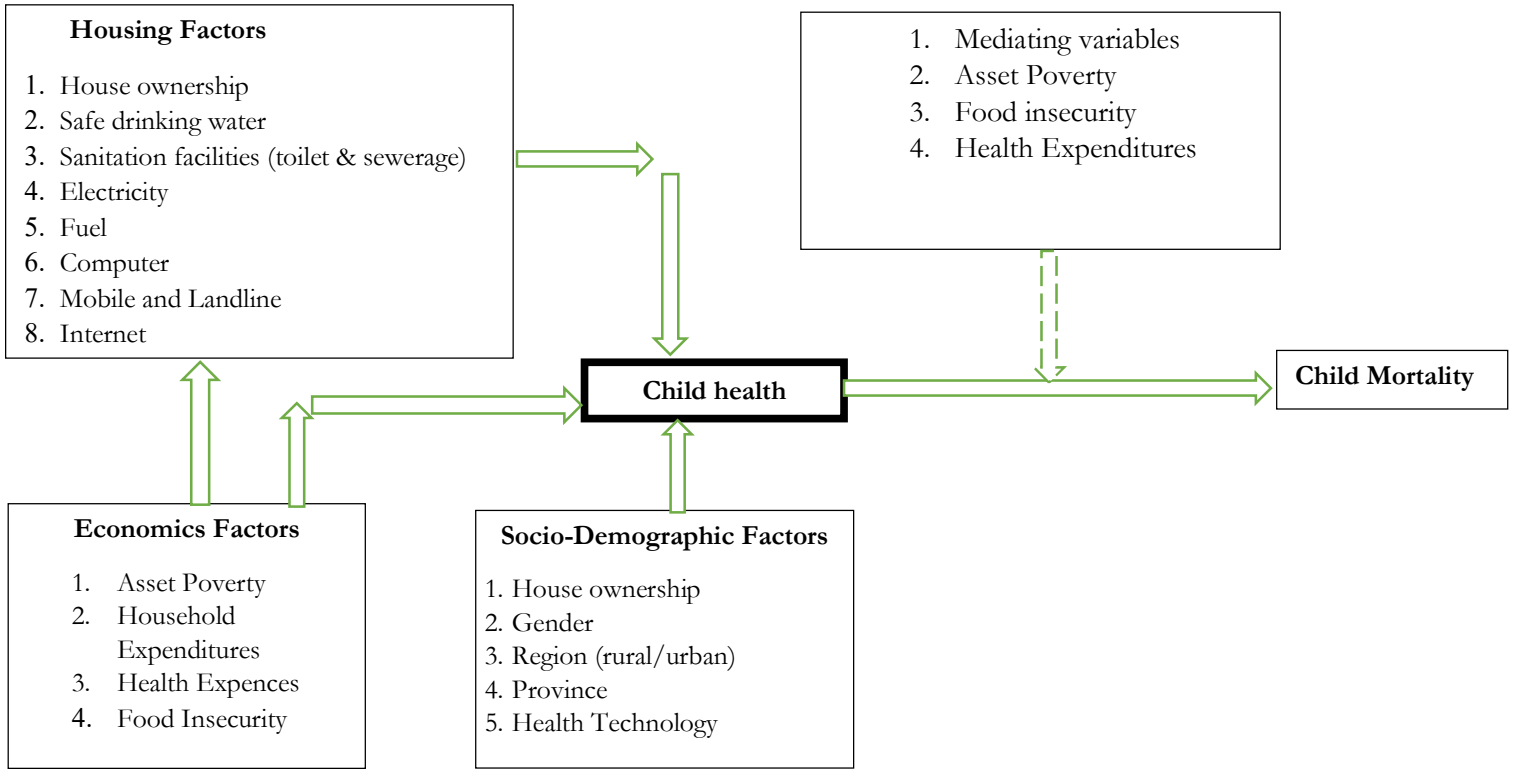
Figure 1.1 shows a significant decline in child mortality during 2000-2020. In brief, there is an immense need to investigate the linkages and determinants of child health in Pakistan. The nightmare of child health diseases must be controlled to provide a good quality of life standard to the people. This needs a deep review of the previous literature on this topic to dig out the health issue in detail. Moreover, by assessing important factors must be identified that play an important role in the assessment of better child health so that Pakistan can achieve the target of standards in child health in line with the Sustainable Development Goals (SDGs) of the UN by the year 2030.

Keeping in view the study of Fay et.al. (2005), Fotso et.al. (2007), and Pradhan and Arokiasamy (2010). The conceptual framework of this study is developed.

Figure 1.1 clearly explains the phenomena of various factors affecting a child's health that ultimately leads to child death in some cases. Economic factors are the key factors that serve as a root cause of all the derived factors like socio-demographic and housing factors affecting child health. economic factors not only directly affect the outcome variable but also support the housing factors to emerge. Housing and demographic factors directly affect a child's health in this regard. While determining the social, economic, demographic and housing factors which are

conceptualized from various studies of the previous literature led to a foundation of critically important factors like asset poverty and food insecurity which are the novel segment of this study. Unlike the previous studies, these studies not only put an end to the child health outcome but draws the attention of the policymakers to the child health factor which is a derived factor of maternal health. But according to this new concept, the relationship between child health and child death can be mediated by various factors. Upon a deep statistical analysis, this concludes that three major economic factors mediate this relationship i.e. asset poverty, food insecurity, and health expenditures of a household.

Figure 1.2
Conceptual Framework of the Study



Source: The author developed the concept from the literature on child-infant health and mortality. For Reference see Fay et.al. (2005)

1.3 Research Gap:

The objective of the current study is to investigate the socioeconomic factors that affect children's health in Pakistan, with an emphasis on three innovative factors: asset-based poverty, food insecurity, and an indirect analysis using Hayes' technique. This study fills in previous gaps and offers a thorough examination of the variables affecting child health outcomes in the Pakistani context by including these extra aspects. Previous studies on the socioeconomic determinants affecting children's health in Pakistan have mostly focused on common measures like income, education, and access to healthcare. However, they frequently overlook the minute details that might have a significant impact on how well children's health turns out. This study tries to bridge this research gap by including three specific dimensions that have received little attention in the previous literature.

1. Asset-Based Poverty: This study proposes an asset-based approach to determining poverty, in contrast to conventional income-based measurements. It offers a more thorough picture of the socioeconomic position of households and its relationship to child health outcomes by taking into account the ownership of durable assets. The long-term economic security of families and its impact on children's health are also goals of this dimension.

2. Food Insecurity: This study specifically addresses the effect of food insecurity on child health outcomes, acknowledging the crucial role that nutrition plays in children's health. It examines the availability, use, and accessibility of nutrient-dense food within households, illuminating the link between food security and child health. This aspect aids in comprehending the multifaceted nature of child health and the need of attending to nutritional requirements.

3. Using Hayes' Methodology for Indirect Analysis This study uses Hayes' methodology to look at indirect impacts and potential mediating factors in addition to direct studies. It provides insights into the fundamental mechanisms through which socio-economic determinants have an impact on children's health by examining the mediating routes between these factors and outcomes. This method of indirect analysis aids in the comprehension of intricate interactions and offers a more complicated viewpoint on the socioeconomic elements influencing children's health.

The results of this study will help us gain a deeper knowledge of the socioeconomic determinants that affect child health outcomes and will help us design treatments and policies that are specifically intended to improve child health in the Pakistani environment.

1.4 Objective of the Study

This study is an addition to the existing literature on child Heath in Pakistan which still needs more deep investigation to channel this issue with its various direct and indirect determinants. This study assesses some social, economic, and environmental factors of child health that are prevailing in the geography of Pakistan. The following are the objectives of the study;

1. To analyze the socio-economic and demographic factors that directly affects child health in Pakistan.
2. To assess the indirect way of factors influencing child health in Pakistan.
3. To assess the health-induced child mortality in Pakistan.

1.5 Research Questions

The research questions of this study are.

Q1. What are the influencing social, economic, and demographic factors that directly affect child health in Pakistan?

Q2. What are the indirect ways of factors affecting child health in Pakistan?

Q3. What are the critical factors that significantly mediate between child health and child death in Pakistan?

1.6 Research Hypothesis

This study employs the following hypothesis.

H1: There exists a strong direct nexus between socio-economic factors and child health in Pakistan.

H2: The Role of mediating factors affecting child health is significant in Pakistan.

H3: The mortality ratio is concentrated among children having poor health conditions in Pakistan.

1.7 Significance of the Study

There is widespread agreement that children are any nation's future human capital. Therefore, for the benefit of a nation, a robust guarantee of children's health is required. Even though medical technology and management have made significant strides, developing nations are still working to reduce the morbidity and mortality rates among children. Finding the potential reasons for children's health disparities is vital since they are in grave danger if they have poor health. Desired health policies can be formed in large part by considering social, economic, and demographic aspects. Although estimates of child morbidity and mortality as derived from the various data sources in Pakistan show great variation. Recognizing the fact that child adverse health and most child deaths could be minimized, it is important to study the progressions that are likely to influence the improvement in child health. The health care factors, which are vital components of mortality change in Pakistan are concentrated mostly in urban areas contributing to a lower risk of morbidity among children. In contrast, basic health facilities along with massive poverty in rural areas contribute to the relatively high incidence of child adverse health and deaths. The support from the government for mass health-related programs has been expanded yet the availability and provision of public health facilities are much below the needs of the growing population in Pakistan.

However, the understanding of the factors of child health in both rural and urban areas is extremely limited. Given this substantial difference in Pakistan and the different lifestyles of the masses, this study examines the relative contribution of health-related socio-economic factors that affect the health status of children under 5 years of age and their survival at the regional and provincial levels. This analysis provides a crucial basis to judge the variation in child health and its determining factors across the country to identify more authentic and effective policies for lessening the regional gap in child health and deaths.

1.8 Structure of the Study

This study is organized into 6 chapters. Chapter 1 explains the background of the problem, theoretical and conceptual framework, objectives, and the rationale of the study. A review of the literature is discussed in Chapter 2. Chapter 3 explains the data, its sources, and the variable description. This chapter also encircles the frequency of the data and how the variables are constructed. Chapter 4 encircles the methodology along with theoretical models and test hypotheses employed for empirical analysis. Chapter 5 encircles the results of the study. Chapter 6 concludes the key findings and policy implications of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Child health is considered as a result of a nation's development process. Numerous studies investigate how children's health influences future socioeconomic status and the growth of human capital (see, for instance, Behrman & Deolalikar, 1987; Case & Paxson, 2010; Case et al., 2002; Currie, 2008; Glewwe & Jacoby, 1995; Olsen & Wolpin, 1983). On the opposite end of the spectrum, there are in-depth studies that look at the factors that affect children's health (for examples, see Alderman et al., 2001; Arif, 2004; Chen & Li, 2006; This study aims to add to the latter viewpoint on children's health).

2.2 Literature Reflecting Social and Demographic Determinants of Child Health

Several studies are conducted to investigate the issues of child health across the world. Researchers apply various techniques to investigate the determinants of child health in developed and developing countries of the world, however, leave ambiguous conclusions. There are some gaps in the previous literature on child health across the world that need to be addressed and bridged. This study is an addition to bridging the gaps of early studies on social and demographic outcomes of child health in Pakistan. Child health is an important issue of this century. Every country faces the problem of child health in its context and severity. This issue has been widely investigated in several studies; Aksit and Aksit (1989) attempt to assess infant and child mortality in Turkey and try to find empirical results by applying multivariate analysis. Their study explains that mortality in infants and children possesses a key nexus with the mother’s education. According to them, the household survey in Turkey shows the regional changes and their impact on the statistics of mother education. The urban areas of Turkey show a strong negative relationship with the mortality rate of children. Moreover, the survey also highlights the deep connection

between the education of parents and the socio-economic and cultural determinants of an individual in Turkey.

Tanaka (2005) added the political and welfare aspects to determine infant and child health outcomes by taking a sample of 19 OECD countries. They consider Social security transfers as a percentage of GDP, benefits for sickness, old-age allowances, family allowances, and social assistance grants as a measure of welfare. Among the welfare variables, only medical assistance of people under public medical care is significantly affecting the mortality outcomes. The two welfare state variables accounted for more variability in mortality rates than the two political variables. The same area is explored by Chung and Muntener (2006) explore the determinants of political and welfare states on child health. the sample contains monetary stable countries. A time-series data of nineteen OECD countries are taken from 1960 to 1994. Proxies for the welfare and political states were the provision of public medical facilities. Whereas the political state is proxied by the nature of government that prevails in a country. The results of the study postulate that medical facilities for the public by the welfare countries are very sensitive to child health under 5 years of age. Also, a strong political will by the rulers of the state supports egalitarian plans and policies that is playing a vital role in improving the nation's health. this study also focuses on inequality measurement as it is an unavoidable part of any government policy.

Social epidemiology offers several frameworks and models to support empirical research focused on the socioeconomic determinants of health inequities in some studies, such as Krieger's (2005). The findings offer a conceptual framework for understanding a variety of social inequality and welfare issues, such as class, racial, and gender disparity as well as health consequences. By focusing on Canadian data, the study shows how improving social benefits by the government lowers health inequalities. the establishment of Canada's universal health care system to lessen relative income disparities in mortality caused by medical problems. These findings are further corroborated by research by Kunitz and Pesis (2005) and James et al. (2007) that demonstrates a correlation between rising public health spending in underdeveloped nations and declining relative wealth disparity. Brazilian studies showed that increasing investments in health-related infrastructure reduced both absolute and relative income inequality in children's health. in line with these studies,

some social aspects related to household care are also important. Rutstein (2000) focuses on the role of the factors that affect the trends in the explanatory variables of a certain dependent variable. For example, according to this study, child health is directly affected by factors like mother's feed, knowledge of initial immunization to infants, income disparities, etc. but an effective policy will emerge if special attention is paid to the factor explaining changes in these explanatory factors. Like increasing the expenditure on the provision of health knowledge to the rural mother through health programs in basic health units (BHUs). Improving infrastructure, child vaccination, provision of free elementary education, and lowering gender disparities. The study analyzed 89 surveys in 56 countries[1] . The study is focused on countries that are less developed and are receiving handsome funds from international agencies.

The role of mothers is also analyzed by Nandy et al. (2005) to evaluate the situation of women regarding infant nutrition in 36 nations across three continents: South Asia, Sub-Saharan Africa, and Latin America. Data sets from nationally distributed household surveys are used in the study. According to the survey, Latin America and the Caribbean, Sub-Saharan Africa, and South Asia are the regions where women's position has the greatest impact. The ability of women to make decisions in South Asia has a significant impact on the long- and short-term nutritional health of their offspring, which eventually has an impact on the survival rate. However, the higher influence of women in decision-making in Latin American and Caribbean nations only has a short-term positive impact on children's health. Women's relative decision-making power has a stronger positive impact on children's nutritional status in poorer families in all three of the sampled regions than it does in wealthy families, suggesting that women's status is an important enabling factor to improve children's nutritional status and health in developing countries. Studies by Aseno et al. (2012) and Tolhurst and Nyonator (2006) investigate the connection between access to control over resources and norms of decision-making. Even while some studies have found that mothers typically consult the male household head about a child's treatment when there are certain circumstances, such as when they have limited resources, women do occasionally approach to seek medical treatment. When a mother wishes to take her child to the hospital or when the condition is thought to be serious, for instance, a male is asked to pay for the treatment. An analysis of

[1] http://www.who.int/bulletin/tableofcontents/2000/vol.78no.10.html (see summary of the countries and surveys is available on this site)

intrahousehold negotiations about treatment-seeking behaviour was done qualitatively. According to Tolhurst et al. (2008), the degree of the relationship between mothers' access to control over the financial means to pay for health care, norms and values of responsibility, and power of decision-making greatly influence the treatment-seeking for a kid. It follows from the conversation that women can run their households by getting an education. The health of children is significantly influenced by education.

Some families in search of child welfare migrate from one place to another to avail better opportunities for their spouses. According to Brockerhoff (1995), there is a three-level association between the rural-urban migration rate and the child morbidity rate, i.e., children who are left behind in the rural areas, children who migrate with their parents, and children who are born in urban areas after migration. Compared to people who were born in rural areas, rural-to-urban migrants have better survival odds. The study by Poros (2010) demonstrates the significance of social institutions in aiding immigrants' integration into the host society. These social institutions include a variety of civic organizations that offer health care and some close relatives who already reside in the host town. Relatives or acquaintances who are now alive can supply the migrant with information that will aid in acclimating to their new metropolitan surroundings. No matter where in the city, the child morbidity rate increases when migrants fail to adapt to their new urban environment and continue with their customary methods of obtaining healthcare and education. Similarly, Brockerhoff (1994) explains the existence of rural-urban differentials and documents that migration improves the child's survival chances as families seek more advantages in the urban areas in health, education, and social protection. These elements provide a safe platform for good care of a child and fulfilling the basic requirements of life. Studies like Stephenson and Matthews' (2003) analysis of urban-rural migrants in India, however, investigate the link in multivariate frameworks and discover that migration has little to no effect on infant mortality. Their study goes on to explain that rural-urban migrants had higher mortality rates than urban non-migrants due to the difficulties they have integrated into the new urban environment (indicated by their poorer socioeconomic position compared to the urban non-migrants. To ascertain the social and demographic causes of child illness among Pakistani children, Arif (2012) analyses the 2004–2005 PSLM Survey. Children under the age of five are included in the study's sample. The results of this study have

verified the beneficial effects of land and livestock on children's health. In areas of Pakistan where land and animal ownership are both sources of income, multivariate analysis reveals that women should be educated on personal hygiene, particularly when making extra meals for kids. This study also showed that immunization and the overall number of children born are more effective ways to reduce child illness in rural areas.

2.3 Some Other Studies Reflecting the Socio-Demographic Determinants of Child Health

Author(s)	Research Study / Variables	Sample data	Findings
Caldwell and McDonald (1982)	Maternal education, child health.	Third-world countries data	Education from the primary to secondary level is more significant in reducing child mortality.
Bishai et. al. (2014)	literacy, income, technology, and health coverage	146 low- and middle-income countries	89% and 50% of the reductions in child mortality are due to improvements in coverage of health determinants and technological improvements in health.
Cadwell (1982)	Fertility control, cultural characteristics, such as ethnic group, medical services, income, and nutritional levels.	Third-world developing countries	More factors affecting death rates than wealth and access to healthcare are social ones, such as education level or use of birth control, or cultural ones, such as ethnic group.
Susuman (2012)	Selected demographic and socio-economic variables concerning	Ethiopian Demographic and Health Surveys 2000 and 2005	Child mortality declines significantly with the improvement of socio-economic

	mothers.		factors in Ethiopia.
Bolstad and Manda (2001)	For each birth, biological, demographic, and social factors were gathered.	Malawi Demographic and Health Survey, 1992.	Women, particularly those living in urban areas with education, are aware of the social, economic, and cultural factors, lowering child health.
Mturi and Curtis (1995)	Under-five mortality, urban or rural domicile, partner's and mother's educational level, as well as the existence of a radio in the home.	Tanzania Demographic and Health Survey 1991-92.	No significant impact on rural/urban residences while paternal education and 2 years span between the birth of a child reduces mortality under 5.
Samuel and Amoo (2019)	Wealth index, mother education, occupation of parents.	Nigeria Demographic and Health Survey (NDHS) 2008	education of both parents and the occupation of mothers were found statistically significant in improving child health.
Folasade (2000)	In two distinct towns in southwestern Nigeria, environmental and maternal factors have been linked to childhood illness.	child health in Sub-Saharan Africa through statistical analysis	Environmental elements, such as a source of drinking water, and childcare behaviour factors, such as where the child was kept when the mother was at work, especially in the market economy, affect children's health.
Ahmed et. al. (2019)	Region. Mother education, birth order, breastfeeding, family size, child	Pakistan Demographic and Health Survey 2012-13.	Morbidity reduces with an increase in the mother's education, breast

	morbidity.		and family size.
Becher et. al. (2004)	Age of the mother, birth intervals, the season of the birth, the village, the ethnicity, and the distance to the closest medical facility.	Population in sub-Saharan African nations under demographic observation from 1992 to 1999	All explanatory variables are highly significant showing a deep impact on child sickness. Distance to the hospital matters a lot in reducing child mortality.

2.4 Economic Factors Determining Child Health

According to the study by Schutz (1984), epidemiological research often establishes a nexus between health and its determinants like nutrition and medical care. However, social sciences and economic studies, examine the constraints regarding individual opportunities linked with child and infant health by assuming the role of some direct and indirect behavioural factors. The study of Caldwell and McDonald (1982) implies that statistics sometimes misleads the outcomes because people are different in their health endowments. Different people have different approaches to their health endowments and tend to be affected by their level of education. There is a linear direct relationship between child health and economic endowments of human and nonhuman capital, health expenditures, choices, demographics, etc. Their study highlights the variation in the responses of the households to derive the health demand function that depends on the change in their income. Considering the study by Schutz suggests that an individual's economic demand mainly predicts the extent to which a labour market affects the possibilities of child health and hence mortality in the long run.

Szwarcwald et.al. (2002) investigates the effect of inhabited concentration of poverty on health status in Brazil. According to their study concentrated poverty cause more serious health issues than randomly scattered clusters of poor people in a country. They used census data in which the poverty status is measured by the monthly earnings of a household. The proposed index for the geographic abundance or clusters of poor people across various districts of the country. Child health is determined by the factors like early infant mortality rate, the ratio of teenage

motherhood, and the fertility rate of mothers using a partial correlation method. Their study postulates that intra-city differences in the newborn baby's mortality rates significantly vary according to the geographical clusters of poverty across the country. Torres-Arreola et.al (2005) examines child health as a public health issue associated with the nonexistence of equity in the living population. Child health is proxied by low birth weight explained by some society-influenced variables like race, rural-urban differences, education, and excess to basic health facilities. Their results show that socio-economic factors are very much associated with health factors. In addition to that improper nutrition, smoking by either parent and most important parental care are also documented to be unavoidable factors in the health issues of infants and children along with economic disparity. Other than that the unequal distribution of resources and economic inequality also throws an impact on the child health outcome like Hosseinpoor et. al. (2005) tend to estimate the social and economic inequality and its impact on infant mortality in Iran. They use the national surveys of the country regarding demography and health for the year 2000. They study the province-wise and national-level estimates. Their study concludes that social and economic disparity at the province level shows the worse condition, which means that national resource distribution among the province must be based on equality of rights. The findings of this study are further supported by studies like Wagstaff (2000) who conclude that countries have an uneven distribution of resource consumption and distribution have a greater rate of mortality in children. Ups and down and unequal distribution of resources are reflected as cyclical phenomena in developing countries for instance Mueller et. al. (2008) analyze the relationship between different economic stages of development to the death rate of audiovisuals in later life. This study considers the business cycle theory and its determinants as exogenous variables including a record of birth, death, and marriages from 1912-2000. The results reveal that those individuals who were born in the stage of various business cycle stages have a significant negative association in later life. This outcome serves as evidence that economic circumstances have a long-lasting impact on mortality rates. Consequently, Schellekens and Van (2012) documented that the mortality rate is the U-shaped function of age because cyclical changing indicators are varying i.e. priorities change as the age of individual increases. Sometimes he is an immense consumer and sometimes he becomes an immense saver through the life cycle. So the consumption pattern and distribution of wealth are not affecting health outcomes, which means that

income equality is not a determinant of proper medical facilities rather it means that the link exists indirectly. Income inequality is a result of something else in society that directly impacts the health status of infants and children. Therefore, income inequality is an endogenous factor in this regard. These outcomes are further endorsed by Tapia (2008) provides results in-line with the findings of Baird and Schady (2005). They study the economic ups and downs and their impact on mortality in postwar time in Japan. In this study mortality rate is explained by eight factors including some economic factors like income, recessions, and boom periods. Their result shows a 4% decline in recession as compared to the boom period. Recessions cause various hazards to the economy like unemployment, inflation, low output etc. Lin (2006) defines the role of earnings, health facilities, and demographic variables in determining the outcome of child and infant mortality rates in Taiwan. The findings of the study reveal that hid mortality rate is counter-cyclical to that of the unemployment rate in the country. This study further documented that medical facilities available to the citizen of Taiwan in far-reached areas have a significant positive impact on child health. In addition to that economic vulnerability is having a deep impact on the neonatal mortality rates in Taiwan. Being a developing state of the world, the outcomes of this study may be generalizing to other developing Nations like Pakistan for further investigation of this issue. Similarly, Allendorf (2007) conduct a quantitative survey in Nepal and finds that if mothers are empowered by financial assets, it leaves a beneficial outcome for their children's health and nutrition. This study assesses that income accruing to women has a positive impact on a child's nutritional status. To counter unemployment, besides men, women shall also play a vital role in determining the impact to improve the health status of their family by earning and taking social responsibility for their family. Between 1960 and 2000, Amouzou and Hill (2004) look at the under-five mortality trend in sub-Saharan African nations as well as the relationship between social and economic status and elements such as per capita income, illiteracy, and urbanization. Their research demonstrates a substantial decrease in under-five mortality in Sub-Saharan Africa between 1970 and 1990. The analysis reveals a continuous inverse association between per capita income and mortality among children under the age of five. The study also demonstrates a considerable reduction in under-five mortality as a result of urban migration for economic reasons, in search of a safe environment, greater employment prospects, and higher education. However, because facilities are now

available in rural regions as well, the effects of urbanization and illiteracy have lessened over the previous ten years, while the impact of per capita income has grown over time. The study of Gokhale et. al. 2004 and later by Chen and Li, 2009, explains the role of earning women another study carried out in Benin explains one of the pathways in which money in the possession of women provides a positive effect on the health outcomes of the children. to empirically justify the scenario a quantitative survey of 191 households is studied and concludes that women's income is one of the key factors that predict household social environment results and explain the impact on child health protection strategies. According to Houweling and Kunst (2010), qualitative interviews with working mothers enable the link between social determinants and children's health to be better understood. Additionally, individual interviews reveal that working women can buy bed nets, pesticides, and other household goods, which would subsequently be accessible to their kids. However, given their perceived status as the household's "breadwinner," the male counterparts of households are more likely to utilize the same bed nets that they purchase since they see their own need as larger. Other studies have also highlighted women's influence on decision-making, in keeping with the theories generated from the interviews with various in-field women. Studies by Apodaca (2008) and Hoffmann and Flake (2005) that use diet as a control variable demonstrate the relationship between gender and child health. By improving the ability to make decisions and also raising the method of having a sense of authority over the resources, they discover an important connection between the status of the mother and the health of the child.

2.5 Summary of Some Other Prior Empirical Evidence

Author(s)	Research Study / Variables	Data Sample	Findings
Sede and Sede, Ohemeng (2015)	life expectancy, income, education, health expenditure	1980-2011, Nigeria	Significant impact on unemployment and education but surprisingly insignificant in income.
Rudan et. al.	Human capital, fertility, and long-run growth	Chinese data based on a survey	Health is negative with growth-hand human capital investments.
Hoque et al. (2010)	Parental education, household income,	Sample of 769 respondents	Both social and economic conditions

	electricity	interviewed in Bangladesh	are closely related to child sickness.
Chilupula (2020)	Social, economic, and biological factors	Health Survey of Zambia during 2013-14	The significant positive relationship between wealth index and child health.
Boehmer and Williaumson (1996)	Female participation, income per capita, and female literacy.	96 developing countries	The negative impact of Income per capita, female participation rate, and positive impact of female illiteracy with child adverse health.
Cornia and Mwabu	access to clean water and sanitation, female literacy, and per capita income.	Sub-Saharan Africa	All variables are negatively associated with child and infant morbidity.
Amate-Fortes et. al. (2016)	Gini, female illiteracy, physicians, income	88 developing countries	Income inequality (Gini). and literacy is positive while personal income and the number of physicians are negatively related to child sickness.
Isenman (2016)	Income, literacy	59 developing countries	Income and literacy are negatively related to child health.
Mwabu (2009)	CPI, income per capita, population density	39–68 developing countries	Inflation, per-capita income, and population density are negatively related to child health.
Rogers (2019)	Income, Gini	56 countries	Gini is negative, and income is positively associated with child mortality.
Paul and Singh (2011)	GNP per capita, per cent of women heading households (+ve), per cent of women attending births (-ve), female education/literacy (-ve), female labour participation (-ve), and religious dummy	32 developing countries	Female education and female participation are negatively associated while women as a household head are positive with child sickness.

Subbarao and Raney (1995)	Female enrolment, male enrolment, income per capita, population per physician, rate of urbanization, regional dummies	72 developing countries	Education enrolment and income per capita are negative while population per doctor and urbanization is positive with child mortality.

2.6 Literature Reflecting Infrastructural Factors of Child Health

There is growing research on child health that focuses on the effects of various socioeconomic factors on child health standards, such as the mother's literacy level (Subbasrao, 1995), household income (Das, 2010), and the insufficient use of available health inputs (Panis and Lillard, 1994; Maitra, 2016), as previously mentioned. There is evidence that, among other things, demonstrates how several other crucial determinants of child health, such as parental usage of health inputs, have a direct and positive impact on child health outcomes. As mentioned by Grabowski (1990), who finds that access to clean water and proper sanitation lowers the likelihood of child illness, it has been argued that the availability of clean water and sanitation, the availability of electricity, and most importantly owning a place to live in are some significant determinants that affect child health. Although there are differences in child health in developing nations, this suggests that other elements, such as water supply and good sanitation, such as piped toilet facilities, may increase children's chances of surviving. Ridder and Tunali (1999) did not discover any evidence to substantiate the association between child mortality and a hygienic sanitation system, in contrast to Grabowski's (1990) findings. Alderman (2001) examines the impact on children's health in Ghana of the calibre and accessibility of health services as well as other public infrastructure. When biological causes are considered, birth order and parity no longer have a significant impact on mortality, according to Guilkey and Riphahn (1998). However, it is discovered that nursing is one of the most significant factors in determining a child's survival. In recent years, a lot of academics have focused on establishing the link between environmental health concerns and both maternal and child health. According to the WHO's 2015 World Health Report, 4% to 8% of the total burden of diseases in developing countries is attributable to unsafe drinking water, inadequate sanitation facilities, and unsanitary living conditions. Numerous studies examine this component individually and

evaluate the household-level statistics in light of the significance of the infrastructural ecosystem, particularly safe water, sanitation, transportation, and availability of electricity in the homes, for child-enhanced health. The important findings from the micro-household research show a significant relationship between access to clean water, good hygiene, and sanitation for children.

Micro-household studies reveal the strongest connections between water, sanitation, hygiene, and health outcomes. The study by Galiani et al. (2005) reveals that child morbidity decreased by 5 to 9 per cent in areas where water services were privatized. This decrease was based on the variance in ownership of water provision (and the related rise in coverage and improvement in water services quality). The poorer the place, the greater the effect. The authors establish that privatization is unrelated to deaths from causes unrelated to water quality but is associated with a large decrease in infectious and parasitic disease mortality. They also evaluate the robustness of these results in several different methods. Brenneman and Kerf (2002) also emphasize some of the major nexuses between health, transportation, and power in the literature as part of their thorough analysis of the connections between infrastructure and poverty. They discover data that suggests improved transportation facilitates easier access to healthcare as well as simpler staffing and management of clinics. Additionally, a better transportation strategy minimizes the emissions of dangerous gases like carbon dioxide, which affects acute respiratory infections and lead pollution, both of which are especially damaging to children. Consequently. Fay (2005) emphasizes a health-transport-electricity nexus in addition to the previous literature to explain child morbidity. He discovers proof that more effective transportation infrastructure makes it simpler to staff and run clinics, hence facilitating quick access to healthcare. Additionally, he adduces that better transportation and sound infrastructure policies lessen air pollution, which is damaging to young children more than it is to adults. Electricity has a less obvious effect but is still utilized for cooking in underdeveloped nations. As a result, it does not directly replace the use of conventional fuels for cooking, which is known to have a seriously detrimental effect on a family's health. However, it has been demonstrated that electrification is associated with the shift from conventional to modern fuel mechanisms, which tends to lower indoor air pollution. According to McDonald (2005), traditional biomass fuels are well known to be a significant source of indoor air pollution with a detrimental effect on children's health in impoverished countries

like Bangladesh, even though electricity is regularly used for cooking. This practice demonstrates how electrification is linked to a decrease in household accidents such as paraffin poisoning and burns, which are mostly brought on by the use of biomasses as fuel in combination with other widely used fuels like kerosene oils. The supply of refrigeration in homes is another benefit of electricity. In general, improved clinic and hospital performance is linked to rural electricity facilities. Last but not least, access to basic services has an impact on academic achievement and school attendance, both of which are linked to better health outcomes. According to the material Brenneman (2002) cited, electricity promotes attendance at schools by encouraging improved health and enables more studying to be done at home in a peaceful environment.

Incorporating the World Development Indicators for a sample of 60 developing nations, Wang (2003) discovers that infrastructure facilities are crucial in explaining child health outcomes. While researching a cross-section of 60 nations, he discovers some interesting findings that demonstrate the vital importance of electricity in determining child illness across the sample. According to Wang, a household's ability to acquire electricity is probably unrelated to its level of income. Along with the income variable, which accounts for 67% of the effectiveness in improving child health, the electricity component also explains roughly 64% of the variability in under-five mortality rates across the sample of nations. Access to electricity is more likely to have a higher in urban rather than rural areas of a county, where food refrigeration is more critical to warding off infectious diseases that are more likely to spread in urban areas of a county, where food refrigeration is more critical to warding off infectious diseases that are more likely to spread infections.

2.7 Some Other Studies Reflecting the Infrastructural Factors of Child Health

Author(s)	Research Study / Variables	Sample data	Findings
Alan and Goldin (2019)	clean water, effective sewerage, under-five mortality.	US economy during 1980-2020	Improvement in child health conditions with proper sewerage and clean water.
Shi (2000)	urban potable water, sewerage connections, local water services, child health	Data at the city level are offered by Global Urban Indicators (UN)	The negative association between child health and local water services and sewerage.

Merrick (1985)	Piped water, household income, child mortality, child diseases	Data reflecting urban Brazil	Access to piped water in a household is likely to be of most direct benefit in lowering child mortality
Currie and Neidell (2005)	emissions of CO and O3, air pollution, and neonatal mortality	Environmental Protection Agency of California data	In California, lowering carbon monoxide levels throughout the 1990s saved about 1000 baby lives.
Atuoye et. al. (2015)	Roads, excess to hospitals, poverty, maternal health services, child mortality	Data based on Health Planning and Services (CHPS) Ghana.	Vehicular transport reduces the death rate of child and positively affect maternal health.
Fay at. al. (2007)	infant mortality rate, accessibility to basic infrastructure (piped water, sanitation, and electricity)	Demographic and health survey of the USA	The outcomes for children's health can be significantly improved with the help of infrastructure services.
Jalan and Ravallion (2003)	Female literacy, piped water, family income, and the death rate of children under five-year age.	data from a study of 33,000 rural households in 1765 villages across 16 Indian states.	Positive income effect, health gains from piped water in villages, and the weak impact of education on child morbidity.
Getachew et. al. (2018)	Gender, religion, house ownership, distance to hospital, child mortality	In 10 communities in Ethiopia between 1987 and 2008, Event History Analysis (EHA) was performed utilizing 22 years of data.	Neonates who were born to mothers who lived between 5 and 9 kilometres from the hospital had a higher risk of dying than those who resided within 5 kilometres of the hospital. Babies born to moms who lived in thatched dwellings were more likely to die.
Rao and Pandey (1997)	infant and child mortality, access to a toilet, household income, mother's literacy, and immunizations	data from the 1992-93 National Family Health Survey (NFHS) in India.	Owning consumer goods lowers infant and child illness, but living in the city or the country, mothers' media exposure and the use of clean cooking fuel are found

			to have no impact on infant and child mortality.

2.8 Literature Specific to Pakistan and Concluding Remarks

Pakistan has the 6th population in the world, with people about 64% residing in rural areas. Given the rate of population growth, Pakistan ranks as 5th most populous nation in the world by 2050 (World Bank Report). According to the Pakistan Demographic and Health Survey 2018–19, the literacy rate for people aged 15-45 is 49% (with males having 56%, while females are at 43%), and a life expectancy of about 66.5 years, respectively. Corresponding improvements in the nation's health accounts, particularly in infant, child, and nutrition health, have lagged other low- and middle-income nations with comparable economies. According to Rizvi et al. (2015), Pakistan has the 26th highest rate of under-5 child mortality in the world. The leading causes of death during the postnatal period, according to the Pakistan Demographic and Health Survey (PDHS) 2018-2019, are pneumonia (26%), followed by diarrhoea (27%), and they are all closely related to risk factors like poverty, undernutrition, poor hygiene, and unfavourable home environments. It is important to note the impact of social determinants on children's health in Pakistan. Socio-economic factors, such as parental education, and household wealth, exhibits a significant impact. Although, there are urban slums in megacities with equal rates of child health problems. Keeping in view this rate of adverse child health, the under-five mortality rate is higher in the poorest quintiles compared to the rich, and there is also variation between provinces as well. Nevertheless, despite widespread perceptions of clustering of morbidity followed by mortality among urban slums, there is little data on this effect at the national level. Although these numbers have been contested as being understated, it is believed that 21% of Pakistan's population still lives below the poverty level (Di Cesare et al. 2015). In addition to rates of maternal and child undernutrition, other indicators of poverty include food insecurity. Due to the increased awareness of its effects on social well-being generally, child health has become a prominent area of study in economics. Researchers have looked into several aspects of Pakistani children's health in this setting. Studies like Rizvi et al. (2015) and Noh et al. (2018) have looked at how poor health facilities and restricted access to immunisation

services affect children's health. These researchers stress the need of removing the obstacles that keep kids from receiving crucial medical interventions. Additionally, studies on child health that focused on social determinants like ethnicity, gender, and demographics were conducted by Ali (2009), Khalid (2018), and Abbasi (2018). These studies emphasise the importance of taking into account social determinants that may affect children's health outcomes since differences based on them may result in unequal access to healthcare and health inequalities. Furthermore, a sizable body of research has taken an economic perspective on child health, as demonstrated by Arif (2004) and Mahmood and Kiani (1994), who proceed with roughly the same elements of effect. These studies provide insight into how resource constraints, low-income levels, inflation, and illiteracy affect child health outcomes.

Through the addition of fresh perspectives to the analysis, this study seeks to add to the body of knowledge already available on children's health in Pakistan. To provide a more thorough assessment of child health outcomes, it specifically takes into account the home problem of asset poverty and the global problem of food insecurity. This study aims to highlight the diverse character of child health and explore other determinants that may affect child well-being in Pakistan by extending the scope beyond frequently studied issues like malnutrition, parental education, and access to health facilities. Indicators of Economic growth and lifestyle quality in developing nations include child health. Through an empirical examination of the most recent microdata collected nationwide, this study focuses on the variables influencing children's health in the general context of Pakistan. Given the need to enhance child health in Pakistan, it is important to consider the situation of child mortality when assessing the MDGs and later the Sustainable Development Goals (SDGs). This research should be conducted not just at the national level but also at the sub-regional level considering the diversity that exists among the four provinces. The context stated above provides the context for this study's importance. This study makes a significant contribution to the current literature because there aren't many reliable empirical studies on child health in Pakistan.

CHAPTER 3

DATA AND VARIABLES

3.1 Introduction

The study area and the sources of the chosen sample of data are both thoroughly described in this chapter. This chapter also highlights the details of data collection, its procedures, population, the technique of sampling design, sample size, definitions of variables used, and data analysis procedures.

3.2 Data Sources

The data is obtained from the Household Integrated Economic Survey (HIES), commonly known as the Pakistan Social and Living Standard Measurement Survey (2018-19). This survey provides comprehensive data on economic, health, and demographic factors at the national and state levels. The eleventh round of a series of surveys that began in 2004 is the HIES (2018–19). It includes 159949 respondents and offers comprehensive data on indicators related to education, health, mass welfare, housing, water sanitation, and hygiene, as well as information on communication and technology (ICT), the Food Insecurity Experience Scale (FIES), and income and expenditure specifics. HIES (2018-19) also offers data on household income, savings, liabilities, and consumption expenditures, as well as consumption trends at the national and provincial levels, with a breakdown of urban and rural areas.

3.3 Data Collection Methods

Data from the HIES (2018–19) are gathered using a team approach that includes both male and female enumerators. In each field, a team of female enumerators is supposed to interview a female respondent of the household members while male enumerators are likely to interview the male household members and collect a separate set of information on an especially designed module.

3.4 Universe of the Study Data

The data consists of rural-urban areas of the four provinces of Pakistan. This survey excludes the military-restricted areas of the country. It is here worth mentioning that areas of formerly called Federally Administered Tribal Areas (FATA) are now merged into Khyber Pakhtunkhwa (KPK) and are covered in this survey.

3.5 Study Sample Design

This study includes four provinces of Pakistan namely Punjab, Sindh, KPK, and Baluchistan for assessing child health. All four provinces are reflected vis-a-vis. dummies in the empirical model. Provinces are different from the social and economic points of view. The norms and values and governance vary from province to province. That's why we see a clear difference in the socio-economic and political infrastructure of these provinces. Baluchistan is the most deprived province of Pakistan. Lack of interest by the politicians and worse situation of law and order situation this province suffers a lot in every field of life, Basit et. al. (2021). Comparatively, if we look at the statistics of Punjab, it is far better governed than Baluchistan followed by KPK, and Sindh. Therefore, health outcomes are also varying a lot at a provincial level. This study includes 'province' to assess the child health factors in Pakistan.

The data generated vis a vis HIES, a provincial-level survey is used to produce 24 Sustainable Development Goals (SDGs) indicators and to provide data regarding consumption expenditure for computation of poverty incidence by the Ministry of Planning Development Pakistan. Following are the numbers of enumeration blocks in rural and urban areas of Pakistan;

Table 3.1
Number of Enumeration Blocks as Per Sampling Frame (2017)

	Number of enumeration blocks		
Province	Rural	Urban	Total
Punjab	60666	27853	88519
Sindh	17215	21915	39130
KPK	22538	3266	25804
Baluchistan	8384	1826	10210
Total	108803	54860	163663

Source: HIES Survey (2019), Pakistan Bureau of Statistics

Table 3.1 shows the number of enumeration blocks. Pakistan Bureau of Statistics has divided the selected sample of the population into rural and urban areas of the respective provinces. Among the total figure of 108803 blocks 54860 constitute the urban territory while 163663 constitute the rural demography. Pakistan is in its transition phase of development vis a vis its maximum proportion of the population still lives in the rural areas of the country. Punjab province is the largest among all provinces with a total magnitude of 88519 population, followed by Sindh, KPK, and Baluchistan. The highest number of the population of Pakistan lives in the rural KPK against the smallest number of 1826 who live in urban Baluchistan province. Thus the table clarifies the population distribution upon the enumeration segments that would lead to clarifying the outcome of this study regarding the number of children and other related factors taken into consideration.

As explained earlier that this study takes care of the factors affecting child health cum mortality at the household level, therefore we apply the statistical formulation to merge the individual data into the household data. After doing that selected sample of the respondents is encircled into 24809 families. The total number of under 5 children is distributed among the 24809 households. The details of the data sample are depicted in Table 3.2 given below. The table shows the age of equal and under 5 years children ever born to females. 4505 children are in their neo-natal period. There are 8909 infants in the selected sample of this study while the definition of children comprises 15063 numbers. Among them, 4803 are the children who have not yet reached the maximum age limit of the selected sample for this study. this sample comprises Live birth means that a baby breath after birth to show a sign of life even if he/she only lives for a few minutes. This study ignores the stillbirths of the population still births mean a child who died at birth i.e. there is no sign of life at all. It is because of this reason that a dead child has never enjoyed the

living facilities in either way. That's why stillbirths are excluded from the sample for this study. Also, the preliminary analysis shows the insignificant outcome of the infants and neo-natal population due to the small percentages, it is, therefore, the children population (who reached their 5^{th} birthday) are selected as a sample for this study to dog out the more robust results.

Table 3.2
Frequency of a Child Less or Equal to 5 Years of Age

Age in years	Frequency	Per cent
Less than 1	4505	15.8
1	4137	14.5
2	4772	16.8
3	4909	17.2
4	4803	16.9
5	5351	18.8
Total	28477	100.0

Source: Author's calculations from HIES (2018-19).

Table 3.3 shows the equal to or under 5 years of age distributed among the provinces of Pakistan. The data depicted is converted to household level as stated earlier. The total frequency of children under or equal to 5 years of age is 28477, 41.5% are from Punjab province, followed by KPK and Sindh. Baluchistan is at last in the series comprising 11.6% of the sample of children under 5 years. This data set is formulated from the HIES 2019 published by the Bureau of Statistics, Pakistan.

Table 3.3
Province Wise Distribution of Children Under or Equal To 5 Years of Age

Province	Frequency of Households	Per cent
Khyber Pakhtunkhwa	7052	24.8
Punjab	11832	41.5
Sindh	6294	22.1
Baluchistan	3299	11.6
Total	28477	100.0

Source: Author's calculations from HIES (2018-19).

3.6 Construction of the Variables

As discussed, Household Integrated Economic Survey is a micro-based data set. The scatter data must be reorganized and structured in a way that fits the needs of this study. For this reason, the variables are constructed given various previous literature and World Bank data and socio-demographic organization's work. Following are the selected variables of this study and their compositions.

3.6.1 Child Health

Children are more vulnerable to diseases like malaria, hepatitis, and tuberculosis. HIES data keenly collects data on children who suffer from these diseases. These problems occur mainly due to low-calorie intake and consuming unhealthy food, poor families do not have access to safe drinking water and the situation becomes even worse if sanitation problem is added to them. This study considers a child's health if a child under five years is infected with either disease asked in the questionnaire. Any single positive response will be a proxy for an unhealthy child.

Other factors immensely affecting a child's health are covered under the umbrella of economic factors and social factors. Some of the socioeconomic factors are directly affecting child health while some are affecting the dependent variables indirectly.

Table 3.4 portrays the overall picture of child health frequency. The child's adverse situation is not only due to medical problems like diarrhoea, tuberculosis, hepatitis etc., rather it is a phenomenon that is caused along with the overall ecosystem in which the family is living. These are some fatal diseases that sometimes cause to death of a child if not seriously handled (some of them are mentioned). Among the total selected sample 24809, 22.6% (5618) families possess an unhealthy child having adverse health situations during the survey period of the study. Among them, 4033 families are reported to have at least one child die due to an adverse health situation. This constitutes 16.3% of the sample which is quite a high rate of death in children ratio. This should be kept in mind that this ratio shows the number of families not the individual cases of death. This means that the number of children dying is a significant part of the total live births of the sample.

Table 3.4
Child Health and Mortality Statistics of the Selected Sample

	Frequency of Households	Percentage
Healthy Child	19191	77.4
Child is Sick	5618	22.6
Total	24809	100.0
No child died in a house	20776	83.7
At least one child died in a house	4033	16.3
Total	24809	100.0

Source: Author's calculations.

Children are more vulnerable to diseases like malaria, hepatitis, and tuberculosis. HIES data keenly collects data on children who suffer from these diseases. These problems occur mainly due to low-calorie intake and consuming unhealthy food, poor families do not have access to safe drinking water and the situation becomes even worse if sanitation problem is added to them. Sometimes the blood transfer, not using disposable syringes, no vaccination, and sometimes the reason is not known to the household cause of the disease of the infected child. This study considers a child's health if a child under five years is infected with either disease asked in the questionnaire. Any single positive response will be a proxy for an unhealthy child.

Table 3.5 shows the provincial breakup of the selected sample for child health. according to the table, Sindh is having the highest rate of child health issues i.e. 24.1% followed by the Khyber-Pakhtunkhwa province which has 23.1% of child sickness. 2632 households in Punjab are reported to have unhealthy children comprising 22.3% of the selected sample. Baluchistan contains 445 families that report an unhealthy child. Baluchistan is showing the lowest rate but it is not because there is a safe and healthy environment rather the response rate of this province is very low in this regard. Surprisingly, Punjab shows a relatively low percentage of child health relative to Khyber-Pakhtunkhwa. It is because of the reason that Punjab is allocating a higher budget to health facilities and related infrastructure. Sindh is adverse in this regard. Poor governance and lack of interest of the authorities in the health and other socio-economic mechanics of the province have led to a rise in health issues not in children but also adults. A child doesn't need to be sick due to his/her disease rather there is a strong possibility that the disease is transferred from an unhealthy mother to her child. From here we say that health is vital not only for children rather it is equally critical for the mother as well. Health facilities in Pakistan vary not only from province to province but also inside the province there are health differentials inside the province in sub-divisions. In recent years, we still see health differentials between the rural and urban areas of the country. Rural areas are lacking basic facilities and other health infrastructures like hospitals, roads, transport, and means of information technology to link people to the required facilities for health. table 3.6 shows the region-wise division of child health in the country.

Table 3.5
Child Health Statistics at the Provincial Level

		Frequency	Percentage
KPK	Household with sickness	3442	76.7
	Household without sickness	1043	23.3
	Total	4485	100.0
Punjab	Household with sickness	9149	77.7
	Household without sickness	2632	22.3
	Total	11781	100.0
Sindh	Household with sickness	4718	75.9
	Household without sickness	1498	24.1
	Total	6216	100.0
Baluchistan	Household with sickness	1882	80.9
	Household without sickness	445	19.1
	Total	2327	100.0

Source: Author's calculations.

Table 3.6 shows the regional disparity in the provincial distribution of child health in Pakistan. According to the table, Khyber Pakhtunkhwa has a total sample of 4855 households, out of which 3035 households do not possess any sick child while 1450 households possess a sick child during the study period. 22.6% are families with no sick child live in rural areas whereas 24.7% of households are from the urban areas of the province.

Surprisingly, almost double the number (2351) of households in rural areas are reported to have sick children compared to urban households (1091). This is because the Khyber Pakhtunkhwa province of Pakistan is blessed with the natural environment of forests in the northern areas, hill stations, and plenty of clean water resources that keep the air clean and healthy and so the dwellers of the region. In urban areas, people are confronted with artificial food and other transformational pollutants like hazardous gases in the air and high temperatures are very vulnerable for kids. The same is the case for Punjab as well. The child health ratio in rural Punjab is more than in urban areas of the province. Punjab is a province that has a high percentage of the population living in rural areas. Unfortunately, no government has ever been interested to upgrade the standard of living in rural Punjab. Recently some steps are being taken to establish a new province covering the southern part of Punjab that mainly constitutes the rural areas of the current province. There are 78% of households with no child sickness in rural Punjab as compared to 77.2% of households in urban Punjab. Sindh in this regard is showing some adverse situations. The population of healthy households is the same in rural and urban Sindh, but the situation becomes more adverse in the area where the population is reported to be sick. A total number of 27.6% of households are reported to have an unhealthy child

in rural Sindh compared to the 19.7% of households living in the urban areas of Sindh. Rural Sindh is very deprived as it is constituted of some desert areas where there are no such facilities of health and other infrastructure. The governance in the Sindh province is also not good. Lack of interest in the province and lower number of natural resources like safe drinking water, agriculture, and other infrastructural facilities are not up to the mark. People used to travel a long distance to fetch some drinking water from the wells. No technological installations exist. Hospitals are in very less numbers and those existing are not functional to serve serious patients. Baluchistan on the other side shows 20.0% of households reported to be having unhealthy children in the rural side of the province compared to 17.4% of households possessing unhealthy children in the urban areas of the province. Baluchistan was also a deprived province of Pakistan but recently CEPEC investment is just the dream come true for Pakistan. there is a belt of roads now being constructed in the province along with plenty of medical treatment sites, educational institutions, and tourist spots. These developments will uplift the living standards of the dwellers of Baluchistan. As far as security is concerned, this province is badly affected by external factors that continuously engaged in destabilizing the internal matters of the province. About 80% of households possess healthy children at the age of 5 in rural Baluchistan. Comparatively, this number is low in the urban side of the Province showing that despite the urban living of the people, the masses are more confronted with health risks in the rural region of the province.

Table 3.6
Child Health Statistics at the Region Level

		Region	
		Rural (%)	Urban (%)
KPK *Sample (4485)*	Household with sickness	77.4 (2351)	75.3 (1091)
	Household without sickness	22.6 (684)	24.7 (359)
	Total	100 (3035)	100 (1450)
Punjab *Sample (11781)*	Household with sickness	78.0 (6106)	77.2 (3043)
	Household without sickness	22.0 (1730)	22.8 (902)
	Total	100 (7836)	100 (3945)
Sindh *Sample (6216)*	Household with sickness	72.4 (2535)	80.3 (2183)
	Household without sickness	27.6 (962)	19.7 (536)
	Total	100 (3497)	100 (2719)
Baluchistan *Sample (2327)*	Household with sickness	80.0 (1255)	82.6 (627)
	Household without sickness	20.0 (313)	17.4 (132)
	Total	100 (1568)	100 (759)

Source: Author's calculations. Values in brackets show the sample size.

Health and mortality are not a point of concern for the elders but in the young population especially the kids under 5 years of age, health is the point of worry. It is because of this reason that when a child got sick, and if, he/she is not provided with the required medical or social treatment at the time of illness, this may cause the death of the child. Children are very vulnerable to diseases. Their immune system is not much stronger to defend against strong diseases. That's why the government-run has various child protection programs in which not only the diet plans for the kids included rather a different type of vaccination is also carried out at the different level stages to safeguard the life of a child. Vaccination for the child is very necessary. The government contains the data for child vaccination which is now equally important for taking admission to elementary education. It is, therefore, said that child health is strongly correlated to mortality.

3.6.2 Child Mortality

Child mortality is a derived variable from the adverse health condition of a child. It is explained as death before five years of age. (death from the age of birth to 59 months). Responses of the households or women are recorded in 'yes' or 'no' in response to a question – 'is a child alive?' This data is collected from all women who have had a live birth. This data also includes the children who later died starting from the first birth. After that, the data is scrutinized by applying the age filter of ' all children who are alive or dead before reaching the age of five years of age. Some houses include no children at all. On the other side, some houses include children, but they cross the age limit of five years or if they, unfortunately, died, at that time their age was above five years. This study focuses only on the proportion of households that includes at least one death reported in the family of a child before reaching the age of five years. In filtering the data for child deaths, we first filter out the data of households based on families having children and that have at least a single reported death of a family member. Later the age filter is applied to restrict the population to the threshold point of 5 years. It is for this reason that some children die above the age of five years. In the construction of data for child deaths, we have assigned '0' if there is no child who dies in a family while "1" is allocated to the family where there is at least one child death.

Table 3.7 shows the total deaths in households spread over the provincial level in the country. According to the study sample, Sindh is having the highest number of death recorded. In Sindh 16.8% households reported of child deaths followed by 16.6% in Punjab. Khyber Pakhtunkhwa is almost the same as Punjab reporting 16.3% of the death recorded in the households.

Baluchistan is having 13.1% of households with a positive death of a child under 5 years of age. Surprising three provinces i.e. Sindh, Punjab, and Khyber Pakhtunkhwa show almost the same percentage of child survival. In this regard, Baluchistan is leading by having an 87% of child survival rate. The detailed reasons for the regional differentials of child deaths among the provinces are observed in Table 3.8 as there is a vital role of regional differentials in determining child survival. As this is obvious that rural areas of a country are lagging in the provision of health facilities.

Table 3.7
Child Death Statistics at the Province Level

		Frequency	Percentage
KPK	Household with no child death	3754	83.7
	Households with child death	731	16.3
	Total Sample	4485	100.0
Punjab	Household with no child death	9827	83.4
	Households with child death	1954	16.6
	Total Sample	11781	100.0
Sindh	Household with no child death	5174	83.2
	Households with child death	1042	16.8
	Total Sample	6216	100.0
Baluchistan	Household with no child death	2021	86.9
	Households with child death	306	13.1
	Total Sample	2327	100.0

Source: Author's calculations.

According to Table 3.8, the deaths of children under 5 years are distributed by rural and urban regions. For any developing country, the provision of health facilities in the rural area of the country is very challenging. Not only the health facilities, but the infrastructural development also plays an important role in the child death rate. It is also observed that most of the deaths are caused in houses that are situated far away from the hospitals. Non-availability of transport facilities also boosts this ratio. If there is a sudden emergency, a lot of time is spent on the arrangement of a transport facility. So, these all factors collectively play their role in increasing the death rate of children. The life and health of children are very much different from

those of adults. Adults can survive in more adverse situations. Therefore, medical facilities must be near and easily available to access. Keeping these factor differentials in view, the death rate in rural areas is much more than in urban regions.

The child death rate in the rural region of the country is more than in the urban areas. The reason is obvious. The available facilities in rural areas are not meeting the requirements of standard health facilities. Rural Punjab is ahead of all the other provinces by reporting 18.6% of families in which there is at least one child death followed by Sindh which reported up to 20.1% of families of child deaths. Khyber Pakhtunkhwa province is third in this regard by reporting 82.2% of households with a positive response to child death in the rural areas and Baluchistan is reported to have 12.6% of households with at least one child death. If we look at the response rate of urban Pakistan, we see that Punjab and Sindh are having some close statistics on child deaths in the urban region.

Table 3.8
Child Death Statistics at the Region Level

		Region	
		Rural (%)	Urban (%)
KPK *Sample (4485)*	Household with no child death	83.8 (2543)	83.5 (1211)
	Households with child death	82.2 (492)	16.5 (239)
	Total	100 (3035)	100 (1450)
Punjab *Sample (11781)*	Household with no child death	81.4 (6378)	87.4 (3449)
	Households with child death	18.6 (1458)	12.6 (496)
	Total	100 (7836)	100 (3945)
Sindh *Sample (6216)*	Household with no child death	79.9 (2793)	87.6 (2381)
	Households with child death	20.1 (704)	12.4 (338)
	Total	100 (3497)	100 (2719)
Baluchistan *Sample (2327)*	Household with no child death	87.4 (1371)	85.6 (650)
	Households with child death	12.6 (197)	14.4 (109)
	Total	100 (1568)	100 (759)

Source: Author's calculations. Values in brackets show the sample size.

The reason is that both provinces are highly populated and in response huge traffic with a low number of roads available. Many of the deaths occurred due to the space in the hospitals, the late arrival of the ambulances at the destinations, and huge differentials between public and private health hospitals. Sometimes the household is lacking enough financial resources to provide the required health treatment for the child. Many of the deaths are reportingly to be occurring in public hospitals where the facilities provided to the patients are not up to the mark. Baluchistan is no doubt a deprived province of Pakistan besides it is equipped with a huge number of natural

resources, the authorities are not interested to facilitate the people by providing some serious measures to improve their quality of life. A total number of 14.4% of deaths are reported in urban Baluchistan. Khyber-Pakhtunkhwa province is having 16.5% of households with at least one child death reported.

3.6.3 Household Expenditures

Household expenditures comprise all goods and services that are consumed by the households. Those goods and services that are received on a credit basis and those used in barter transactions and those consumed on payment are included in this head. Household expenditures show a significant part of a household head to showcase a healthy environment to the family member and especially to the children in the house. Expenditure on neat and clean food, water, clothes, and other basic needs for sustainable living will play a role to reduce child morbidity and deaths. This study includes the overall consumption expenditures of a household. Expenditures are considered instead of the income as a person might be earning more but the element of the marginal propensity to consume defines his or her level of satisfaction derived from the given money income and available resources. it is, therefore 'household expenditures' is an authentic measure of the total satisfaction of a household.

Table 3.9(a) shows the division of income groups in the total sample of 24809 across the country. Expenditure groups are divided into three subgroups the low, medium, and high-level expenditure groups. The lower group of households includes those households who spend up to a maximum of Rs. 20,000 per month. The medium group of people includes all those households whose monthly spending are in between Rs. 20,000 and Rs. 60,000. The high expenditure group includes those households who spend more than Rs. 60,000 per month. According to Table 4.8a, there are 31.9% lower-level expenditure groups in the country. The medium group is spread over a larger space by including 51.5% numbers of households. 16.6% of households cover the high expenditure group in Pakistan.

Table 3.9(a)
Expenditure Groups at the Region Level in Pakistan

Region	Low (%) (≤20,000 Rs.)	Medium (%) (20,001-60,000 Rs.)	High (%) (>60,000 Rs.)
Rural	79.5 (6288)	62.5 (7977)	40.6 (1671)
Urban	20.5 (1625)	37.5 (4806)	59.4 (2442)
Total	100 (7913)	100 (12783)	100 (4113)

Source: Author's calculations. Values in brackets show the sample size.

Table 3.9(b) shows the provincial categorization of the expenditure groups by low, medium, and high level controlling for the regions. There is a total of 79.5% of households having a low level of expenditures in the rural areas of the country against the 20.5% of low-spending households in the urban areas. In this division, there are 1013 households from Khyber Pakhtunkhwa, comprising 78.8% rural households and 21.2% urban households. Punjab in this regard comprises 3683 lower spending groups including 81.8% households from rural Punjab and 18.2% from urban areas of Punjab. Sindh stood second in the lower spending group by having 2419 households divided further into 76% rural households and 24% urban households. Baluchistan encircles 798 low-spending groups including 79.6% rural and 20.3% urban households.

Table 3.9(b)
Expenditures Groups at Province Level

Province	Region	Expenditure Groups		
		Low (%)	Medium (%)	High (%)
KPK *Sample (4485)*	Rural	78.8 (798)	69.2 (1727)	52.2 (510)
	Urban	21.2 (215)	30.8 (768)	47.8 (467)
	Total	100 (1013)	100 (2495)	100 (977)
Punjab *Sample (11781)*	Rural	81.8 (3014)	66 (3995)	40.4 (827)
	Urban	18.2 (669)	34 (2054)	59.6 (1222)
	Total	100 (3683)	100 (6049)	100 (2049)
Sindh *Sample (6216)*	Rural	76 (1840)	48.8 (1446)	25.3 (211)
	Urban	24 (579)	51.2 (1516)	74.7 (624)
	Total	100 (2419)	100 (2962)	100 (835)
Baluchistan *Sample (2327)*	Rural	79.6 (636)	63.3 (809)	48.8 (123)
	Urban	20.3 (162)	36.6 (468)	51.2 (129)
	Total	100 (798)	100 (1277)	100 (252)

Source: Author's calculations. Values in brackets show the sample size.

Baluchistan, in its urban region, contains 127 households that belong to the medium expenditure group. It is the highest group according to the number of households compared to 798 households in lower expenditure groups and only 252 from the higher expenditure group. The expenditure of households living rural part of Baluchistan is spending more compared to the dwellers of the urban region. This is true as economic theory says that the marginal propensity of middle-class people is more than upper-class people. It is because of this reason that middle-class people spend more on the necessities of life. Punjab in this regard is the largest province having a maximum medium expenditure group of households (6049). There are 66.0% of households from rural Punjab while 34% are from urban Punjab. Urban

Punjab contains fewer medium-spending households compared to its rural areas. It is because of this reason that cities contain more facilities and hence more expenditures. While in villages people are relatively confronted with the same level of opportunities and environment and because of their common lifestyle the expenditure differential in the rural areas is not that much. Sindh is having 2962 households or medium pace spending people of which 48.8% and 51.2% are from rural and urban respectively. This distribution is relatively even. Khyber Pakhtunkhwa embodies 69.2% of households of medium propensity to consume from its rural population against the 30.8% of households from the urban areas. At last, the high-spending group is comprised of 4113 households across the country. If we see the provincial distribution of this group, there are 21.8% of households with a high level of spending from Khyber Pakhtunkhwa, 17.4% from Punjab, 13.4% of households from Sindh, and 10.8% from Baluchistan respectively. The ratio of the high-level groups from Khyber-Pakhtunkhwa is more or less the same number in rural and urban areas of the province, which is almost the same as in Baluchistan where there are 48.8% and 51.2% households distributed between rural and urban areas of the province. The high differential of high spending group exists in Punjab Province where there are 59.6% of households of high spending groups against 40.4% of households in rural areas of rural Punjab.

There are some indirect sources of earnings of households that showcase the economic status of a household. This is also a true measurement from the primary data point of view as it shows the actual amount of cash inflow of an individual and the economic status of the household. The per-capita income of the household comes not only from the job or self-employment only. There are sources of income apart from his/her primary income including earnings from agriculture, livestock, pension, rentals, etc. This study counts the income of a person on the total level of earnings of a household. A rich household can earn a better livelihood for his/her family as compared to a poor person. On the other hand, this study considers the per capita expenditures of the households instead of the income as income does not describe the actual economic status of a household. Sometimes a poor household may have high expenditures that are financed by other sources of income that might not be in recorded form. So, expenditure per capita is more authentic to be used instead of household income.

3.6.4 Health Expenditures

Health expenditure includes the expenses of inpatient and outpatient healthcare facilities. It also includes the expenses of self-medication as it is a common practice in Pakistan. Sometimes health care is provided in government or private hospitals, clinics, Hakeem, or homoeopathic sites. HIES very smartly gathers the health expenses on detailed medication sites like Military hospitals, dispensaries, railways hospitals, social security hospitals, Automatic bodies hospitals, and public/private laboratories. A variable of health expenditure covers the expenses related to transportation involved in medical services, doctor fees, medicines, diagnosis tests, food, Tips, Accompanying person's costs, and others. This variable is taken as a count in domestic currency units in aggregate.

Health expenditure is vital to explain child health issues as this factor needs a lot of attention whether a household is rich or poor. Health expenditure is computed as a separate variable in this study to see the individual intervening effect in explaining the child's health and mortality. According to the HIES, health expenses includes spending on medicines, medical apparatus, doctor's fee, tests charges, and other miscellaneous health expenditures like ambulances, midwives, tips, room charges, etc. The variable for the health expenditure is computed by considering all the mentioned heads of expenditures of health in HIES. It is no doubt very difficult to compute the health expenditures as the respondents of the survey are slightly shy to provide the exact spending trail to the investigator. Taking this point into consideration HIES tries to recover as much information for the field survey. Another issue that also affects the data authenticity is the sample of the study. As most of the rural areas of Pakistan is still lacking basic health facilities.

Table 3.10(a)
Health Expenditures Groups at Province Level

Province	Expenditure Groups			
	Low (≤5000 Rs.)	Medium Low (5001-10,000 Rs.)	Medium High (5001-10,000 Rs.)	High (10,001-20,000 Rs.)
KPK	6.8 (561)	15.6 (1025)	24.8 (1422)	34.3 (1477)
Punjab	52.5 (4318)	45.8 (3003)	44.8 (2571)	44.0 (1889)
Sindh	27.8 (2295)	30.0 (1958)	22.8 (1311)	15.1 (652)
Baluchistan	12.8 (1052)	8.6 (564)	7.4 (426)	6.6 (285)
Total	100 (8226)	100 (6550)	100 (5730)	100 (4303)

Source: Author's calculations. Values in brackets show the sample size.

It is because of this reason that the expenditure on health might be a very little part of the total expenditure, which also affects the overall impact of this factor on the

child's health issue. In this study the health expenditures are computed on a monthly frequency which can be better understood by the table 3.10 (a).

Table 3.10(a) represents the household and their expenditures on health facilities distributed among four different groups i.e. low, medium-low, medium-high, and high across the total selected sample of 24809 households. The 'lower expenditure group' comprises 8226 households across the country. These are people who spend up to Rs. 5000 on health per month. The 'medium lower' group constitutes 6550 families across Pakistan of which Punjab and Sindh are the major contributors. Almost the same number is of the 'medium-high group' (5730) in which surprisingly Sindh and Baluchistan contain a very low number of households who spends a relatively higher proportion of their earnings on health. it is the reason that these two provinces are relatively deprived economically due to the per capita earnings of the people in these provinces are low. Hence, they spend less. The high-spending group comprises 4303 households with which a maximum number of households belonging to KPK and Punjab provinces. Their region-wise details of health expenders show a clear picture in this regard. This is shown in the following table.

Table 3.10(b)
Health Expenditures Groups at Region Level

Province	Region	Expenditure Group (%)			
		Low (≤5000 Rs.)	Medium Low (5001-10,000 Rs.)	Medium-High (10,001-20,000 Rs.)	High (>20,000 Rs.)
KPK *Sample (4485)*	Rural	67.5 (9379)	66.9 (686)	69.4 (986)	66.7 (984)
	Urban	32.5 (182)	33.1 (339)	30.6 (436)	33.3 (493)
	Total	100 (561)	100 (1025)	100 (1422)	100 (1477)
Punjab *Sample(11781)*	Rural	68.1 (2941)	45.5 (1964)	40.2 (1737)	27.6 (1194)
	Urban	31.8 (1377)	34.6 (1039)	32.4 (834)	36.8 (695)
	Total	100 (4318)	100 (3003)	100 (2571)	100 (1889)
Sindh *Sample(6216)*	Rural	58.5 (1344)	56.2 (1101)	55.0 (721)	50.8 (331)
	Urban	41.4 (951)	43.7 (857)	45.0 (590)	49.2 (321)
	Total	100 (2295)	100 (1958)	100 (1311)	100 (652)
Baluchistan *Sample(2327)*	Rural	69.6 (732)	62.8 (354)	67.6 (288)	68.0 (194)
	Urban	30.4 (320)	37.2 (210)	32.4 (138)	31.9 (91)
	Total	100 (1052)	100 (564)	100 (426)	100 (285)

Source: Author's calculations. Values in brackets show the sample size.

Table 3.10(b) shows the frequency of households that are distributed among four different groups by the range of spending on acquiring health facilities in either form. The range of health expenses is distributed in such a way that households who spend up to Rs. 5000 per month are placed in the lower group of expenditure group.

Medium-low group accommodates those households who spend between Rs. 5000 to Rs. 10000. Families whose spending are ranging from Rs. 10000 to Rs. 20000 are placed in the medium-high group while household whose health expenses exceeds the Rs. 20000 limits are placed in the high group.

It is clear from the table that rural households are the ever highly spending people on health. it is the reason that makes living in the villages more exposed to unhygienic conditions due to the unavailability of proper sanitation facilities like toilets. There is also less involvement of media and technological lags that further boosts this figure up. People of villages are not that aware of the basic health safety that are normally advertised by the authorities via social media. Non-availability of the internet and gadgets like computers, laptops, and mobile play a vital role in this regard. In the Khyber-Pakhtunkhwa province of Pakistan, both rural and urban households at maximum are spending on the acquisition of health facilities. Whereas there a huge difference exists between the 'lower group' of having 67.5% and 32.4% households in rural and urban areas respectively. This difference is not that much in the 'lower medium group' of people in Punjab. Whereas, other groups of people are very apart from each other in this regard. For instance, 68.1% of households in rural Punjab are paying a maximum of their income on purchasing health facilities against the 31.8% of households in the urban area of Punjab. Surprisingly Sindh shows equalized outcomes in the 'medium high' and 'high group' between its rural and urban regions while the other groups of households are showing the results as the other parts of the remaining provinces. A high differential lies in the 'lower income group' of people in Sindh where there are 58.5% of households spend at least Rs. 5000 on health facilities per month against the 41.4% of households doing the same in urban Sindh. The major reason is again that rural Sindh is highly lacking health facilities despite being the biggest business hub of Pakistan in the context of international trade. Baluchistan is a province that is big in acquiring land size but small in the consumption of development expenditure including the health sector. Being an ignored province in the context of development, there is a low number of people living in the urban side of Baluchistan. It is right to be said that Baluchistan is spread mainly upon the rural geographical setup. It is because of this reason that the statistics show a lower number of households who live in the cities and spend on the health side. There are only 31.9% of households who are said to be health conscious

or highly spend on their health. The ‘medium groups’ of Baluchistan are not that much apart from each other while in the ‘lower group’ 69.6% of people living the rural Baluchistan are spending at least Rs. 5000 on their health every month while 30.4% of families in the urban regions do the same. It is clear from the statistics of the provincial statistics that there exists a huge differential among the spending group of families on acquiring health facilities. Therefore, it is obvious that this factor is highly affecting family health and of course, child health which has a counter effect on child deaths in each province.

3.6.5 Housing Characteristics

Children who live in homes with appropriate plumbing and an installed motor pump are less likely to get sick than children who live in homes with wells or rivers as their only sources of water. Due to the availability of piped water, child fatalities from bad health conditions are less common in metropolitan settings than in homes with alternate water sources. Rural sections of the nation still experience this discrepancy, albeit on a much smaller scale. Compared to children who lived in homes with different sources of toilet facilities, the occurrence of illness was lower in homes with a suitable flush system connected to sewerage lines. The general assumption is that children who live in homes with flush toilets connected to sewage systems are less likely to get sick than children who live in homes with other sources of sanitization, but some studies have found no connection between these facilities and illness or death in children. It could be a result of the inadequate sanitary conditions in these places. Housing facilities are crucial in helping people meet their fundamental needs. In today's technology age, electricity is a fundamental element. Electricity is also used as a substitute fuel for cooking purposes and heating. Safe drinking water is also an important component that keeps a person healthy and vice versa if contaminated. Most of the rural areas of Pakistan are equipped with river water or wells. In that case, the water reservoirs are open to any time of contamination from the air as well as from the surroundings as well. Clean drinking water reduces the risk of illness in children and hence reduces the chances of mortality in them. Similarly, sanitation or the type of sanitation in the house is also vital and unignorable content of the baskets of the basic need of a household. Sanitation or a type of toilet in the house is very important. Rural areas of the country still lack this facility. It is because of this reason that the surroundings are getting dirty and various germs of different kinds tend to

contaminate not only the air rather it also directly affects the eatables. Children are very exposed to such type of environment where their immune system is not that much strong, and they can easily get affected and become ill.

HIES (2018-19) covers this segment of the data by asking numerous questions from the household about the presence of these facilities in the house. The question about water is asked in a dichotomous manner of 'yes' or 'no'. The question about sanitation is also dived into the 'yes' or 'no' option with the addition of the responses like whether the sewerage system is open or underground. The availability of toilet facilities is made dichotomous as if there is 'no toilet' contrary to 'there is a toilet' whether in any shape.

There is another characteristic of a house that plays a critical in the information about the household. In this study, this characteristic is named 'technology'. This variable consists of having the following installed in the house i.e. internet, mobile phone (android), computer, laptop, tablet, etc.

3.6.6 Sex of the Household Head

The household mechanism is like handling a project in a specified manner. The household head plays a role of a clever driver in this regard. The gender of a household is vital in explaining the tasks of a family including three basic tasks i.e. food shelter and clothing. Both males and females are blessed with different mindsets to perform the duties of a household head. It is therefore important to explore the extent of the population in which the family is headed by a male or a female counterpart. Without going to the grass root level of why the head of a household is male or female we just specify the characteristics of a household by its gender so that it is clear to draw an analysis that whether a male or a female is counter-effective is child health in Pakistan. the following table shows some statistics in this regard.

Table 3.11
Gender-wise Distribution of Household Heads at the Province Level

Province	Male (%)	Female (%)	Total (%)
KPK	95.4 (4279)	4.6 (206)	100 (4485)
Punjab	95.9 (11302)	4.1 (479)	100 (11781)
Sindh	97.7 (6079)	2.3 (137)	100 (6216)
Baluchistan	99.0 (2304)	1.0 (23)	100 (2327)

Source: Author's calculations. Values in brackets show the sample size.

Table 3.11 shows that Punjab is having 95.9% male household heads and 4.1% female households. The number is relatively the same in KPK by having 95.4% male household heads compared to 4.6% female household heads. Sindh possesses 97.7% of families headed by male members and 2.3% by female heads. In Baluchistan, only those families are headed by the female where a female is a widow therefore it comprises 1% of females as s household heads and 99% of families are headed by male heads.

3.6.7 House ownership

House ownership mediates a relationship between socio-economic factors of child improved health. A household may own a house or live on rent. Whatever the case may be, it leaves a financial burden upon the resident of that house. A significant amount of earnings is spent instead of rent of the house which affects the other expenditures including health expenses. Another way the impact of house ownership reflects in the locality of the house. Sometimes a rented house is too far from the hospital, road, and educational institution which directly affects the life of a household. A child suffers from getting no medical care time as well as they may also bear the unavailability of electricity, sanitation, internet, etc. which affects the quality of life and hence boosts the chances of adverse child health and sometime in the extreme case death of a child.

Ownership status means that a household pays a part of its earnings as the rent of the house and vice versa. There is a vital role in household occupancy via an increase in the spending of a household. If a person is living in their own house he or does not pay the rent meaning that that part of the expenditures may be spent in some other head of expenditure and may be on health, education, and healthy food that improves the health of the house members.

Table 3.12
House Occupancy Status of Households at the Province Level

Province	Own House (%)	On rent (%)	Total (%)
KPK	82.7 (3710)	17.3 (775)	100 (4485)
Punjab	85.0 (10022)	15.0 (1759)	100 (11781)
Sindh	85 (5290)	15 (926)	100 (6216)
Balochistan	87.2 (2028)	12.8 (299)	100 (2327)

Source: Author's calculations. Values in brackets show the sample size.

According to Table 3.12, there is a total sample of 24809 Households across the country. In this total sample, 4485 households are from KPK, 11781 from Punjab,

6216 from Sindh, and 2327 from Baluchistan. Punjab has 85% of households living in their shelters against the 15% of families living on rent. Sindh is as same Punjab in house ownership ratio having 85% of households living in their residencies while 15% of families live on rent. Khyber Pakhtunkhwa possesses 82.7% of households living in their own houses while 17.3% of families live on rent. In Baluchistan, there are 12.8% of families live while 87.2% of households live in their own houses.

3.6.8 Availability of Electricity

Electricity is one of the important types of fuels that are commonly used in the house for various purposes like lightning, cooking, heating, and others. Despite that, there are many other forms of the fuels like coal, kerosene oils, dung cakes, tree woods, etc. this study takes care of the availability or non-availability of electricity at the house because of the reason that there is no such fuel type that is comparable to electricity because one can use another source for lighting purpose but there is no comparable source for cooling and running electric appliances at home live TV, fans, and other chargeable equipment's. the following table shows the statistics of the households having the facility of electricity at home or vice versa.

Table 3.13
Availability of Electricity at the Province Level

Province	Without electricity (%)	With Electricity (%)	Total (%)
KPK	12.7 (573)	87.3 (3912)	100 (4485)
Punjab	4.8 (574)	95.2 (11207)	100 (11781)
Sindh	16.4 (1018)	83.6 (5198)	100 (6216)
Baluchistan	24.7 (575)	75.3 (1752)	100 (2327)

Source: Author's calculations. Values in brackets show the sample size.

In a sample of 4485 from Khyber Pakhtunkhwa, households who are equipped with the facility of electricity 87.3% while 12.7% of households do not possess this facility. In Punjab, the figure is 95.2% households for households with electricity. The scenario is worse in Sindh province where 16.4% of the households don't have this facility to carry out the normal routine life. The modern era like today can not be even thought of without the availability of electricity. At last, Baluchistan is also a deprived province in this regard. There are 24.7% of houses in the sample province that does not have electricity at home against the 75.3% of houses that are equipped with the facility of electricity.

3.6.9 Availability of Safe Drinking Water

Water is the most important element of the human body. Enough and clean water is an important element of human health as well. The diseases like diarrhoea in children are mainly caused due to contaminated water taken into the body. Again, the child's health is very vulnerable to water if the proportion of water in the child's body is not sufficient, this situation may cause the death of the child. It is, therefore, water and more precisely safe and clean water that must be available for the child that keeps him safe from diseases.

There are several places to get safe drinking water, including taps, hand pumps, wells, ponds, etc. In Pakistan, just 65% of families have access to clean water sources that provide pure and high-quality water. As a result, a sizable section of the populace continues to drink contaminated and hazardous water. Aquatic illnesses brought on by toxic water place a severe strain on household budget expenses. Despite being expensive, it also makes people sick. Families without access to clean, safe drinking water employ a variety of strategies (such as buying bottled water) to obtain it without incurring costs. Maqbool and Mahmoud (2006). Household income has a considerable impact on how much households are ready to pay for a government-provided enhanced water delivery system. There is an urgent need to eliminate the information gap and give policymakers scientific research given the severity of drinking water concerns and the lack of systematic understanding of home drinking water choices at the provincial level. To determine household preferences for drinking water sources in Pakistan, Polyzou et al. used this setting as the basis for their study (2011).

Table 3.14
Availability of Safe Drinking Water at the Region Level in Pakistan

Province	Region	Safe drinking water is not available (%)	Safe drinking water is available (%)	Total (%)
KPK	Rural	25.3 (769)	74.7 (2266)	100 (3035)
Sample (4485)	Urban	18.6 (270)	81.4 (1180)	100 (1450)
Punjab	Rural	7.0 (545)	93.0 (7291)	100 (7836)
Sample (11781)	Urban	4.7 (186)	95.3 (3759)	100 (3945)
Sindh	Rural	21.8 (761)	78.2 (2736)	100 (3497)
Sample (6216)	Urban	19.2 (521)	80.8 (2198)	100 (2719)
Balochistan	Rural	19.1 (300)	80.9 (1268)	100 (1568)
Sample (2327)	Urban	17.5 (133)	82.5 (626)	100 (759)

Source: Author's calculations. Values in brackets show the sample size.

The Table 3.14 showcases the availability of clean drinking water from fresh fountains, tap water, or another source. The 'no' answer to this query of water availability means that water is available but that is not safe or has some contamination in it. According to Table 3.14, the majority of the households have the availability of safe drinking water but there is a noticeable proportion of those households that lacks the availability of safe drinking water. If we compare the provincial statistics in this regard we come to know that Sindh province of Pakistan is the safest drinking water-lacking province in Pakistan followed by Khyber Pakhtunkhwa have 25.3% of households have no access to safe drinking water to ensure their health in the rural region while 18.6% in an urban region. similarly, Baluchistan provinces have 19.1% and 17.5% households who are living without and with the availability of clean and fresh water for drinking respectively. If we look at the regional differentials, the Table shows that Baluchistan and Khyber Pakhtunkhwa possess a high degree of water lacking differentials in the rural and urban areas as compared to the other two provinces. Surprisingly urban areas of Pakistan are more vulnerable compared to the urban areas in safe water availability. It is because the reason that the sources available in the rural areas are mainly spread on fresh lake water closed wells, and fountains where there is a low chance of its contamination whereas in the urban areas of Pakistan mostly the water is tap water which is relatively closed piped and have a chance of leakages that increase the chance of contamination. In Khyber Pakhtunkhwa, 74.7% of households are using safe water for drinking in urban regions. In Punjab, 93% of houses in the rural areas are enjoying the facility of safe drinking water against 95.3% of households in the urban areas. Similarly, this figure is almost equally spread in the rural and urban Sindh having a distribution of 78.2% and 80.8% households on rural and urban sides respectively. At last, Baluchistan is having only 82.5% of families in its urban region who are enjoying the water facility while in the rural part of Baluchistan is having 80.9% of households drink safe and clean water and ensure their good health.

3.6.10 Availability of Toilet Facility

Toilets partake a substantial effect on children's health and nutritional status. The availability of toilets helps small children to reach their full physical and mental growth. The vice-versa case, however, cannot be neglected the absence of a toilet in a house have deep implications. Consider the life of a child living in a village with no

or poor sanitation system. They go outside, use to play in the fields where people defecate; they use to put their fingers in their mouths which are contaminated by the soil of the same fields without knowing. Considering such things is not the domain of young children under 5 years of age but it is very important not only for that child but also for his/her family, village, and community. It is very clear what happens when a child's environment is contaminated with faeces. The United Nations estimates that 2.4 billion people around the world still lack access to improved sanitation facilities concerning the toilet, nearly 1 billion of which practice open field defecation. This figure is alarming even today in developing nations. this study also takes care of this issue. The following table shows the availability of toilets in the household in the selected sample of HIES.

Table 3.15 shows the extent of the toilet facilities available to the household based on province and region. As far as the rural region is concerned, Baluchistan is more deprived having 25.6% of households living without the facility of a toilet. Sindh is at number second in this hierarchy by having 24.5% of households without toilets. Baluchistan and Khyber Pakhtunkhwa are showing this number of 25.6% and 10.2% houses without a toilet facility. The HIES survey of Pakistan further divides the availability of toilets in different forms following the norms and culture and definitely due to the financial constraints of the households. This includes toilets that are either connected to flush tanks or public sewerage lines, open drains, dry raised toilets, dry pits toilets, or some other form that somehow makes the difference as a toilet in use. Septic tanks attached to the toilet are the most hygienic way to dispose of human waste and have low chances of contamination which is good for the health of a family. Similarly, 40.2% of households use toilets connected to septic tanks in Punjab, 28.8% in KPK, only 5.4% in Baluchistan, and 2.5% in Sindh. Considering pits, 11.2% of households flush out the waste to the open drains while 9.3% of households use toilets connected to dry pits. Now we must know that the toilet is the most vulnerable place to spread germs via contaminated hands, air, or another source of transformation which a serious threat to the health of small children is. A significant part of the population in Pakistan is living in rural areas comprising 15936 households according to the selected sample of the study. On the contrary, their sample from the urban region is comprised of 8873 households of which 1.1% of households lack a toilet facility. In the remaining sample, 4549 households use toilets connected to a flush

system, and 16.5% of households possess a toilet that is connected to the septic tank. 17.4% of households flush the waste into the open drainage system which is the common way to dispose of waste in the cities while only 10.6% of households use toilets that are connected to pits.

Table 3.15
Type of Toilet Facility in a House at Region Level

		Province			
		KPK (%)	Punjab (%)	Sindh (%)	Balochistan (%)
		Rural			
Type of toilet	No Toilet	10.2 (312)	18.4 (1441)	24.5 (858)	25.6 (402)
	Flush connected to sewerage	1.6 (49)	5.5 (436)	9.9 (348)	1.9 (30)
	Flush connected to septic tank	28.8 (8750)	40.2 (3152)	2.5 (89)	5.4 (86)
	Flush connected to the pit	46.3 (1406)	18.8 (1480)	15 (526)	11.3 (178)
	Flush connected to open drain	2.6 (79)	15.7 (1233)	2.6 (91)	5.29 (83)
	Dry raised latrine	5.8 (178)	0.3 (26)	16.7 (587)	9.7 (153)
	Dry pit latrine	3.8 (115)	0.8 (62)	19.3 (677)	40.1 (630)
	Composting toilet	0.2 (6)	0.0 (0)	0.2 (8)	0.4 (6)
	Other	0.5 (15)	0.07 (6)	0.4 (13)	0.0 (0)
Total		19 (3035)	49.2 7836	21.9 (3497)	9.8 (1568)
		Urban			
Type of toilet	No Toilet	0.6 (9)	0.1 (47)	1 (29)	1.9 (15)
	Flush connected to sewerage	1.2 (171)	63.1 (2493)	64.1 (1743)	18.7 (142)
	Flush connected to septic tank	46.4 (673)	18.2 (717)	1.4 (37)	5.9 (45)
	Flush connected to the pit	29.1 (422)	6 (237)	2.7 (74)	28 (213)
	Flush connected to open drain	8.7 (127)	11.2 (443)	28.8 (785)	25.8 (196)
	Dry raised latrine	1.2 (17)	0.05 (2)	0.4 (11)	2.2 (17)
	Dry pit latrine	1.7 (25)	0.1 (5)	1.1 (30)	17.1 (130)
	Composting toilet	0.0 (0)	0.0 (0)	0.1 (4)	0.13 (1)
	Other	0.4 (6)	0.02 (1)	0.2 (6)	0.0 (0)
Total		16.4 (1450)	44.4 (3945)	30.6 (2719)	8.5 (759)

Source: Author's calculations. Values in brackets show the sample size.

After all first, the existence of a proper toilet is important, while secondly, the sewerage system of the house must be in such a way that it does not affect the health

of the family members especially small children under the age of 5 as they are more vulnerable to the contaminated environment.

3.6.11 House Crowding

The extent to which children grow up in crowded houses is a neglected but potentially important factor of social disparity in society. Poor living circumstances serve as a mechanism of social stratification that affects a child's well-being and is ultimately consequential in the intergenerational transmission of social disparity (Evans, 2003). The adverse effects on a child who is raised in a crowded home persist throughout his or her life, affecting their future socioeconomic prospects and adult well-being. House crowding means a house occupied by many people or few people living in a congested place. Living in crowded housing circumstances creates pressure in the house and leaves a negative impact on its members. Children are particularly vulnerable to this kind of substandard and congested housing, as it is where they do their household chores, connect with family members, form their own identities, practice their talents, and get a good night's sleep (Fremont et. al., 2008).

It is therefore important to discuss house crowding in Pakistan and the extent of house crowding in Pakistan. The sample of this study shows that among 15936 households in rural areas, 31.6% of households live in single-room residences. And this situation is even worse when looking at the grass root level in which we come to know that among 31.6% of households, the majority are from Punjab and Sindh. A house with the occupancy of two rooms is also prominent in the Punjab and Sindh Province having 18% and 7.4% households respectively. A total number of 17.7% of households live in three-room residences. Due to the village life and fewer resources, people tend to live in houses with a low level of infrastructure i.e. rooms, etc. four rooms are considered to be the normal occupancy status. Accommodation of four rooms is used by only 9% of households among the total of 15936 selected sample of rural households. On the other side, there is also some spacious accommodation of more than 6 rooms. But the number of people living in this type of housing is very few. Households living in a house having more than six rooms are 1.4%. The scenario on the urban side is a little bit different from the rural areas. In the urban side of the dwelling, people use to live in small houses but the accommodation in the house is more proxied by the number of rooms whether the rooms are small. There 12.8% of households used to live in a house having only 1 bedroom or a living room. People

are relatively evenly distributed among the 4-room houses across the urban region constituting 10.6% of households among the 8873 households. A total number of 3.1% of households used to live in 6 to 8 rooms houses. It is mentioned that the more spacious the residence with more rooms assures the well-being of a child. If we look at the aggregate level based on rural-urban differentials, the majority of the households are living with a house of 2 to 3 rooms in both rural and urban areas of the country.

3.6.12 Technology

Technology is a double-sided sword especially if we talk about child health and mortality. Technology on the one side helps the household to carry out some preventive measures regarding health and achieve prior information from sources without visiting the doctor or clinic. In today's world, the internet has equipped people with such an advanced source of information that nobody can even think of manual ways to get information. Mobile phones and other technological gadgets like TV, computers, etc. provide an up to date information to households. Various social campaigns regarding self-medication, vaccination information, and programs to guide parents to provide their child s better care at home. There is a vital difference between the person who does not possess a technological gadget. Not only health but technology also play a vital role in the mental development of a child by providing a fruitful program. Children can learn from TV programs and this factor makes the mind of a child sharper. But on the other side, all these positives are converted into negativities like the technological gadgets like mobile phone, radio, and Bluetooth item receive and emits radiation that is very dangerous for the health of a child as well as adults.

Digital technologies are used widely by children and increasing rapidly over the decades. Digital technologies have intensely changed childhood and youth behaviour very much. Technology has transformed the education style and learning methods. Technologies are now embedded in our society in such a way that can’t be ignored. Since the emergence of smartphones and the replacement of desktop computers with tablets, young children use digital devices constantly. They spend the majority of their time playing with gadgets. Although parents are crucial to their children's growth and development, they occasionally neglect to protect them from the dangers of prolonged exposure to these gadgets. But as earlier said that this technology is now very helpful

to the household to keep the family safe by understanding some first aid and other ways to learn hygiene and other information that was acquired on payment in the past from the concerned people of expertise like doctors, engineers, teachers, etc. HIES in this regard gathered the data on technological gadgets very thoroughly. Some statistic about having technological gadgets is provided in the following table.

According to the sample selected in this study, most of the population in the urban area of the country possesses technical gadgets in their home. The regional differences are showing that urban people are near to technology in this regard. There is a total of 39.7% of households in the Khyber Pakhtunkhwa province of Pakistan who are having an internet connection at the house out of the selected sample of 4485 households. This figure is 32% of the 11781 households in Punjab Province. Houses equipped with internet connection in the Sindh province are 32.7% of the total sample of 6216 households. Baluchistan is lagging behind all the provinces in this facility having 19.4% of households having internet facilities out of the 6216 household sample.

Mobile phone as a mean of electronic gadget plays a vital role in the social activities of people. There are significant regional differences in the availability of mobile phones in the house. Punjab is the most equipped population with mobile phones. There are 95% of households with mobile phones available in their homes. Khyber-Pakhtunkhwa has 95.6% of households that are accessible to mobile phones. This percentage is 92% in and 91% in Baluchistan.

In line with the cell phone, people of Pakistan are well familiar with and habitual to use the landline phone as well for a means of communication. This study considers landline phones to better understand the role of communication in Pakistan. As the typical landline is replaced by mobile phones because of their smart size and functions, still 2.7% of households are having this facility in their houses. Punjab in this regard possesses households at 2.1%, Sindh at 1.2%, and Baluchistan at 3%. Similarly, a computer facility in the house is vital in this regard. According to the selected sample of this study, Khyber-Pakhtunkhwa is having 15.2% of households that possess computers at home. There 14.5% of households enjoy the facility of computers at home. Sindh is having 12.3% of households and in Baluchistan, 5.6% of households have computer facilities at home.

The technology is also measured by other sources as well, but this factor is best proxied by having such gadgets available at home along with the internet and access to the different media platforms. The purpose of all tools is supposed to be to get well and up-to-date information about daily life with special reference to health according to the study. We suppose that a person equipped with technological gadgets is well informed and has more knowledge compared to a person who is away from these sources and hence it is claimed that he or she might be unaware of the home remedies and first aid health to the family members in this regard.

3.6.13 Food Insecurity

Food insecurity is a term used to describe when people lack access to food or there is a shortage of it. According to the United Nations Committee on World Food Security, this word is defined as everyone having access to enough, wholesome, safe, and nutritious food at all times that satisfies their minimal dietary requirements and food choices for an active and healthy life. Following this significant contributor, HIES (2018-19) collected this data from the homes at the main level. By addressing eight questions about food insecurity in a household, our survey tackles this problem. Does that also apply to households that worry about food scarcity only due to a lack of funds, or did the person in question ever limit their food intake due to financial constraints? Food insecurity also refers to the circumstance in which a family skips a meal or, occasionally, is forced to go without food for the entire day because there are insufficient funds available to the family. One of the other possibilities is that a household allocates the funds to other basic needs due to which there is not enough money to buy food. Food insecurity also includes a feeling of insecurity about whether a household will get food or not or he/she thinks about the past days in which a person does not get enough food. This study takes all the questions asked related to food insecurity. A person in any case if provided a positive answer is considered as a food insecure household. A binary variable is developed for this variable which counts the yes and no answers in ‘1’ and ‘0’ respectively.

This study examines whether mild household food insecurity is associated with poor child health outcomes to compare the differences in relationships between family food insecurity and health problems. Since household food insecurity is frequently defined as a dichotomous variable that does not distinguish between households that are mildly food insecure and those that are food secure, placing

mildly food insecure households in the same category as food secure households, little research has been done in this area. Cook et al. (2013) identified a link between mild food insecurity and worse health in children under the age of five in the United States; however, no links were detected in Mexico and Colombia (Hackett et al. 2008; Cuevas-Nasu et al. 2014). By experimentally examining the possible effects of both families with moderate levels of food insecurity and those with severe food insecurity on children's health and mortality, this study contributes to research and policy.

Using an American and Caribbean Food Security questionnaire that was initially created based on the US instrument, the assessment of household food insecurity was first done (Nord 2009). The reliability of this questionnaire as a measure of food security at the household level was evaluated and validated throughout Latin America (Gonzalez et al. 2008; Ruiz et al. 2013). Later, when this matter became a crucial aspect in predicting a child's prospects, many tools were created. We employ the field-tested instrument as part of our study design, concentrating on family groups and conducting interviews to modify the language for usage in Pakistan. The Pakistan Bureau of Statistics created a thorough list of questions for this aim, including 8 questions about household concerns and experiences with food scarcity over the previous year due to a lack of funds or other resources. The major goal of the questionnaire is to gauge the respondent's—in this case, a household head—perceptions of their experiences with food insecurity in their respective domains. Household food security is divided into three categories, according to Gonzalez et al. (2010): food security (zero positive replies), mild food insecurity (1-2 positive responses), and severe food insecurity (3–5 positive responses).

Table 3.16(a)
Food Insecurity at Region Level

Province	Region	Food Insecurity (%)		
		Food secure	Mild Food Insecure	Food Insecure
KPK Sample (4485)	Rural	64.6 (1402)	70.0 (852)	70.9 (781)
	Urban	35.4 (765)	30.0 (365)	29.1 (320)
	Total	100 (2167)	100 (1217)	100 (1101)
Punjab Sample (11781)	Rural	62 (5372)	77.5 (619)	79.6 (1845)
	Urban	38 (3294)	22.5 (180)	20.3 (471)
	Total	100 (8666)	100 (799)	100 (2316)
Sindh Sample (6216)	Rural	44.3 (1422)	57.3 (691)	77 (1384)
	Urban	55.7 (1790)	42.7 (516)	23 (413)
	Total	100 (3212)	100 (1207)	100 (1797)
Balochistan Sample (2327)	Rural	65.3 (914)	67.2 (312)	73.7 (342)
	Urban	34.6 (485)	11.2 (152)	26.3 (122)
	Total	100 (1399)	100 (464)	100 (464)

Source: Author's calculations. Values in brackets show the sample size.

Table 3.16(a) provides information about the regional statistics of household food insecurity i.e. the new element that is investigated by the Pakistan Bureau of Statistics. The table is divided into three scales showing the food insecurity levels. The information gathered by the questions asked from the sample of the household in the four provinces of Pakistan is further investigated in the regions of rural and urban differentials. The sample households are divided into three sub-sections i.e. food secure households, mild food insecure households, and severe food insecure households. According to the table, the most food insecure province of Pakistan is Sindh where 28.9% of households are reported to be severely food insecure in rural regions and 19.4% are mild food insecure. Investigation at the regional level shows that food insecurity is severe in rural Punjab and KPK. Sindh contains 28.9% of households that are severely food insecure, whereas, among the 1797 households in Sindh, 77% food insecure population lives in rural areas. There are a total of 19.4% of households that are mild food insecure in the province. The situation of food insecurity is not different in Khyber-Pakhtunkhwa (KPK) compared to Sindh according to the table. There are 24.5% extremely food insecure households in the province. The maximum number of food-insecure people dwell in the rural areas of the province.

As far as the food secure households are concerned, 73.5% of households living in Punjab who is food secure or they feel to be secure. Similarly, 48.3% of households among the total sample of the household are food secure in Khyber-Pakhtunkhwa, 51.7% of households in Sindh, and 60.1% in Baluchistan respectively.

Table 3.16(b)
Food Insecurity in Pakistan

	Frequency	Per cent
Food secure	15444	62.3
Mild food insecure	3687	14.9
Severe food insecure	5678	22.9
Total	24809	100.0

Source: Author's calculations.

Table 3.16(b) is showing the overall percentage of food-insecure households in the selected sample of Pakistan. There are noteworthy percentages of food-insecure people in the sample. There are 22.9% food insecure households, 14.9% mild food insecure households, while 62.3% of households in the sample are feeling to be fully

food secure. Broadly speaking food insecure households comprises 37.8%. with such a huge percentage this factor cannot be ignored while assessing child-related health issues and mortality.

3.6.14 Asset Poverty

Asset poverty is a more severe and pervasive economic and social condition than income poverty. Asset poverty is the inability of a household to obtain economic means sufficient to meet its basic needs for three months. The term "basic needs" refers to the absolute minimum standards for acceptable needs and consumption. Household possessions, other real estates, livestock, and other possessions belonging to the households, as well as the net value of farm and business assets, stocks, checking and savings accounts, and other investments, are examples of non-movable assets that are not money (money in savings bonds, life insurance policy cash values, etc.). A household may have certain immovable assets that are nonetheless a replacement or a source of reducing the financial responsibilities of the household, even when a person may be poor because their income is zero, or they are unemployed.

Poverty is one of the important determinants of child health. This study intends to support the guardians to care for children living in poverty conditions through tips, communications materials, and advocacy resources at their best. Child poverty is at the midlines of multiple systemic problems like race discrimination, climatic changes, and the economic progress of a country. Some previous research shows that living in poverty conditions has lifelong health consequences on the household. Families in need of assistance can gain from tax credits and income support programs, paid family leave for military members, early childhood support, economic and community development, as well as concerns with food security, homelessness, and housing instability.

This study develops an asset poverty index for the whole sample of the selected households across the country. The index is categorized into five levels starting from asset poor and ending at the asset-rich level. There are mild asset poor and rich people that are lying in between the two extreme points. The regional and provincial differentials of asset poverty among the households us shown in Table 3.17. Table 3.17 show the regional differences among the provinces regarding asset

poverty in Pakistan. HIES 2018-19 is used to assess these figures. The table shows the percentage distribution of asset groups within the provinces, within the asset groups, and as a percentage of the total population of the survey.

Table 3.17
Asset Poverty at the Region and Province Level

Asset Group	Count	KPK	Punjab	Sindh	Baluchistan
		Rural (15936 Households)			
Asset Poor	Frequency	486	1529	1774	657
	(%)	16.0	19.5	50.7	41.9
Mild Asset Poor	Frequency	883	1753	833	410
	(%)	29.1	22.4	23.8	26.1
Average	Frequency	663	1725	611	258
	(%)	21.8	22.0	17.5	16.5
Mild Asset Rich	Frequency	553	1649	215	154
	(%)	18.2	21.0	6.1	9.8
Asset Rich	Frequency	450	1180	64	89
	(%)	14.8	15.1	1.8	5.7
	Total	3035	7836	3497	1568
	(%)	100	100	100	100
		Urban (8873 Households)			
Asset Poor	Frequency	43	143	234	99
	(%)	3.0	3.6	8.6	13.0
Mild Asset Poor	Frequency	140	368	381	135
	(%)	9.7	9.3	14.0	17.8
Average	Frequency	297	665	797	185
	(%)	20.5	16.9	29.3	24.4
Mild Asset Rich	Frequency	391	1090	660	198
	(%)	27.0	27.6	24.3	26.1
Asset Rich	Frequency	579	1679	647	142
	(%)	39.9	42.6	23.8	18.7
	Total	1450	3945	2719	759
	(%)	100	100	100	100

Source: Author's calculations.

The groups are listed between the asset's poor to asset-rich people with three in between levels of mild asset-poor or asset-rich households. The whole study population comprises 15936 households who live in rural areas of the country. In this sample, 486 households are asset-poor belonging to the Khyber Pakhtunkhwa province, 1529 asset-poor households from Punjab, 1774 households from Sindh, and 657 households from Baluchistan. The total number of 4446 households are extremely

asset poor which comprises 27.9% per cent of the total selected sample of the study. This is a noteworthy number that must be considered for assessing the child health and mortality issues in the country. Similarly, as the rural population secures a significant portion of Pakistan, it is, therefore, the Asset rich ratio is also an eye-catching figure. A total number of 1783 households in the country are asset rich which counts for 11.2% of the rural sample. As people in the rural area are daily involved in agriculture so assets like property and other valuables are less to be seen in rural areas.

There are 8873 households representing the urban population of the HIES sample. As early mentioned that a high portion of the area of Pakistan is living in rural areas, therefore, the total number of populations comprising the urban population is low, and hence 5.8% of the people living in the sample are asset poor. On the contrary, 34.3% of the people are asset rich which is a noteworthy figure. If we compare the provincial differences in the urban areas of Pakistan, we see that on average the same number of populations is near asset rich and poor respectively. People of urban Punjab are wealthier compared to the people living in the other urban areas of the provinces.

3.7 Variables and Their Measurements

Table 3.18 provides a brief picture of the variables, their description, and measurement;

Table 3.18
Dependent, Explanatory, and Mediating Variables

Dependent Variables			
Notation	**Description**	**Measurement**	**Section of Questionnaire**
CH	Child Health and if at least one child is sick in a family	= 1 if at least one child is sick = 0 otherwise	3-M part C and 3-F, Part B.
CM	Child Mortality	= 1 if at least one child is dead = 0 otherwise	4-F part A and B.
Explanatory Variables (Economic Factors)			
HE	Health Expenditures	Count	3-M and 3-F, part D.
FI	Food Insecurity	= 1 if the household is food secure = 0 otherwise = 1 if the household is mild food insecure = 0 otherwise = 1 if the household is severely food insecure = 0 otherwise "food secure" is a base category	Section 5 (M)
TE	Total Expenses	Count	6-M and 6-F part C, D, E.

HE_G	Expenditure Groups	= 1 if the expenditure is low = 0 otherwise = 1 if the expenditure is mild low = 0 otherwise = 1 if the expenditure is mild high = 0 otherwise = 1 if the expenditure is high = 0 otherwise 'low expenditure' is the base category	3-M and 3-F, part D.
APOV	Asset Poverty	= 1 if a household is asset poor = 0 otherwise = 1 if a household is a mild asset poor = 0 otherwise = 1 if a household is average = 0 otherwise = 1 if a household is a mild asset rich = 0 otherwise = 1 if a household is asset rich = 0 otherwise 'asset poor' is a base category	9-M part A, 10-M part B.
	Socio-Demographic Factors		
PR	Province	Khyber Pakhtunkhwa (KPK) Punjab Sindh Baluchistan	Survey title
REG	Region	= 1 if Urban = 0 otherwise	Survey title
GEN	Sex of a Household Head	=1 if the Male =0 otherwise	HH Roster (M/F)
TECH	Health Gadgets (self medication)	=1 if yes =0 otherwise	3-M and 6-M part D.
HO	House Ownership	= 1 if a household lives in its own house = 0 otherwise	5-M part A
	Housing Characteristics		
H2O	Safe Drinking Water	= 1 if safe water is available to drink = 0 otherwise	5-M part A
ELEC	Electricity	=1 if electricity is available =0 otherwise	5-M part A
TOF	Toilet	=1 if toilet facility is available =0, otherwise	5-M part A
SEW	Sverige Facility	=1 if the Sverige facility is available =0 otherwise	5-M part A
HC	House Crowding (rooms)	Count	5-M part A
FUEL	Fuel for energy/cooking	= 1 if gas = 0 otherwise	5-M part A
MOB	Mobile Phones	=1 if Households possess mobile. =0 otherwise	5-M part A
PTCL	Landline	=1 if the facility is available =0 otherwise	5-M part A
INT	Internet	=1 if the facility is available =0 otherwise	5-M part A

CHAPTER 4

METHODOLOGY

4.1 Introduction

The relationship between early-life health and long-term economic outcomes can be seen clearly via the lens of the human capital hypothesis. This idea holds that the development of skills, knowledge, and productive capacity depends on investments in children's health, education, and other human capital aspects. It is impossible to exaggerate the significance of early-life health in this context since it establishes the framework for the growth of future human capital. The number of studies examining how early childhood health and the foetal period affect long-term economic prospects shows that this field of study has experienced tremendous growth. To comprehend the broader implications of child health on economic well-being, it is important to understand the socio-economic factors that influence children's health in Pakistan. This research contributes to this body of knowledge by addressing these factors.

The importance of the foetal era in predicting future outcomes has recently gained widespread recognition. As seen by the rise in the number of articles published on the subject, an economic study in this area has expanded significantly. The foundation for generating exact ideas about the effects of shocks during the foetal period was laid by early studies like Cole and Currie (1993). Future results can be significantly and permanently impacted by shocks and interventions at this time, as demonstrated by research like those by Currie and Hyson (1999) and Costa (2000). The interplay between nature and nurture is a crucial result of this literature, as demonstrated by Currie and Moretti's (2007) study on maternal and child birthweights. While conditions at the time of the kid's birth can buffer this link, they found that maternal birthweight and child birthweight do correlate. This calls into question the nature vs nurture dichotomy by highlighting the connection between nature and nurture. In addition to studying the foetal period, economists are also starting to look at early childhood development. The conceptual framework developed

by Almond and Currie (2011), which is based on Heckman's (2007) work, provides a strong framework for looking at early childhood health.

Several factors related to a society's social, economic, and demographic circumstances affect children's health. Numerous techniques, including multiple regression, are frequently employed to examine the connection between the variables influencing infant mortality as evaluated by poor child health. Some authors have critiqued this approach (see; Sufian, 1990 Stone, 2000). The precise structure of the usual order Probit or logistic models controls the distributional effects a priori without allowing the data to " let the data speak". For this study, a model must be sufficiently adaptable such that the given functional form cannot adequately account for the influence of socioeconomic variables on the probability distribution of child health. However, if the unobservable variables connected to each stage are correlated, the sequential pattern of the observations could cause economic problems. The unobservable variables in the sequential model are assumed to have a multivariate normal distribution known as the sequential Probit model.

Keeping in view the dichotomous outcome variable, this study employs the Logit regression model for the empirical evidence regarding the underlying data. Similar studies like Subhan and Ahman (2012), employing the dichotomous outcome variable also adopt the same methodology while inquiring the house ownership in Pakistan based on HIES data from 2004-05, Ahmad and Faridi (2020) applied the Logistic model to analyzing poverty in Southern Punjab. Literature on the dichotomous dependent variable shows that the Logit model is an efficient and robust empirical technique of analysis.

The reason is that while dealing with the information of the infants and neo-natal the other socio and demographic factors become insignificant as there is no role of factors on the health of the infants and neo-natal like technology, housing characteristics like house crowding, etc. it is, therefore, this study take some serious measures to analyze the determinants of the child health and deaths on real standards.

In the field of social sciences, the simultaneous use of the logit regression model and the mediation analysis has enormous significance. To analyse binary or dichotomous outcomes, the logit model, a specific type of logistic regression, is a good choice when assessing categorical dependent variables with two possible

outcomes. Researchers can effectively investigate the relationships between independent and dependent variables by using the logit model, revealing light on the direct influences of various causes on particular outcomes. Researchers can acquire a more comprehensive and nuanced understanding of the factors impacting categorical outcomes by combining the strengths of the logit regression model and mediation analysis. This integrated strategy equips researchers to not only identify the immediate impacts of each predictor but also to unravel the complex web of interrelationships that these effects are mediated via. In the end, the simultaneous application of the mediation analysis and the logit model enhances the thoroughness and rigour of social science research, promoting a deeper comprehension of the mechanisms underlying human behaviour and decision-making.

4.2 Introduction to Logistic Regression

Verhulst, a mathematician from France, is credited with creating the logistic function. He developed it in the 19th century to explain population increase and the progression of auto-catalytic chemical reactions. The logistic model closely matches the real trajectory of the population in the early 1830s France, Belgium, Essex, and Russia. While researching the population expansion of the United States, Pearl and Reed (1930) rebuilt the logistic function with a little more accuracy. The Generalized Linear Model (GLM), which separates the respondents or cases into two exclusive groups and more than one independent (predicting) variable, includes both simple linear regression and logistic regression as components. The GLM predicts the value of a dichotomous dependent variable.

Regression models having more than two categories for the predicted variable are dealt with using a variety of sophisticated models, which are referred to as multinomial, polychotomous, or logistic regression models. Let's take data on some characteristics of security force recruits as an example, where it is predicted whether or not they will successfully finish their initial training. This kind of model seeks to pinpoint the explanatory factors that effectively predict the outcome as well as their relative importance.

For example, it can be discovered that "family size" as an explanatory variable does not predict the success of security officers' recruits after training, whereas another variable, namely education level, is a solid predictor in forecasting success

level. It's also intriguing how different continuous or even multi-category variables can be reduced to dichotomous ones. The health status of the population can be classified as either "healthy" or "unhealthy" using a seven-point Likert scale, which ranges from "totally healthy" to "life-threatening condition."

A crucial model of multiple regression is logistic regression. Because it makes no assumptions about the nature of the link between the explanatory factors and the dependent variables, logistic regression is a more flexible technique than multiple regression, despite the similarities between the two techniques conveyed by their names. Additionally, the predictors need not be regularly distributed (Although the power of the analysis is increased if the independent variables are normally distributed and do have a linear relationship with the dependent variable).

Categorical and continuous independent variables can both be accommodated by logistic regression. Logistic regression determines the likelihood that a case with a specific set of explanatory variable values falls into the modelled category for each given circumstance.

4.3 Purpose of Logistic Regression

The purpose of using Logistic regression is;

1. is to estimate adjusted occurrence rates, i.e. adjusted for potential mediating factors like social, demographic, or economic characteristics.

2. is to calculate the impact of dichotomous explanatory factors after adjusting for other covariates.

3. is to investigate how effectively the explanatory factors predict a categorical result or the extent of prediction.

4.4 Assumptions of the Logistic Regression

The logistic regression model follows the underlying assumptions;

1. The logit model does not assume that the explanatory variables be normal, linear, or homogeneous in terms of variance. This model does not impose these conditions since discriminant analysis is chosen when the data does not meet these presumptions.
2. Y_i follows a binomial (n_i , m_i) distribution.

3. Y_i is independent.
4. Log odds $P\ (Y_i\ =\ 1)$ or logit $P\ (Y_i = 1)$ is a straight-line covariate function.

4.5 The Logistic Curve

A binary dependent variable has a value of 0 or 1, whereas the probability value must be constrained to fall inside the given range. The logit model uses a logistic curve to depict a connection between the explanatory and dependent variables when attempting to explain a relationship that is constrained to an outcome of 0 or 1.

At very low levels, the likelihood of explanatory variables approaches zero, but it never hits zero. Similar to how projected values grow along the curve and approach the maximum value of one as the independent variable's coefficient value rises, it never goes above this limit.

4.6 Logistic Regression

This study considers child health as a response variable, which possesses an expected binary outcome, thus making it a dichotomous variable. It is, therefore, logit regression a suitable estimation technique to use. Following Baker (1987), the logit model is developed to predict a binary outcome of a dependent variable as a function of predictor (explanatory) variables. In the logistic model, the logit is the natural logarithm of the likelihood ratio or the odds. In this model, the dependent variable i.e. child health is 1, if a child is healthy and 0, otherwise. The probability P, of the dependent variable of a logit model, is presented as follows;

$$ln\left[\frac{P(Y)}{1-P(Y)}\right]=\beta_o + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n \ldots\ldots (1)$$

$$\frac{P(Y)}{1-P(Y)} = e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}$$

$$P(Y) = e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n} - P(Y)e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}$$

$$P(Y) + P(Y).e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n} = e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}$$

$$P(Y)\left[1 + e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}\right] = e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}$$

$$P(Y) = \frac{e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}}{1 + e^{\beta_o+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_n X_n}} \ldots\ldots (*)$$

$Where;$

$ln\left[\frac{P(Y)}{1-P(Y)}\right]$ $is\ the\ \log(odds)\ of\ the\ outcomes.$

$Y, is\ the\ binary\ expected\ outcome\ of\ the\ dependent\ variable.$

$X_1, X_2, \ldots\ldots, X_n$ $are\ the\ explanatory\ variables\ predicting\ the\ outcome\ of\ Y.$

$\beta_o, is\ the\ intercept\ of\ the\ equation\ explaining\ the\ value\ of\ Y\ in\ absence\ of\ all\ explanatory\ variables, whereas\ \beta_1, \ldots\ldots, \beta_n,$ $are\ the\ regression\ coeeficients\ explaining\ the\ elasticities\ of\ explanatory\ variables.$

Equation (*) shows the probability of Y, which directly relates to a specific set of predictor variables in the logistic regression model.

4.6.1 Parametric Estimation of the Logit Regression Model for the Estimation of Maximum Likelihood

The coefficients for the logit equation are determined using a maximum likelihood estimation in the case of logistic regression. A maximum likelihood estimation is a repeated process that effectively uses the model to get reliable empirical results. The maximum likelihood estimation process employs values for model parametric estimators that make the observed data maximum likely. As a result of this approach, standard errors of the models are obtained. To estimate the (k+1) unknown parameters in equation (*), a logistic regression model is used. This is accomplished with the use of a maximum likelihood estimation technique, which calls for the identification of a set of parameters for which the likelihood of the observed sample data is highest.

A probability distribution of the dependent variable is used to create a maximum-likelihood equation for the logit model. As each Y_i signifies a bi-nominal sum in the population, a density function with joint probability for Y_i is given as:

$$f\left[\frac{Y}{\beta}\right] = \prod_{i=1}^{N}\left(\frac{ni\ !}{yi\ !\ (ni-yi)!}\right) P^{y}.(1-P)^{ni-yi} \ldots\ldots (1)$$

For each set of populations, there are $\binom{ni}{yi}$ different ways to arrange Y_i failures among n_i several trials. Since a chance of failure for any of the n_i trials are P_i, the overall probability of Y_i failures are P_i^{yi}. Like wise the probability of $n_i - y_i$ successes are $(1-P)^{ni-yi}$.

A value of Y that is a function of a known value is shown by a joint probability density function of logit regression in equation (1). It should be noticed that the Logit model shown in equation (*), was related to P. The likelihood function has the same structure as the probability density function, but its parameters are inverted, meaning that it displays the values in terms of a predetermined fixed value for Y. The following can be written as a result:

$$L\left(\frac{\beta}{Y}\right) = \prod_{i-1}^{N} \frac{ni\,!}{yi\,!\,(ni-yi)} P_i^{yi}(1-P)^{ni-yi} \ldots\ldots(2)$$

The estimates of a maximum likelihood of an equation are represented by the coefficient of β, given in the following equation (2).

Calculating the likelihood function's first and second-order differentials is necessary to arrive at maximum likelihood estimations. A likelihood function is substantially simple to lessen the differentials of a likelihood function w.r.t β.

First, the factorial terms don't contain Pi . Therefore, these are fundamentally considered constants-terms and overlooked. Optimizing the underlying equation without containing factorial terms leads to the same outcome as if they were included in the equation.

Second, from the indices, $a^{x-y} = \frac{a^x}{a^y}$, thus by rearranging equation (2), is given as;

$$\prod_{i=1}^{N} \left(\frac{Pi}{1-Pi}\right)^{\mathrm{Yi}} (1-Pi)^{ni} \ldots\ldots(3)$$

Taking e to both equations we get ;

$$\left(\frac{Pi}{1-Pi}\right) = ek = ^{\sum_{k=0}^{k} xik\beta k} \ldots\ldots(4)$$

Considering P_i as a subject;

$$P_i = \frac{e^{\sum_{k=0}^{k} xik\beta k}}{1 + e^{\sum_{k=0}^{k} xik\beta k}} \dots\dots (5)$$

By substituting $equation\ (4)\ and\ (5)$ in $equation\ (3)$ we get;

$$\prod_{i-1}^{N} \left(e^{yi \sum_{k=0}^{k} xik\beta k}\right)\left(1 - \frac{e^{\sum_{k=0}^{k} xik\beta k}}{1+e^{\sum_{k=0}^{k} xik\beta k}}\right)^{\text{-ni}} \ \textit{..... (6)}$$

Now, put:

$(a^x)^y = a^{xy}\ to\ simplify\ the\ equation\ \ we\ get\ and\ replace\ 1\ by\ the\ following;$

$$\frac{1 + e^{\sum_{k=0}^{k} xik\beta k}}{1 + e^{\sum_{k=0}^{k} xik\beta k}} = 1$$

$$\prod_{i=1}^{N} \left(e^{yi \sum_{k=0}^{k} xik\beta k}\right) \left(1 + e^{\sum_{k=0}^{k} xik\beta k}\right)^{-ni} \dots\dots (7)$$

The last likelihood function to be maximized is this one. But it has to be simplified by using its log function. The likelihood function's greatest value is also its optimal level because the log is a monotonic function, and vice versa. Thus, by taking the log of an equation (7) yielding a log-likelihood function as follows;

$$\beta log \left(\sum_{n=0}^{k} xik.\beta k\right) - ni \log \left(1 + e \sum_{n=0}^{k} xik.\beta k\right) \dots\dots (8)$$

To empirically find the critical points of the log-likelihood function, the first-order differential w.r.t each β is equated to zero. To differentiate $eq\ (8)$ note that;

$$\frac{\delta}{\delta\beta k} \sum_{n=0}^{k} xik.\beta k = Xik \dots\dots\dots (9)$$

So far, the other terms in the summation function do not depend on βk and hence be treated as a constant term. By taking the differential of the second half of $equationn\ (8)$, a general rule is followed i.e.

$$\frac{\delta}{\delta\beta k} \log y = \frac{1}{y} \frac{\delta y}{\delta x}$$

Now by taking the differential of $eq.\ (8)\ w.r.t.\ \beta k$, we get;

$$\frac{d(\beta)}{\delta\beta k} = \sum_{i=1}^{k} y_i X_{ik} - n_i \frac{1}{1 + e^{\sum_{k=0}^{k} xik\beta k}} . \frac{\delta}{\delta\beta k}\left(1 + e^{\sum_{k=0}^{k} xik\beta k}\right)$$

$$= \sum_{i=1}^{N} y_i X_{ik} - n_i \frac{1}{1 + e^{\sum_{k=0}^{k} xik}} . e^{\sum_{k=0}^{k} xik\beta} . \frac{\delta}{\delta\beta k} \sum_{k=0}^{k} X_{ik}\beta k$$

$$= \sum_{i=1}^{N} y_i X_{ik} - n_i \frac{1}{1 + e^{\sum_{k=0}^{k} xik\beta k}} . e^{\sum_{k=0}^{k} xi} . X_{ik}$$

$$= \sum_{i=1}^{N} y_i X_{ik} - n_i p_i X_{ik} \ldots\ldots (10)$$

A maximum likelihood estimate of β is found by setting each $(k + 1)$ $equations$ in $eq.(10)$ to 0 and by solving it for each β_k.

There are various such solutions, and each one identifies a crucial optimum point. When a matrix of second-order partial differentials is negative, that is, when every diagonal member of a matrix is less than zero, a critical point is at its maximum. This matrix's ability to create the variance-covariance matrix of the parametric estimates is another crucial feature. It is formed by taking the second-order differentials of the equation (10) and taking the following general form;

$$\frac{d^2(\beta)}{\delta\beta k \delta k_i} = \frac{\delta}{\delta\beta k_i} \sum_{i=1}^{N} y_i X_{ik} - n_i X_{ik} P_i$$

$$= \frac{\delta}{\delta\beta k^1} \sum_{i=1}^{N} -n_i X_{ik} P_i$$

$$= -\sum_{i=1}^{N} n_i X_{ik} \frac{\delta}{\delta\beta k^1} \left(\frac{e^{\sum_{k=0}^{k} xik\beta k}}{1 + e^{\sum_{k=0}^{k} xik\beta k}} \right) \ldots\ldots (11)$$

To solve $eq.(11)$, two general rules for taking differentials. the first rule is the rule for differentiating exponential functions given as follows;

$$e^{u(x)} = e^{u(x)} . \frac{d}{dx} u(x)$$

$$let\ u(x) = \sum_{k=0}^{k} X_{ik}\beta_k \ldots\ldots (12)$$

The second rule for differentials has a quotient function;

$$\left(\frac{f}{g}\right)^{t}(a) = \frac{g(a).f^{'}(a) - f(a).g'(a)}{g(a)^{2}} \ldots\ldots (13)$$

By applying these rules of differentiating to $eq.(11)$ We get the following;

$$\frac{d}{dx}\frac{e^{u(x)}}{1+e^{u(x)}} = \left(1+e^{u(x)}\right).e^{u(x)}\frac{du(x)}{dx} - \frac{e^{u(x)}.e^{u(x)}\frac{d}{dx}u(x)}{\left(1+e^{u(x)}\right)^{2}}$$

$$= \frac{e^{u(x)}\frac{d}{dx}u(x)}{(1+e^{u(x)})^{2}}$$

$$= \frac{e^{u(x)}\frac{d}{dx}u(x)}{1+e^{u(x)}} \cdot \frac{1}{1+e^{u(x)}} \cdot \frac{d}{dx}\ u(x)$$

After the required calculations, $eq.(11)$ is written as;

$$\frac{d^{2}(\beta)}{\delta\beta k\delta k_i} = -\sum_{i=1}^{N} n_i X_{ik} P_i(1-P_i).X^{'}_{ik} \ldots\ldots (15)$$

4.6.2 Properties of Maximum Likelihood Estimators

Greenland and Drescher (1993) highlighted some properties of maximum likelihood estimates given as follows;

a. They are unbiased estimators.

b. Estimators are asymptotically efficient i.e. they possess narrow confident intervals.

c. Estimators are asymptotically normally distributed.

d. Estimators are consistent.

4.6.3 Estimation of Confidence Intervals (C.I)

Benichou et.al. (1990) extended the Logistic model for the confidence interval of a 95% chance of acceptance for any β_k is given as;

$\widehat{\beta_k} + Z_{x/2}(S.E\widehat{\beta_k})$ *and* $\widehat{\beta_k} - Z_{x/2}(S.E\widehat{\beta_k})$

the odds ratios for the K^{th} *coefficient of the model is given as*;

$\widehat{O.R} = \exp(\widehat{\beta_k})$

we also write the 95% $C.I$ *for the odds form of the model as*;

$\widehat{O.R} = e^L e^U$

where (L, U) *is a* 95% *confidence interval for* β_k.

4.6.4 Assessment of the Goodness of Fit (R^2) for the Logistic Regression

A logit model's test for goodness of fit is assessed in two different methods. As with the classification matrix in discriminate analysis, the first step is to evaluate the model estimation fit, and the second is to analyze the predicted accuracy. Even though both methodologies investigate the model fit from unique angles, they produce identical results. Both methods would be applied in this investigation.

4.6.5 Assessing the Estimation Fit of the Model

The likelihood value is a fundamental and simple indicator of how well the likelihood estimation technique fits. The sums of squared values employed in the multiple regression model are analogous to the likelihood value. The logistic regression model uses a value equal to -2 times the log of a likelihood value to assess the estimation fit. This refers to -2.log likelihood $(-2L.L)$. The minimum value obtains for *-2L.L* is zero, corresponding to a perfect-fit, *(likelihood value = 1 then -2L.L= 0)*. Therefore, the lower the value of *-2L.L*, good is the fitted the model. A value *-2L.L* is also used to compare a difference in fit between the equations or to calculate estimates comparable to the $\boldsymbol{R^2}$ estimates in a multiple regression model, (Hu and Palta, 2006).

4.6.6 Testing Hypothesis

The null hypothesis is tested against the alternative as follows;

$H_o: \beta_1 = \beta_2 = \cdots = \beta_k = 0$

$H_1: \beta_1 = \beta_2 = \cdots = \beta_k \neq 0$

The test statistic is given as;

$$X^2_{obs} = -2ln\left[\frac{L_o}{L_1}\right] = -2\ln(L_o) - (-2lnL_1)$$

$where;$

L_o ; $likelihood\ of\ a\ model\ without\ predictor\ variable\ (reduce\ model)$

L_1; $likelihood\ of\ a\ model\ with\ predictable\ variables\ (full\ model)$

The critical region is;

$\chi^2_{obs} \geq \chi^2_{\alpha,k}$

$p - value: P(\chi^2 \geq \chi^2_{obs})$

Where; χ^2 is with *d.o.f* equal to the additional number of parameters in the whole model.

4.6.7 Pseudo (R^2) Estimates

Other than the statistical chi-square (χ^2) tests, this study also employs a pseudo-R^2 value to evaluate the good fit of a model. The pseudo-R^2 value is calculated as follows and is equivalent to the simple coefficient of determination R^2 in a multiple regression model.

$$R^2_{logit} = \frac{2L.L_o - (-2L.L_1)}{-2L.L_1}$$

In the logistic function, the value of R^2 ranges between 0 to 1. This study employs the Cox and Snell measure of R^2 and Nagelkerke measure of R^2. Both are similar enough to the pseudo R^2 measure and hence are vital in the empirical analysis, (Hu and Palta, 2006).

4.6.8 Testing Coefficients for Statistical Significance

The statistical significance of the logit regression coefficients is assessed using the Wald test. For any coefficient value say $\boldsymbol{b}$, a Wald test statistic is given by the following formula, let $\boldsymbol{Z}$ be a Wald test statistic then;

$$Z = \frac{b}{S.E_b}$$

Since the Wald test statistic is near to normality according to the theorems of $\boldsymbol{\chi^2}$ distribution, therefore, Z^2 is approximately equal to $\boldsymbol{\chi^2}$. In fact, $\boldsymbol{Z^2 \sim \chi^2(d.f)}$ where $d.f = k - k_o$ and $k = number\ of\ parameters\ in\ the\ full\ model,$ while, $k_0 = number\ of\ parameters\ in\ reduce\ form\ model.$ In the Wald test if $b = 0$, it follows that $d.f = k - (k-1)$, and hence $\boldsymbol{Z^2 \sim \chi^2(1)}$, (Asteriou, 2021).

4.6.9 Transformation of Probability in Odd and Logit Values

The modification of the logistic function ensures that the model's estimated values do not deviate from the range of 0 and 1. This is accomplished in the two steps listed below.

1. The probability is changed to odds, which are defined as the ratio of the probabilities of two outcomes (events), i.e.

$$Odd = \frac{probability\ of\ event}{1 - probability\ of\ event}$$

Odd estimates are converted back into the probability values by the following expression that ranges between 0 and 1;

$$probability\ of\ event = \frac{odd\ value\ of\ event}{1 + odd\ valuve\ of\ event}$$

2. The logit value, which is estimated by taking the log of the odds values, must be computed to avoid the odds values from falling below the lower limit, or 0, which is 0. While odds ratios greater than 1 have positive logit values, odds ratios less than 1 have negative logit values. The odds ratio of 1 (corresponds to a probability = 0.5) have a logit value of 0, (Asteriou, 2021).

4.7 Interpretations of the Odds Ratios

Increasing an explanatory variable (X_i) by 1 unit, keeping all other factors constants, the odds value of the dependent variable (Y_i) increases by a factor of exp (βi), called the odds-ratio ($O.R$). Odds values lie between zero to positive infinity. It shows that a relative value by which an odd of an outcome increases *(O.R>1)* or

decreases *(O.R< 1)* when the value of the corresponding explanatory variable rises by one unit, (Asteriou, 2021).

4.8 Retaining Variables in a Logistic Model

Numerous studies have chosen to keep all the variables indicating the same factor if at least one of them is statistically significant since it is evident that the estimates of the included variable in a model are sensitive to changes in the other excluded variables. This is referred to as a complete model (see Kockelman and Kweon, 2002; Lee and Mannering, 2002; Kim et al., 2008). In contrast to these researches, some additional studies aim to remove every variable from the model that is statistically insignificant to improve the accuracy of estimates and the robustness of a model. Such a model was referred to as a reduced form model (see Wang and Abdelaty, 2008; Wang et. al., 2007). To enhance the efficiency of child-improved health prediction, this study follows the later studies by keeping a reduced-form model having only statistically significant variables. The empirical model will be making a robust and efficient estimator of child health by following a general to simple methodology in a step-wise reduction procedure using the latest version of the SPSS software package.

4.9 Significance Criterion

Common probability of 5% and 1% are considered, i.e. a confidence interval of 95%, and 99%. Variables holding probability values less than or equal to a specified level of probability are considered statistically significant. However, significance at a confidence level of 90% can also be considered depending on the nature of a variable, (Asteriou, 2021).

Following the logic paradigm, the Hayes mediation procedure. In some circumstances, there may be one or more intermediary factors that moderate the direct association between the predictor and outcome variable. In certain situations, a logit model's simple analysis of the connection between the predictor and outcome variable would not be sufficient to fully understand the underlying causal mechanisms. Through the use of one or more intermediary variables, mediation analysis can help to discover and quantify the indirect impacts of the predictor on the result variable. We can better understand the underlying causal mechanisms and perhaps find new targets for intervention or policy action by integrating these mediating variables into the

analysis. Given that it can handle both continuous and categorical variables and allows for the simultaneous estimate of many mediators, the Hayes mediation method is a particularly valuable tool for undertaking mediation analysis. The Hayes approach additionally offers an easy-to-understand way of calculating the predictor's direct, indirect, and overall effects on the outcome variable, as well as the precise indirect effects mediated through each intermediate variable.

The Mediation and Logit models cannot be compared rather the mediation provides a detailed insight into the role of some factors that bridge the impact between the dependent and outcome variables. Logit regression explains the probability of occurrence whereas the ultimate objective to apply the indirect regression model is to identify the role of some key economic factors to mediate the relationship between the variables. The application of the Hayes mediation process following the logit model will add some crucial details about the underlying causal mechanisms influencing the connection between the predictor and outcome variables (Rijnhart et. al. 2019). This can make it harder for us to formulate sound hypotheses or find appropriate solutions to the problem at hand. We wouldn't be able to pinpoint any intermediary variables that might be influencing the link between the predictor and outcome variables without performing a mediation analysis. This can lead to a failure to recognize potentially significant elements that might be the focus of intervention or policy initiatives.

4.10 The Hayes Process of Mediation

Most of the time, research in any field is in its early phases, and the main focus is on finding evidence of a link of some kind between two or more variables and determining if this association is causal or merely of a certain kind, such as spurious, epiphenomenal, etc. After that, as a field of study develops and matures, the emphasis shifts from proving the presence of a cause and effect to explaining the process by which an "effect" operates and defining its boundaries. A greater comprehension of the topic under discussion and a better understanding of how that understanding might be applied result from answering the "how" and "when" questions.

Logically, questions of ‘how’ are typically handled by ‘mediation analysis’ (MacKinnon, Fairchild, & Fritz, 2007), whereas, questions about ‘when’ are answered via moderation analyses as documented by Jaccard & Turrisi (2003). The purpose of

mediation is basically to establish the relationship among the variables, where an explanatory variable influences some outcome variable via one or more ‘mediator variables. When performing a "moderation-based analysis” a researcher looks to examine if a moderator variable has any bearing on the amount or sign of the influence that some explanatory variables have on the result variables.

Researchers always suggest an analysis that largely combines both indirect-based investigations, which are uncommon in studies closely related to economic research. By combining parameter estimates from a mediation process with parameters, the research of Muller, Judd, & Yzerbyt (2005), Edwards & Lambert (2007), and Preacher, Rucker, & Hayes (2007) aims to empirically quantify the nature of mechanisms in which an explanatory variable exerts its influence on the outcome variable. (2010) Ilyas et al.

The Wright (1920) method of analysis' by path coefficients, which describes the direct and indirect causation to determine the genetically produced colour combinations in a species of pigs, is linked to the origins of the mediation process. He defines mediation as the result of the coefficients. Eight years later, Woodworth introduced the "Stimulus Organism Response (SOR) theory," which holds that several mediating processes operating within an organism interact between the stimuli and the response subject (1928). According to certain seminal studies, mediating factors moderate the causal connection between the explanatory and dependent variables. It is impossible to overstate the importance of mediating factors. Since it is obvious, mediating factors serve as an introduction to the knowledge of cause-and-effect mechanisms. Many other domains, such as interventional science testing, treatment-related practical research, and the creation of psychological concepts, particularly in behavioural psychology, are supported by mediating processes of indirect effects (MacKinnon et. al. 2007). This third concept of application of mediation is the most relevant source of investigation when discussing the full or partial mediating relationships among the variables. Explicitly, the observations of the partial mediation process offer a clear implication for empirical testing for the indirect effects in research (Rucker et al. 2011). The mediators are helpful for theory creation in other domains, so we suggest that the social sciences could also benefit greatly from this special method.

4.11 Essentials of Mediation, and Conditional Process Analysis

This section encircles an elementary primer on the process of moderation, mediation, and conditional concepts. These concepts include total effects, indirect effects, direct effects, and conditional effects. When the explanatory variable is used, it always refers to 'X' in the model. The explanatory variable is the causal predecessor of key interest to the researcher whose effect on some outcome variable is estimated. The term 'dependent variable' is indicated by 'Y' while Mediator by 'M'. The mediating variable affects the outcome variable 'Y' directly and indirectly explaining the channel of cause and effect. (Ilyas et al., 2010)

4.11.1 Direct, and Indirect Effects of Mediation

A mediator functions as a "connecting" factor in establishing the relationship between dependent and independent variables. This study does not rely on the direct correlations between the dependent and explanatory variables, in contrast to earlier studies. Instead, this study attempts to channel the causal relationship between the variables so that the analysis's robustness is preserved. For example, it is not necessary that per capita income directly cause a death of a child in a poor family. It is rather a channel of more than two factors, like low per capita earnings causing a reduction in the health expenses of a family that interns lead to the poor health of a child and takes the child to death. This mediation may be true for a couple of other economic variables like food insecurity and assets poverty of households.

Even though they are significantly distinct from one another, mediation and moderation can be confused easily. The simplest mediation model is the simple mediation process model, in which an explanatory variable (X) is represented to impact the outcome variable (Y) both directly and indirectly through a single mediator variable (M), which is causally situated between X and Y, (Hayes 2012).

4.11.2 The Mediation Process

The indirect relationship mediation method adds one or more intervening variables to the actual regression equation, which is an expansion of standard linear regression models. A mediating factor explains how an intervening effect produces its result variable. A mechanism by which X (an independent variable) affects Y (a dependent variable or outcome variable), to put it simply, is the mediating process (Hayes 2013:7). In the mediation process, researchers assume that the explanatory

variable (X) influences the mediator (M), which in turn influences the outcome variable (Y). In other words, they assume that there is an indirect rather than a direct relationship between the independent and dependent variables. A simple mediation concept model between X, M, and Y is shown in Figure 5.1.

The explanatory variable (X) and the outcome variable (Y) may or may not be directly related. When no other variable can have an impact on the link between X and Y variables, there is a direct effect. The indirect type of effect happens when another variable, or other variables, mediate, the relationship between X and Y.

The lines *"a," "b," and "c"* in Figure 4.3, respectively, show the magnitude of the regression coefficients, the correlation coefficient between X and M, M and Y, and X and Y. While the magnitudes of coefficients *"a"* and *"b"* illustrate the indirect effect of X on Y, coefficient *"c"* depicts the direct effect of X on Y.

Figure: 4.2
Concept of Mediation Between Variables

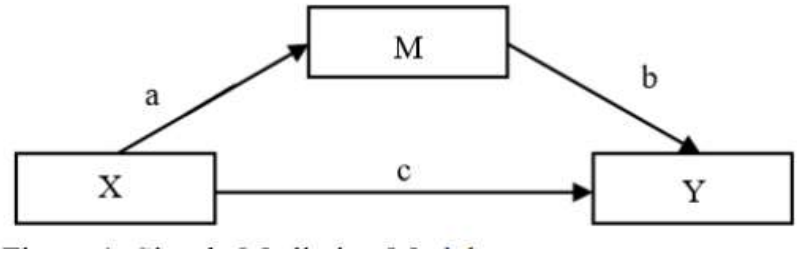


Figure 5.1 shows that the entire impact of X on Y is equal to "$c + a * b$" (Baron and Kenny 1986). According to this graph, the link between X and Y is considered to be a direct relationship if either *"a"* or *"b"* is zero *(Total effect = c + a*b = c + 0 = c).* The percentage of the effect that is contributed by the mediator according to the following formula is represented by the ratio of the indirect effect *(a*b)* and overall effect *(a*b + c)* (Hayes 2013).

$$P_M = \frac{a * b}{a * b + c}$$

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Introduction

This study looks into the crucial socioeconomic elements that affect children's health in Pakistan as well as the circumstances surrounding the eventual illness-related mortality of children under the age of five. The most recent survey undertaken by the Pakistan Bureau of Statistics, the Household Integrated Economic Survey (HIES) 2018–19, is used in this study for this purpose. The survey recently conducted comprises a detailed survey about the social, economic, infrastructural, and demographic components of the households. The data for this study is examined at the household level. It is because of this reason that individual data has a lot of shortcomings like missing the relevant data. As far as this is the scope of this study it is quite hard to clean the data for the children under five years and investigate them for the other social and economic factors as they live a parasitic life meaning that they are the consumers, not the earners so far. The data is first of all assembled at the household level so that we can make a proper examination of all the relevant information about the households and the environment in which the child is living. 24809 families make up the overall sample of the household. Khyber-Pakhtunkhwa, Punjab, Sindh, and Baluchistan are the four provinces represented in the sample, which are dispersed across their rural and urban landscapes. This study employs a new dimension to the empirical analysis of investigation. Unlike the previous research, this study employs an indirect way to find the relationship among the variables. For this purpose, Haye's methodology of mediation is adopted. The variable acting as a bridge between a dependent and an explanatory variable is known as the mediator. So it is not obvious that the relationship must be a direct one, most probably the connection among the variable might be through some other channels of intervening variables. Additionally, this study uses a logistic regression model to determine the cause-and-effect relationship between the variables. The binary logistic model is used for the empirical modelling since the dependent variable for this study,

child health, is dichotomous. If a child passes away before turning five, the dichotomy of death is "1," and if not, it is *"0."*

The analysis portion of the study is covered in this chapter, where models are estimated to determine the empirical footprints of Pakistan's socioeconomic determinants of child health. This issue is also very important in the sense that it is keenly acknowledged by the United Nations and it secures a significant place on the list of United Nations' Sustainable Development Goals, (Nakamura, 2019). The analysis of this study is carried out sequentially as described in the methodology. First of all the country-wise analysis is done by applying the binary logistic models. This is done by using the SPSS software. SPSS is a customized software for running the logistic models and it smartly handles the primary data. Here one thing must be mentioned. The SPSS helps estimate the coefficients of the models concerning the signs of the relationship among the variables. Find the amount of change caused by the explanatory variable in the dependent variables is provided by the probability derivatives of the coefficients of the Logit models. This is done by using another software package i.e. STATA. Other statistical packages are also used as they were required for some specific estimation. The coefficients of the Logit models cannot be interpreted simply. As the dependent variable is binary, therefore, the marginal effect coefficients are estimated using STATA. At the last, the indirect estimation is carried out using SPSS by employing Haye's process of mediation. This is unique in that it not only considers the probability estimates of the logistic regression model but also takes care of the indirect effect of variables on the dependent variables. control variables. This methodology is robust and provides deep insight into the underlying problem of child health and its social, economic, and demographic factors.

This chapter explains the empirical estimates of the impact of selected variables on child health and the later model underlying the outcome of child death. The data analysis is organized as first the overall situation on the aggregate country level is discussed. After that, the provincial and regional wise empirical estimates are explained so that a deep insight is achieved by the policymakers about the child health problems and its solution on the micro grounds. After that indirect effects are estimated and explained so that the uniqueness of this study pertains and we get more policymakers about the problem. The estimations are carried out by considering a dichotomous dependent variable 'child health'. The base category is a child or

otherwise. Before setting the binary logistic model the data is checked for the possible assumption of multicollinearity although the sample size is very large. Regression models, especially logistic regression models, can have multicollinearity measured using the Variance Inflation Factor (VIF). High levels of correlation among predictor variables can cause multicollinearity, which can cause instability in coefficient estimations and interpretation. The VIF assesses the degree to which multicollinearity has increased the variance of the estimated regression coefficient for a predictor variable in a logistic regression model. It measures how inflated the variance of the coefficient is relative to what it would be if multicollinearity didn't exist. According to Vittinghoff et al. (2006), a VIF greater than 5 or 10 is typically regarded as troublesome and indicates severe multicollinearity. According to the results of Table-A (see appendix), the variance inflation factors (VIF) is not exceeding the threshold value of 5, it is, therefore, there is no serious problem of multicollinearity in the model. Similarly, A tolerance of less than 0.20 is cause for concern according to Chatterjee and Simonoff (2013). As none of the tolerance factors is less than the threshold value of 0.2, therefore the explanatory variables qualify for the logit regression. In addition to the VIF, the descriptive statistics are also assessed before proceeding towards the formal estimation of the Logit regression (see appendix, Table A-2).

Table 5.1(a) shows the outcome of the binary logistic model that shows the estimates as the coefficient, unlike the log odds. The coefficients of the logistic regression model cannot be reported as the estimates of simple linear regression models are explained, (Stynes, 2019) We can just see the significance of the estimates of the model. Cornelia (2009) explains that to capture the impact we need to find the probability derivatives or simply called the marginal effects of the variables that show the probability of a per cent change in the dependent variable by a change of an independent variable by 1 percent. According to Table 5.1(a), almost all the economic factors of child health determination are highly significant. Health expenditures and the total expenditures of the household are positively associated with the base category of child health i.e. if expenditures on the health of a child increase, the probability of a child being sick is more. There may be several causes for this, including a rise in the demand for healthcare services, an increase in the price of

medical care, or the scarcity of public health facilities, which results in increased out-of-pocket expenses for individuals and families.

5.2 Assessing the Factors Affecting Child Health in Pakistan

Table 5.1(a)

Logistic Model Estimates of Factors Affecting Child Health in Pakistan

Economic Factors		
Child health (Dependent Variable)	Coefficient	t-statistic
Health Expenditures	0.128	3.41***
Total Expenses	0.325	11.0***
Food Insecurity: Food Secure~0 (Base category)		
Mild food insecurity	-0.089	-1.80*
Severe food insecurity	-0.459	11.0***
Asset Poverty: Asset Poor~0 (Base category)		
Mild asset poor	-0.086	-1.71*
Average assets	-0.251	-4.91***
Mild asset rich	-0.344	-6.21***
Asset rich	-0.526	-8.21***
Health Expenditure Group: Low~0 (Base category)		
Mild low	0.221	3.82***
Mild high	0.42	5.61***
High	0.453	4.21***
Demographic Factors		
Province	-0.025	-2.41***
Region	-0.098	-2.80***
House Ownership	-0.019	-1.22
Sex of Household	0.001	0.11
Health Gadgets	0.046	2.43**
Housing Characteristics		
Electricity	0.368	6.32***
Water	0.210	4.81***
Toilet	0.124	1.90*
Rooms	0.023	2.03**
Internet	-0.001	-0.13
Mobile	0.031	0.42*
Landline	0.094	0.81
Computer	0.141	2.22**
Sewerage	0.067	6.03***
Fuel	0.083	11.2***
Constant	-1.805	-19.3***
Pseudo r-squared	*0.540*	
Chi-square	*234.3 (0.000)*	
****,**, and * shows significance at 1%,5% and 10% respectively.*		

The logistic outcome is based on the available data which reveals several different variables simultaneously affecting the outcome variable[2]. Food insecurity

[2] Alsan, M., Schoemaker, L., Eggleston, K., Kammili, N., Kolli, P., & Bhattacharya, J. (2015). Out-of-pocket health expenditures and antimicrobial resistance in low-income and middle-income countries: an economic analysis. *The Lancet infectious diseases*, *15*(10), 1203-1210.

shows that if the level of food insecurity increases the chances of the child being sick increase as there is a negative relationship between food insecurity and child health outcome. These results are in line with Casey (2005) and Cook (2008). Similarly, asset poverty is also negatively associated with the child's health meaning that the more a person gets asset-rich lesser the chances of the child being sick as there are more resources other than the income available to meet the health expenses of the household, this outcome is verifying Wickham (2016). The households are also divided into different expenditure groups depending upon the level of expenditure. Their groups are arranged in a manner that the base category is the lowest expenditure group. The negative sign shows that as a household dedicates a high proportion of money to heath, less are the chances of the child being sick. This outcome is in line with Bekemeier (2012) and Anyanwu (2009). The impact of factors affecting the dependent variables is explained by the marginal effects.

Table 5.1 (a) also shows the relation between demographic factors and child health in Pakistan. according to the table, provincial differential shows a negative coefficient affecting child health that shows that health impact upon the child's health is different if there is a migration from the area of low opportunities to the areas of high opportunities. This will reduce the adverse health impact on the child's health. This outcome is in line with the studies of national and other economies like Kols et. al. (2018) who acknowledge the same outcome for Pakistan and Canning et. al (2007) for Canada. The same is the situation for regional differences, this study verifies the rural-urban differences and their impact on child health outcomes by Fotso (2006). According to the table, the aggregate impact of house ownership and gender disparity is not significant however these factors do affect the outcome variable at the provincial level. Both the significance and non-significance of these variables are addressed by Gertler (2004) and Ntomimo et.al. (2021) respectively. In addition to that technological health equipment at home also plays a vital role in the provision of first aid services to the patient. The results show a positive impact on a child's health, meaning that a household equipped with these gadgets tends to reduce a child's sickness at best. These outcomes are similar to Trevisanuto et. al. (2011) and Sahu and Singh (2014).

The coefficients of the Logit model of the housing features explaining children's health in Pakistan are also shown in Table 5.1(a). The availability of toilet

facilities and clean drinking water also indicates a good impact on child health, according to the research, as does the availability of power in the home. When connected to the appropriate sewerage system, the impact of the restroom facility is more effective. The study of Hall (2009), this study shows a positive impact on child health. House crowding proxied by several rooms is also positively linked to improved child health. This is also proved by Anand (2004) that a computer facility at home is a source of learning about self-medication and other health tips that play a constructing role in reducing the risk of child sickness, this study shows a positive link between computer facility of a household with improved child health. this outcome is in line with the study of Woo (2016). In addition to that fuel for cooking and heating purposes in houses deeply affect the health of children (Rinne et. al., 2007). This study also provides results in line with Rinne (2007) showing a positive impact on the child health outcome in Pakistan.

5.3 Marginal Effects of the Factors Affecting Child Health in Pakistan

Table 5.1(b) shows the marginal effects of the dependent variables. Marginal effects are estimated because the dependent variable is dichotomous. Therefore, unlike the simple OLS regression, the coefficients of the Logit models are reported as the magnitude of change.

Table 5.1 (b) shows that health expenditures are 0.02% effective in increasing the probability of a healthy child in the house. Similarly, if the total expenditures of the household increase by 1 per cent, the probability of a healthy child increases by 0.05% compared to an unhealthy child. The results also show that as a person got severely food insecure, the probability of a healthy child decreases by 0.04% and 0.08% respectively as a household passes an additional level of food insecurity.

A food-insecure person is not able to bear the cost of health as food survival is the primary goal of any food-insecure person. Like food insecurity, asset poverty also plays a vital role in affecting child health. according to the table as the assets of the household increase, that brings about a gradual decrease in the probability of child sickness which is observed from the coefficient of change i.e. 0.01%. 0.04%, 0.06%, and 0.08% respectively. The last economic factor is the health expenditures of the house. These expenses are specific to the health of the family members, therefore, there is at least a 0.07% change in the probability of a healthy child compared to the

probability of an unhealthy child in a house. The demographic factors and their role are verified by Hill (1995), Fink and Hill (2011), and Nzioki (2015).

Table 5.1 (b)
Marginal Effects of the Factors Affecting Child Health in Pakistan

Economic Factors		
Child health (Dependent Variable)	dy/dx	z-statistic
Health Expenditures	0.022	3.41 ***
Total Expenditures	0.055	11.0 ***
Food Insecurity: Food Secure~0 (Base category)		
Mild food insecurity	-0.014	-1.81 **
Severe food insecurity	-0.083	10.0 ***
Asset Poverty: Asset Poor~0 (Base category)		
Mild asset poor	-0.016	-1.72 *
Average assets	-0.045	-4.81 ***
Mild asset rich	-0.060	-6.22 ***
Asset rich	-0.088	-8.31 ***
Health Expenditure Group: Low~0 (Base category)		
Mild low	0.035	3.91 ***
Mild high	0.070	5.70 ***
High	0.076	4.12 ***
Demographic Factors		
Province	-0.004	-2.01*
Region	-0.017	-2.81***
House Ownership	-0.003	-1.21
Sex of Household	0.000	0.12
Health Gadgets	0.008	2.43**
Housing Characteristics		
Electricity	0.064	6.31***
Water	0.036	4.81***
Toilet	0.022	1.92**
Rooms	0.004	2.01**
Internet	-0.000	-0.12*
Mobile	0.050	4.13*
Landline	0.016	0.81
Computer	0.024	2.22**
Sewerage	0.012	6.01***
Fuel	0.014	11.0***

*Note: dy/dx for factor levels is the discrete change from the base level. ***,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

Table 5.1(b) also depicts the marginal effects of the demographic factors affecting child health at the aggregate level in Pakistan. The impact of province significantly small shows a weak impact of provincial differentiation on children across the country. This means that although there is a role of provincial change in improving very small child health i.e. it brings about 0.4% change if 1% population migrates to a different province. Similarly, the rural-urban differential brings about a 1.7% improvement in child health. this outcome authenticates the findings of Lu (2010). Technological medical care equipment brings about a probability of 0.8%

chance to counter child adverse health in Pakistan. Besides the demographic factors, the following housing characteristic also impacts the magnitude of child health in Pakistan.

According to Table 5.1 (b) electricity facility in the house is expected to bring a 6.4% change in improving child health compared to the otherwise situation. Safe drinking water is 3.6% efficient in improving child health while 2.4% improvement is brought by proper toilet facilities at home. The number of room capacity is a weak determinant in this case as it brings about a 0.4% change in the health of children under 5 years of age. As sewerage is a connecting factor to the toilets why its impact is expected to be 1.2% but adding this factor to the probability of toilet facility makes an effective outcome upon the improvement in child health. Concluding the findings, housing characteristics play a critical role in predicting a child's health outcomes.

In the light of above empirical findings it is concluded that

5.4 Province-wide Logistic Estimates of Factors Affecting Child Health

The country-level estimates of the Logit model provide a deep insight into the aggregate level empirical findings of the factor that are vital for improved child health in Pakistan. As the average values at the aggregate level don’t show the internal picture of the situation, therefore, it is obvious to estimate the provincial breakup for the whole sample so that we can get a better insight into the problem. The following tables show the empirical estimates of the Logit model for each province of the country.

Pakistan's provinces each have their unique administrative and political systems, which may have an impact on the quantity and calibre of healthcare services. As a result, breaking down the data by province can assist reveal trends and distinctions in healthcare spending and utilization that may be unique to particular parts of the nation. Furthermore, distinct cultural and socioeconomic characteristics in each province may have an impact on how people use healthcare, and by conducting our analysis at the provincial level, we may be able to identify some of these factors that could otherwise go unnoticed if we simply looked at wider regional categories.

The estimates from the logit model for the elements influencing child health in the Pakistani provinces are shown in Table 5.2(a). As was already said, the coefficients are only presented to show whether a variable has a positive or negative effect on the dependent variable because the dependent variable is binary. Additionally, the estimates' partial derivatives appropriately capture the change in the dependent variable.

5.4.1 Economic Factors

Considering the largest province i.e. Punjab, a sample of 11781 households is taken. Likewise, the Khyber-Pakhtunkhwa province, Punjab is also showing a positive and significant impact on health expenditures and the portion of total expenditures out of the income sources on sustaining the good health of the children under five compared to the sick children. In Punjab, a household that is at high risk of food insecurity is a major source of increase in the chances of child adverse status compared to those people who are food secure at a 1% level of significance. As far as asset poverty is concerned the results are quite interesting. For a household being an asset poor shows a negative relationship or adverse effect on the child's health while this relationship becomes direct or positive when the status of a household approaches asset rich status in Punjab. While the result is insignificant for an asset-rich household according to the outcome of the logit model. It is derived from the table that a person being asset poor is more vulnerable to adverse child health situations compared to the households holding some secondary sources of wealth in acquiring health facilities for the children in Punjab. However, health expenditure groups are strongly playing their role in explaining the child health differentials in Punjab. According to the table as the health expenditures increase to the next highest level, the chances of the child being healthy increase accordingly. The coefficients of the 2^{nd}, $3^{rd,}$ and 4^{th} expenditure groups increase upon an increase in the level of health expenditures with the highest level of significance and show a direct relationship with the dependent variable. This outcome is verifying Asif (2020) signifying this relationship using the health survey of Pakistan (1990-91).

Looking at the KPK province, we observe that there is a correlation between health spending and overall household expenses. There is an indirect relationship between food-insecure people and child health. People who are more food insecure are having a chance of having a sick child compared to food-secure households. The

inverse relation between asset poverty and the chance of a child being healthy is also negative and statistically significant for the asset-poor household. Relatively asset-rich people have a positive impact on the change in a child's health, but this impact is insignificant for asset-rich households. In addition to that, a group of households who spend more on the family out of income tends to overcome the adverse health of the child. This means that spending on goods and services other than health also play a vital role in keeping child strong and healthy. These outcomes are in line with Newacheck (1994) and Béatrice et. al. (2012).

5.4.2 Demographic Factors

Table 5.2(a) also encircles the demographic factors affecting child health Province-wide. Demographic factors include rural-urban differentials, house ownership, gender of a household, and the availability of hi-tech gadgets at home. There is a striking difference in the ratio of healthy children to unhealthy children when there is a transition between the village and urban lifestyle, supporting Shin's study that regional disparities between rural and urban have a negative significant impact on the child health status in Punjab (2007). Similarly, house ownership in Punjab also shows an inverse impact on the outcome variable, Ntoimo (2021). This means that people who live in their own houses are more likely to have healthy children and vice-versa. Technical gadgets at home leave a positive impact on the child's health outcome, (see, Tristanti et. al, 2020).

Considering KPK, regional changes are statistically significant to bring about some positive effects on child health. this means that regional changes can affect the magnitude of child health across the province. House ownership is insignificant in this regard. A positive and statistically significant coefficient demonstrates that the gender of a home has a minimal effect on the health of the child (0.128). Surprisingly, technology harms child health. this means that technological instruments affect the child either by its wave transmission, (see Woo, 2016).

Table 5.2(a) also shows the demographic factors estimates of child health for Sindh province. The child's improved health in Sindh is significantly influenced by geographical variances. House ownership is also significant and positively associated with the child health issue in Sindh province meaning that a household that lives in his or her own house shows a positive relationship in improving a child's health.

however, household gender and technological gadget in the house doesn't show any significant impact in affecting child health in Sindh.

At last, in Baluchistan, if the region changes from rural to urban the chance of child sickness increases by 0.05%. this shows that in Baluchistan the children are relatively healthier in the rural areas of the province. Relatively, the same outcome is shown by the child's health outcome if the household head is male than female. Families headed by a male person are expected to have 0.05% more healthy children and vice-versa.

Table 5.2(a)
Province-wide Logistic Estimates of the Factors Affecting Child Health

	Economic Factors							
Child health (Dependent variable)	**Punjab**		**KPK**		**Sindh**		**Baluchistan**	
	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
Health Expenditures	0.152	2.9***	0.215	2.3**	0.193	2.3**	0.281	2.2**
Total Expenditures	0.182	4.3***	0.117	1.6*	0.516	8.3***	1.206	9.1***
Food Insecurity: Food Secure~0 (Base category)								
Mild food insecurity	-0.058	-0.6	-0.196	-2.2**	-0.210	-2.3**	0.016	0.1
Severe food insecurity	-0.335	-5.3***	-0.397	-4.2***	-0.335	-4.1***	1.756	12***
Asset Poverty: Asset Poor~0 (Base category)								
Mild asset poor	-0.091	2.5**	-0.199	-2.2**	-0.131	-1.5	0.276	1.7*
Average assets	-0.038	2.1**	0.261	1.9*	-0.583	-6.4***	0.602	3.3***
Mild asset rich	0.065	2.3**	0.162	1.1	0.778	6.8***	0.789	3.8***
Asset rich	-0.098	-0.9	0.106	0.6	1.393	9.7***	1.674	6.3***
Health Expenditure Group: Low~0 (Base category)								
Mild low	0.243	2.9***	0.279	1.8*	0.152	1.3	0.369	1.7*
Mild high	0.484	4.5***	0.237	2.0**	0.341	2.2**	0.888	3.2***
High	0.607	3.9***	-0.273	-1.0	0.154	2.4***	1.38	3.6***
	Demographic Factors							
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Region	-0.019	-1.9**	0.138	1.7*	-0.431	-6.2***	-0.131	-2.6***
House Ownership	-0.026	-2.0**	-0.021	-0.6	0.094	2.9***	0.014	0.2
Sex of Household	-0.059	-1.0	0.128	1.7*	-0.013	-0.1	-0.351	-3.0***
Health Gadgets	0.124	4.7***	0.050	2.0**	0.005	0.1	-0.101	-1.2
	Housing Characteristics							
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Electricity	0.119	1.0	0.215	1.8*	0.433	4.3***	0.926	5.30***
Water	0.107	2.6***	0.123	2.0**	0.095	2.5**	1.004	7.40***
Toilet	0.098	2.1**	0.099	2.2***	0.364	2.9***	0.439	1.69*
Rooms	0.057	3.3***	0.058	2.4**	0.079	2.3**	0.078	1.91*
Internet	0.042	4.1***	-0.041	-0.5	-0.245	-3.2***	-0.167	-1.01
Mobile	0.057	2.0**	-0.280	-2.1**	0.192	1.5	0.245	1.16
Landline	0.109	1.0	-0.060	-0.2	0.107	0.3	0.001	0.00
Computer	0.003	0.1	-0.116	-0.8	0.173	2.2**	0.267	0.87
Sverige	0.196	2.3**	0.008	0.1	0.150	8.2***	0.116	2.97***
Fuel	-0.058	-2.5**	0.081	3.2***	0.151	8.6***	0.328	10.4***
Constant	-1.775	-10***	-1.209	-5.2***	-2.272	-14***	-2.346	-8.38***
Pseudo r-square	*0.570*							
Chi-square	*171.8 (0.000)*							

****,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

5.4.3 Housing Characteristics

Considering the characteristics of the house and their role in affecting the child's health in either way among the provinces, Table 5.2 (a) shows that safe drinking water, availability of toilet at home, and the number of rooms in the house are having a positive association with the child health ratio of being healthy in Punjab province. As the number of rooms increases, there is a space provided for the activities of children in an open space. More likely, more space makes it possible for the household to perform the house activities separately compare to congested houses where a single room is used for different household activities like sleeping, cooking, dining, etc. Internet and mobile phones show a direct relationship with the dependent variable. The estimates also show that houses with proper sewerage lines and proper waste disposal procedures also leave a positive change in the outcome variable i.e. child health meaning that proper sewerage increases the health of a child. The type of fuel also shows a positive and significant impact on the child's health in Punjab.

In the Khyber-Pakhtunkhwa province, facilities like the availability of electricity are positively associated with the chance of having a healthy child. The availability of clean drinking water also has a positive effect on the health of a child in the Khyber-Pakhtunkhwa province. Toilet facility at home has a highly significant effect on a child's health outcomes. According to the table, the space available per person in the house is positively associated with the child's health, meaning that as the number of rooms increases the chance of a healthy child increases. Another important factor is the type of fuel used for cooking etc. A change in the source of fuel for cooking brings about a significant positive impact on the outcome variable i.e. child health. some fuel like burning kerosine oil and dung cakes makes tremendous smoke and other hazardous gases which directly affects the health of a child as well as other members of the house. More surprisingly a mobile phone harms the child's health because it directly affects the body due to its strong signals. Similarly, excessive use of mobile phones for pregnant women is also very risky for the same reasons. Miller et.al. (2019) document that electromagnetic radiation from mobile devices can enter the body and potentially harm cells and tissues. Due to the major changes that their bodies are going through during pregnancy, pregnant women are more susceptible to harmful radiation than other people. Mobile phone radiation exposure during pregnancy can also have an impact on the fetus's growing brain, which may cause long-term health issues.

According to Table 5.2 (a), the availability of electricity, safe drinking water, and toilet facility are statistically significant and positively associated with the improvement in the child health situation in Sindh. In addition to that, the number of rooms is also positively related to improved child health in Sindh. The more spacious the house the high are the chances of a child being healthy. Sewerage of the house is directly related to the child's improved health as it reduces the chances of water contamination in the house. Rural Sindh is deprived of many resources therefore in total, the fuel used as means of cooking and heating purpose also plays a significant role in determining improved child health. Internet is also showing a negative but significant impact on child health in Sindh Province.

Considering Baluchistan, Safe drinking water and availability of electricity are lacking. As the table shows the positive and direct impact of both water availability and electricity, there is an urge to provide these facilities to the household in far areas of the province to make sure the improved health of children under 5 years in the province. Toilet facility also shows a direct relationship with improved child health. house crowding which is proxied by the number of rooms in the house is also showing a positive association with that improved child health in Baluchistan. Surprisingly, none of the other factors like the internet, mobile, landline, and computer show any significant impact on the dependent variable. However, the sewerage system of the house shows a significant positive impact on improving child health that ensures the prevention of water contamination in pipe water so the children become safe from diseases. Fuel is an important component of the population and hence it has some noteworthy impact on the health of a child. If natural gas is used as a fuel for cooking and heating compared to other sources like wood etc. this variable is significant and positively linked to improved child health and vice versa.

5.5 Province-wide Marginal Effects of Factors Affecting Child Health

5.5.1 Economic Factors

As far as Punjab is concerned a unit increase in health expenditure increases the probability of a healthy child by 2.5% compared to a sick child. Similarly, total expenses, other than health bring about a 3% positive impact on the probability of a healthy child in a family. Food insecurity is a major problem in big provinces that have a high population like Punjab. According to the probability derivatives, if there is a one per cent increase in the level of food-insecure households, it leads to a vice

versa impact on the child's health by 5.9%, meaning that food-insecure households are vulnerable to the adverse health of children under 5 years compared to the probability of having a healthy child in a house. Asset poverty shows a significant impact on the health of a child in Punjab. As the expenditure on health is being categorized according to the extent of how much they spend on the health of children shows a deep insight into the probability of increasing the magnitude of healthy children. People with mild spending on health show a 3.6% improvement in the probability of a healthy child in a house. This probability increases to 2.1% when the households allocated more funds to the child's health and upon maintaining this pace this ratio increases to 3.6%.

Table 5.2(b) represents the probability derivatives of the economic factors affecting child health province-wide. Looking into the estimates of KPK, a change of 1% in health expenditure (0.038) brings about a probability of a 3.8% change in the magnitude of a healthy child. The total expenses of a household also bring a positive change in the probability of the occurrence of a healthy child. This makes the idea clear that a household that is more focused on health expenses reduces the chance of child sickness in KPK. A household that is less food insecure compared with a risk of high food insecurity increases the chance of having a sick child by 3.4% and 7.2% respectively for a severe food-insecure household in KPK. Similarly, Asset poverty also shows the same trend as food insecurity. This impact is significant till a household is a mild asset holder. In a household that is asset poor, changing this ratio by 1% is likely to bring about a 2.9% reduction in a chance of a healthy child compared to a sick child. This impact is expected to be 4.5% as a household becomes a relatively mild asset-rich category. Households are also categorized into different expenditure groups according to the extent they spent out of their earnings. According to the table if there is a change i.e. increase in the expenditure group, the probability of a child being healthy increases by 5.2% as compared to a sick child. This impact approaches 4.4% when the expenditure group changes to a mild high in KPK.

In Sindh province, a 1% increase in the health expenditures of a household is expected to improve the child's health by 3.3%. The total expenses made by a household are expected to bring about an 8.9% improvement in child health. Further, when the expenditures are specific to health then the in-depth analysis shows that as the category of household changes from mild high health expenditure group to high

expenditure group, the change of improving the child's health increases from 2.6% to 6% positively. In addition to that, the problems like food insecurity increase the chance of adverse child health in Sindh. The table shows the relative estimates of food insecurity against the food-secure household. Comparatively, to food-secure people, a mild food-insecure household shows a reduction in the probability of an improved child's health by 3.4%. As the severity of food insecurity increases shows a decline in the probability of a healthy child in the house by 6.1%.

Table 5.2 (b)
Province-wide Marginal Effects of Factors Affecting Child Health

Economic Factors								
Child health	**Punjab**		**KPK**		**Sindh**		**Baluchistan**	
(Dependent Variable)	dy/dx	z-statistic	dy/dx	z-statistic	dy/dx	z-statistic	dy/dx	z-statistic
Health Expenses	0.025	2.91***	0.038	2.35**	0.033	2.35**	0.034	2.28**
Total Expenditures	0.030	4.31***	0.021	1.62*	0.089	8.42***	0.148	9.65***
Food Insecurity: Food Secure~0 (Base category)								
Mild food insecurity	-0.009	-0.62	-0.034	-2.12***	-0.034	-2.32**	0.002	0.12
Severe food insecurity	-0.059	-5.11***	-0.072	-4.13***	-0.061	-4.11***	-0.287	-11.0***
Asset Poverty: Asset Poor~0 (Base category)								
Mild asset poor	-0.036	-2.24**	-0.029	-2.25**	-0.026	-1.54	-0.040	-1.72*
Average assets	-0.021	-1.97**	-0.045	-1.94**	-0.107	-6.52***	0.082	3.41***
Mild asset rich	0.036	2.42***	0.027	1.17	0.136	7.31***	0.103	4.02***
Asset rich	-0.016	-0.92	0.018	0.64	0.210	11.61***	0.179	7.53***
Health Expenditure Group: Low~0 (Base category)								
Mild low	0.038	3.02***	0.052	1.72*	0.026	1.30	0.041	1.73*
Mild high	0.080	4.61***	0.044	1.92**	0.060	2.22**	0.112	3.12***
High	0.104	3.84***	0.050	1.03	0.126	3.21***	0.195	3.31***

Demographic Factors								
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Region	-0.020	-2.2**	0.025	1.7*	-0.078	-6.3***	-0.053	-2.9***
House Ownership	-0.030	-2.1**	-0.004	-0.6	0.082	2.9***	0.002	0.2
Sex of Household	-0.010	-1.0	0.023	1.7*	-0.002	-0.1	-0.054	-2.1**
Health Gadgets	0.021	4.7***	0.090	2.1**	0.001	0.1	-0.016	-1.2

Housing Characteristics								
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Electricity	0.021	1.0	0.038	2.1**	0.076	4.3***	0.122	5.3***
Water	0.039	2.4***	0.022	2.1**	0.017	1.2	0.132	7.6***
Toilet	0.027	1.9*	0.048	2.2***	0.064	2.9***	0.058	1.6*
Rooms	0.010	3.3***	0.010	2.4**	0.014	2.3**	0.010	1.9*
Internet	0.007	4.1***	-0.007	-0.5	-0.043	-3.2***	-0.022	-1.0
Mobile	0.040	2.3**	-0.050	-2.1*	0.034	1.5	0.032	1.1
Landline	0.019	1.0	-0.011	-0.2	0.019	0.3	0.000	0.0
Computer	0.001	0.1	-0.021	-0.8	0.033	2.7**	0.035	0.8
Sverige	0.034	2.3**	0.001	0.1	0.026	8.3***	0.015	2.9***
Fuel	-0.010	-2.5**	0.014	3.2***	0.027	8.8***	0.043	11***

*Note: dy/dx for factor levels is the discrete change from the base level. ***,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

The results suggest that food security is a vital problem in Sindh that must be addressed and controlled by the authorities. Asset poverty is a source of indirect

income but it may not be helpful in a condition where a household is not willing to sell the immovable assets to meet the short-run economic calamities of the family. According to the probability derivatives of asset poverty, the probability of improved child health increases as the category of household change changes from asset poor to asset rich. A person who holds a medium level of assets tends to reduce the chance of a child's adverse health by 10.7% if a household is having sufficient assets that household tends to improve the child's health by 13.6% while a household with a large number of assets holding increases the probability of improved child health by 21.0%.

At last, the Baluchistan Province shows a relatively same trend as other provinces but still lacking behind. A 1% increase in the health expenses by the household is expected to bring a 3.4% improvement in the child's health. As a deep insight, this impact increases as the expenditure group changes from low to high. The probability of child health improvement increases by 4.1%, 11.2%, and 19.5% as the expenditure level of the household increases to a high level. Total expenditure also shows the same pattern in this regard. Not only the health expenses but expenditures other than that also show a 14.8% improvement in the child's health by an increase in the total expenditure of a household upon the family. Here the variable of food insecurity shows some mixed outcomes. A household that is mild food insecure shows no impact on child health unless the food insecurity level reaches an extreme. A household that is high-level food insecure by 1% is expected to bring about a 28.7% decline in the child's health measures. Asset poverty shows a conventional outcome. In a household moving from asset poor to the level of asset rich the expected probability of a child's improved health goes on decreases by 4.1%, for a mildly asset-poor household. For asset mild rich and rich households, the probability of an increase in the number of healthy children rises from 10.3% to 17.9% respectively in Baluchistan province.

5.5.2 Demographic factors

The marginal effects of the demographic factors on child health are reported in Table 5.2 (b). Considering Punjab, regional differences i.e. rural-urban differences play a significant role of 2% change in determining the child's health status. This is obvious that urban regions are more facilitated with health facilities compared to rural areas. However, on another side, rural areas are having clean ecosystem compared to

the polluted environment in the cities. Both have pros and cons, but rural areas are at more risk of adverse health the children. House ownership (-0.03) shows that households who own the house are more likely to have healthy children by 3% compared to those who do not own the house. Households possessed with hi-tech gadgets at home like smart medical types of equipment are increasing the chances of healthy children by 2.1% upon every unit change in the hi-tech gadgets at home. The gender of a household doesn't show significance in this regard.

In KPK, the marginal regional changes are most probable to affect the probability of a healthy child compared to unhealthy children by 2.5%. similarly, gender changes in a household are likely to bring about the expected change in child health conditions by 2.3% per cent, meaning that families that are headed by male counterparts are having a high ratio of healthy children compared to families headed by females. The results also show a noteworthy change in improving child health by 9% due to using health-supported technological gadgets at home.

In Sindh, regional differences also play a significant role in determining the child's improved health in Sindh. House ownership is also significant and positively associated with the child health issue in Sindh province meaning that a household that lives in his or her own house shows a positive relationship in improving a child's health. however, household gender and technological gadget in the house doesn't show any significant impact in affecting child health in Sindh.

In Baluchistan, the regional differences are obvious as in the other provinces that's why it is shown by a negative sign which is statistically significant. House and technological gadgets have shown no impact on child health. however, the gender of a household shows a significant relationship to child health. this means that if a household is male rather than female is expected to have more healthy children and vice versa.

Table 5.2 (b) also shows the estimates of the characteristics of the house and their role in affecting the children. According to the results, safe drinking water, availability of toilets at home, and the number of rooms in the house are having a positive association with the child health ratio of being healthy in Punjab. As the number of rooms increases, there is a space provided for the activities of children in an open space. More likely, more space makes it possible for the household to

perform the house activities separately compare to congested houses where a single room is used for different household activities like sleeping, cooking, dining, etc. Internet and mobile phones show a direct relationship with the dependent variable. The estimates also show that houses with proper sewerage lines and proper waste disposal procedures also leave a positive change in the outcome variable i.e. child health meaning that proper sewerage increases the health of a child. The type of fuel also shows a positive and significant impact on the child's health in Punjab.

5.5.3 Housing Characteristics

Considering the coefficients of the household characteristics of child health in the Khyber-Pakhtunkhwa province, facilities like the availability of electricity in positively associated with the chance of having a healthy child. The availability of clean drinking water also has a positive effect on the health of a child in the Khyber-Pakhtunkhwa province. Toilet facility at home has a highly significant effect on a child's health outcomes. According to the table, the space available per person in the house is positively associated with the child's health, meaning that as the number of rooms increases the chance of a healthy child increases. Another important factor is the type of fuel used for cooking etc. A change in the source of fuel for cooking brings about a significant positive impact on the outcome variable i.e. child health. some fuel like burning kerosine oil and dung cakes makes tremendous smoke and other hazardous gases which directly affects the health of a child as well as other members of the house. More surprisingly a mobile phone harms the child's health because it directly affects the body due to its strong signals. Similarly, excessive use of mobile phones for pregnant women is also very risky for the same reasons.

For Sindh province, the probability of change in the dependent variable by a unit change in the housing characteristics in Sindh. A house with a proper connection to electricity shows an improvement in the probability of child health by 7.6%. if there is a 1% positive change in the availability of safe drinking water, this increases the chance of improvement in the health of a child by 1.7%. availability of toilet facilities in a house brings about a 6.4% improvement in child health in Sindh. House crowding proxied by the number of rooms shows a significant impact on the child's health if the capacity of a house compared to the number of people living increases by 1% there is a probability to improve a child's health by 1.4% accordingly. Internet shows however a negative role in child health. a unit per cent increase in the use of

the internet reduces the expected probability of a child's improved health by 4.3%. the use of computers comes out to be positive in determining the child's health by 3.3% change child health. the types of fuel used in a house for cooking and heating and proper sanitation of a house are expected to bring a positive change in child health by 2.7% and 2.6% respectively.

Looking at the marginal effects of household characteristics on child health in Baluchistan, a unit increase in the availability of electricity in a house is expected to increase the probability of improved child health by 12.2%. safe drinking water is expected to bring about an improvement of 13.2% if there is a 1% increase in the magnitude of safe water availability to the household. As discussed earlier the toilet is very important to prevent the members of a house from any harmful germs. If toilet availability is enhanced by 1%, this reduces the probability of child sickness by 5.8%. The number of rooms or housing capacity is having a mild impact, but it cannot even be ignored to explain the child health factor. An expected 1.0% improved change is expected if the accommodation of the house is enhanced by a unit per cent. As the people of this province is commonly living in spacious houses that's why this impact here is a mild one. Gadgets like mobile phones, computers, internet, etc have no significant impact on the improve child health in the province whereas, proper sanitation in the house reduces child morbidity by 1.5%. The type of fuel, which is a gas taken as a base category, if used as a means of cooking and heating reduces the chance of child sickness by 4.3%.

5.6 Levine's Test of Variance for Independent Samples

Further in-depth analysis shows another test to show the estimates of the independent sample t-test. This test is a statistical method used to analyze the means of two groups. In this case, the two groups (rural/urban) regions. In the independent t-test, the two groups must be from the same population, and then the mean of the two sample groups may be the same. But if the sample groups are taken from a different population, the mean may be different. In this case, the sample groups are taken from the same population to see whether the means sample are the same or different. This analysis is helpful to conclude that depending on the available resources in different demographic situations, the outcome variable shows different characteristics or not. The fundamental premise of independent samples of one another is the foundation of the independent sample t-test. Levine's variances are based on the F-statistics

demonstrating the equality of variances among the two groups, whereas the independent sample t-test is based on the null hypothesis assuming that the means of the two independent groups are not significantly different against the alternative that the means of the groups are significantly different. The degree of freedom for the t-test is the summation of the two samples less 2 $(n_1 + n_2 - 2)$. The only shortcoming of this test is that it cannot be applied to groups of more than two in number. That is why this is the best test to compare the mean difference in the rural and urban sample groups in this study.

The estimates of the independent sample t-test (Gerald, 2018), which assumes two independent groups of rural and urban regions, are shown in Table 5.3. The null is assumed to have equal means of the sample. According to the table, the assets poverty is showing a highly significant F-stat (258). with this, the null hypothesis of equal means is rejected. This means that there is a significant difference exists in the means values of the asset poverty among the dwellers of rural and urban areas. This outcome supports the logit estimates of assets poverty for the region in the earlier tables. Health expenditures of the households have an insignificant F-value (0.077) which means that here the null is accepted and there is no meaningful difference in the means of health expenditure behaviour between the rural and urban households. Food insecurity also shows high significance for the F-value (1435) means that again there is a mean difference between the food insecure people living in urban and rural regions of Pakistan.

Table 5.3 shows the estimates of the independent sample t-test for comparing the demographic factors between the rural and urban regions of the country. It is clear from the table that all the demographic characteristics determining the child health outcomes in the country are highly significant in their respective F-statistics. This means that all the factors of demography at the country level are having means differences. For all the factors the null hypothesis is rejected assuming equal means. The country is having clear differences among the people of different provinces, house ownership in the rural-urban regions, gender of a household, use of technological gadgets, and child health.

The health of the child is also shown in Table 5.3, and practically all of the selected housing characteristics are significant against the F-stat values, rejecting the null hypothesis in favour of the alternative hypothesis. According to the findings,

there are significant mean differences between the population of the country's rural and urban areas regarding things like access to electricity, a functioning toilet system, sewerage, clean drinking water, fuel for cooking and heating, and technological tools like a mobile phone, a landline phone, an internet connection, a computer, etc.

Table 5.3
Country-level Variation Among the Economic Factors Affecting Child

		Levene's Test for Variance	Test for Mean
		F-statistic	t-statistic
Economics Factors			
Asset Poverty	No Variance Exist	258***	-66.0***
	Variances Exist		-67.9***
Health Expenditures	No Variance Exist	0.07	-3.20***
	Variances Exist		-3.10***
Total Expenses	No Variance Exist	28.1***	-47.4***
	Variances Exist		-46.5***
Food Insecurity	No Variance Exist	1435***	24.3***
	Variances Exist		25.4***
Demographic Factors			
Province	No Variance Exist	8***	-7.7***
	Variances Exist		-7.8***
House Ownership	No Variance Exist	2272***	-29.7***
	Variances Exist		-28.0***
Sex of a Household	No Variance Exist	537***	-11.7***
	Variances Exist		-10.4***
Health Gadgets	No Variance Exist	1624***	-48.9***
	Variances Exist		-46.3***
Child Health	No Variance Exist	26***	2.5**
	Variances Exist		2.5**
Child Mortality	No Variance Exist	368***	9.3***
	Variances Exist		9.69***
Housing Characteristics			
Availability of Electricity	No Variance Exist	5919***	-33.3***
	Variances Exist		-40.9***
Availability of safe drinking water	No Variance Exist	110***	-5.2***
	Variances Exist		-5.3***
Toilet Facility	No Variance Exist	1099***	-41.9***
	Variances Exist		-53.9***
Rooms in the house	No Variance Exist	6**	-11.3***
	Variances Exist		-11.4***
Fuel for cooking & Heating	No Variance Exist	10811***	21.2***
	Variances Exist		26.3***
Internet Facility	No Variance Exist	3632***	-43.9***
	Variances Exist		-41.8***
Mobile Facility	No Variance Exist	1362***	-17.6***
	Variances Exist		-20.5***
Landline Facility	No Variance Exist	964***	-15.3***
	Variances Exist		-12.9***
Computer Facility	No Variance Exist	3882***	-30.1***
	Variances Exist		-25.7***
Sewerage	No Variance Exist	708***	25.1***
	Variances Exist		27.2***

****,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

5.7 Test for Equality of Mean and Variance (Rural/Urban) Among the Factors Affecting Child Health at the Province Level

This section highlights the province-wide difference regarding child health statistics. Each province is analyzed via. robust tests to get efficient estimates.

Table 5.4 encircles the province-wide variation among the economic factors of child health in Pakistan. Considering the KPK province we see that the Assets group, Health expenditures, and total expenditures of the household have a highly significant F-stat value. This rejects the null hypothesis of equal variances across the province. Alternatively, it is said that there exists a mean difference among these variables in the rural and urban populations in the province. Food insecurity on the other hand shows a different result as the F-value is too low for significance, since the null hypothesis is accepted for food insecurity this shows that rural and urban population in Khyber Pakhtunkhwa province shows no meaningful difference in the occurrence of food insecurity among the rural and urban groups. On the other hand, health expenditures show insignificant t-stat showing equality of means between the two groups.

Table 5.4 also reflects the t-test and F-test outcomes for the demographic factors between the rural and urban areas of the Punjab province. According to the mean test, the null hypothesis for the child health factor is accepted for equality at a very small t-value (-0.9), meaning that there is no meaningful difference between the probability of child health between the rural and urban regions of Punjab. However, the null hypothesis is rejected for the corresponding p-values less than the 5% threshold of significance, indicating that there is a significant mean difference between the two groups for characteristics including child mortality, home ownership, and household gender.

Looking into the KPK province Table 5.11 shows the mean difference among the demographic factors in Khyber Pakhtunkhwa province. According to the results of the test, child mortality is showing an insignificant result (t= -0.2) accepting the null hypothesis of equal means across the sample groups, and also child health shows the same results of equal means. Whereas, Levine's test shows equal variances for only child mortality across the province.

Table 5.4
Province-wide Variance Among the Factors Affecting Child Health

		Punjab		KPK		Sindh		Baluchistan	
Economic Factors									
		F-stat	t-stat	F-stat	t-stat	F-stat	t-stat	F-stat	t-stat
Asset Poverty	No Variance Exists	299***	-42.0***	75.0***	-26.0***	147***	-54.0***	11.0***	-19.0***
	Variances Exist		-45.0***		-27.0***		-53.0***		-19.0***
Health Expenses	No Variance Exists	29.0***	-35.0***	4.0**	-1.0	1.42	-3.41***	2.01	-1.77*
	Variances Exist		-34.0***		-1.0		-3.32***		-1.75*
Total Expenditures	No Variance Exists	25.0***	22.0***	30.0***	-14.0***	1.81	-31.0***	0.24	-11.0***
	Variances Exist		22.0***		-13.0***		-31.0***		-11.0***
Food Insecurity	No Variance Exists	1185***	17.0***	0.17	3.96***	252***	23.0***	22.0***	3.24***
	Variances Exist		18.0***		3.94***		23.0***		3.38***
Demographic Factors									
		Punjab		**KPK**		**Sindh**		**Baluchistan**	
		F-stat	t-stat	F-stat	t-stat	F-stat	t-stat	F-stat	t-stat
House Ownership	No Variance Exists	839***	-18.0***	214***	-10.0***	1545***	-21.0***	27.0***	-2.63***
	Variances Exist		-17.0***		-10.0***		-20.0***		-2.13**
Sex of Household	No Variance Exists	143***	-6.11***	320***	-9.10***	235***	-7.68***	156***	-7.62***
	Variances Exist		-5.35***		-7.33***		-6.95***		-7.23***
Health Gadgets	No Variance Exists	712***	-31.0***	61.0***	-17.0***	731***	-32.0***	281***	-12.0***
	Variances Exist		-29.0***		-17.0***		-31.0***		-11.0***
Child Health	No Variance Exists	3.0**	-0.96	10.0***	-1.64*	215***	7.1.0***	9.0***	8.40***
	Variances Exist		-0.93		-1.69*		7.25***		9.51***
Child Mortality	No Variance Exists	299***	8.3***	0.22	-0.20	278***	8.18***	5.0**	-1.22
	Variances Exist		8.7***		-0.2		8.3***		-1.19
Housing Characteristics									
		Punjab		**KPK**		**Sindh**		**Baluchistan**	
		F-stat	t-stat	F-stat	t-stat	F-stat	t-stat	F-stat	t-stat
Availability of Electricity	No Variance Exists	876***	-14***	806***	-12***	5318***	-27***	2334***	-16***
	Variances Exist		-17***		-15***		-29***		-20***
Availability of safe drinking water	No Variance Exists	92***	-4.7***	110***	-5***	25***	-2.5**	3*	-0.9
	Variances Exist		-5.0***		-5***		-2.5**		-0.9
Toilet Facility	No Variance Exists	4598***	-27***	703***	-11***	5931***	-27***	1650***	-14***
	Variances Exist		-36***		-16***		-31***		-19***
Rooms in the house	No Variance Exists	18***	-6.9***	0.53	-3***	72***	-22***	6***	-1.6*
	Variances Exist		-6.8***		-3***		-21***		-1.6*
Fuel for cooking & heating	No Variance Exists	1030*** 7	28***	217***	-9***	1911***	2.9***	156***	-1.7*
	Variances Exist		37***		-10***		3.2***		-2**
Internet Facility	No Variance Exists	1498***	-28***	164***	-14***	1966***	-31***	338***	-9***
	Variances Exist		-26***		-14***		-30***		-8***
Mobile Facility	No Variance Exists	534***	-11***	158***	-6***	747***	-12***	89***	-4***
	Variances Exist		-13***		-7***		-13***		-5***
Landline Facility	No Variance Exists	777***	-13***	42***	-3***	274***	-8***	84***	-4***
	Variances Exist		-10***		-2.9***		-7.3***		-3***
Computer Facility	No Variance Exists	1682***	-20***	641***	-12***	1220***	-16***	680***	-11***
	Variances Exist		-16***		-10***		-14***		-8***
Sewerage	No Variance Exists	2634***	-24***	37***	4***	823***	21***	413***	2**
	Variances Exist		-19.8***		5.2***		22***		

****,**, and * shows significance at 1%,5% and 10% respectively.*

House ownership, gender, and technology show highly significant outcomes hence rejecting the null hypothesis by both the t-test and F-test meaning that there exists a significant difference among the demographic factors in the rural and urban regions of the province.

For Sindh province, the results of the test, all factors are showing highly significant t-values. The significance of t-values at 5% significance shows the rejection of a null hypothesis of equal means across the sample groups. The result for Levine's test also shows the same results of equal variances. House ownership, gender, and technology show highly significant outcomes hence rejecting the null hypothesis by both the t-test and F-test meaning that there exists a significant difference among the demographic factors in the rural and urban regions of Sindh.

However, for Baluchistan, all factors are showing highly significant t-values except for child mortality. The significance of t-values at 5% significance shows the rejection of a null hypothesis of equal means across the sample groups, whereas, the null is accepted for child mortality meaning that the means of urban-rural households are the same. The result for Levine's test shows the results of equal variances for all factors i.e. House ownership, gender, child health, child mortality, and technology show highly significant outcomes hence rejecting the null hypothesis of equal variances meaning that the sample variance for the two independent samples is different in different regions in the province.

According to Table 5.4, the independent sample t-test and F-tests for the housing characteristics explain the changes in rural and urban regions in Punjab. According to the test results, having access to clean drinking water, electricity, toilets, a sufficient number of rooms, a variety of cooking fuels, internet access, landlines, mobile phones, computers, and a proper sewer system are all highly significant in the corresponding t-stats against each category. We reject the null hypothesis, according to which the means of the two independent groups are equal if the t-statistics are significant. However, in this study, the means of the two groups are not the same. This means that there are differences in the means of the two groups regarding all the selected housing characteristics in Punjab.

For KPK province the result shows that all the factors of the house show a highly significant t-stat showing a rejection of the null hypothesis of equal means. The results documents that there is a meaningful difference exists between the two regional groups. On the other side, Levine's test for equal variances shows that all factors contain the regional differences in variances for the two sample groups except the house crowding, for which the null is accepted to have an equal variance between the rural and urban population across the province.

The outcomes in Sindh are not much different either. According to Table 5.4, the null hypothesis of equal means is rejected for all housing factors, which demonstrates a highly significant t-statistic. The evidence from the results shows that the two geographic groups' means differ.

On the other side, Levine's test for equal variances shows that all factors contain the regional differences in variances for the two sample groups except the house crowding, for which the null is accepted to have an equal variance between the rural and urban population across the province.

In Baluchistan, according to the outcome of the test, availability of electricity, toilet facility, number of rooms in the house, the type of fuel for cooking in the house, internet facility, landline, mobile, computer, and a proper sevrage facility is showing high significance on the respective t-stats against each category except the safe drinking water that shows the t-value (-0.9) which is too less and hence insignificant. Since there is no apparent difference between the two sample groups based on the availability of drinking water in both regions, the null hypothesis is accepted for this component. For the remaining factors, all the t-values against each factor are significant, which means that the null hypothesis is rejected. Rejection of null states that the means of the two independent groups are not equal. However, in this study, the means of the two groups are not the same. This means that there are differences in the means of the two groups regarding all the selected housing characteristics in Baluchistan. For more literature on provincial and regional differences see (Wright and Simmon, 2003).

5.8 Post-Hock Test (ANOVA) for Comparing Multiple Samples

Now the results are checked for some further tests to take a deep insight into the situation. As previously mentioned, earlier tests are used to determine whether there is a mean difference between the two independent sample groups. The

independent sample t-test is suitable for encapsulating regional variations at the national and provincial levels. As we know that it is now better to check for any possible mean difference among the provinces of the country as there are different samples of each province and each province has its own set of economic and social circles. For this purpose, Analysis of Variance of specifically called one-way ANOVA is applied (Kim, 2017). The main focus of this test is seeing any mean difference among the sample of more than two or we can say that if there are a few sample groups then one-way ANOVA is applied to see the significant difference among the means of the groups. The results for the one-way ANOVA are reported in Table 5.13. According to the table, the mean square between the groups is 1.49 which has a corresponding value F-value of 8.52. the F-value for the ANOVA test is highly significant at a 1% level whereas the software assumes a default value of alpha= 0.05. As the F-statistic is highly significant this means that there is a significant difference exists between at least two of the groups among the total. Here it must be kept in mind that this test doesn't claim a mean difference among all the selected groups. A significant difference might exist between any of the two groups or it may be between all the groups. To see the exact mean difference among the group there is another test named Post Hock test for ANOVA also followed by Sedgwick (2014) presented by Tukey. The results of Tukey's Post Hock test are reported in Table 5.5 as follows;

Table 5.5
Post-Hock Test (ANOVA) for the Determinants of Child Health

ANOVA Table At least one child is sick					
	Sum of Squares	df	Mean Square	F-stat	Sig.
Between Groups	4.476	3	1.492	8.525	0.000
Within Groups	4341.3	24805	0.175		
Total	4345.8	24808			

Note: Groups are provinces. Source: Author's calculations.

Table 5.6
Post-Hock Test for Variances for Multiple Groups (Provinces)

At least one child is sick: Tukey B[a,b]			
Province	N	Subset for alpha = 0.05	
		1	2
Baluchistan	2327	0.191	
Punjab	11781		0.223
Khyber Pakhtunkhwa	4485		0.232
Sindh	6216		0.241

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 4452
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Source: Author's calculations.

Table 5.6 shows the Post Hock analysis for testing any significant difference among the groups. For this purpose, Tukey's B Post Hock test is applied. According to the table, all provinces are considered as the independent four sample groups. There are two categories of groups. In Category 1, there is only one province that is Baluchistan, whereas, in Category 2, there are remaining three provinces namely, Punjab, Khyber Pakhtunkhwa, and Sind. This means that there is no significant difference exists among the variances of Punjab, Sindh, and Khyber Pakhtunkhwa provinces. Whereas, there exists a difference of variance regarding child health between Baluchistan and the other provinces of the country. The results can be further elaborated as Baluchistan shows a different trend in child health from the other province. This is obvious because Baluchistan is always remaining a deprived province of Pakistan. comparing the basic need and health facilities this province is lagging because of political injustice, law and order situation, and other socio-economic hurdles in the way of its development. Even though this province is having some God-gifted economic zones like the world's natural deepest seaport, shipyards, and other coastal regions that are abundant in coal reservoirs but unfortunately despite all these factors this province gets very little care from the governing parties. To illustrate the results further to check which group varies from which other group, the Games-Howell test is applied to the data. The results are reported in Table 5.15

Table 5.7
Post-Hock Test for Multiple Comparisons

Games-Howell Test		
(I) Province	(J) Province	Mean Difference (I-J)
Khyber Pakhtunkhwa	Punjab	0.009
	Sindh	-0.008
	Baluchistan	0.041*
	KPK	-0.009
Punjab	Sindh	-0.017*
	Baluchistan	0.032*
	KPK	0.008*
Sindh	Punjab	0.017*
	Baluchistan	0.049*
	KPK	-0.041*
Baluchistan	Punjab	-0.032*
	Sindh	-0.049*

**. The mean difference is significant at the 0.05 level.*

Source: Author's calculations.

Table 5.7 shows the results of the Games-Howell test for multiple comparisons of child health among the different groups, the first column of the table shows the province (I) while the second column shows the province (J). Both columns

are compared for the mean comparison against the significance values. The rule of thumb for the result is that there is no significant difference between the means of the groups I–J and vice versa if the P-value is less than the 5% significance value. The outcomes of the Games-Howell are the in-depth analysis of Tukey's B test. From Table 5.7, it is shown that there is no noteworthy mean difference between Khyber Pakhtunkhwa and Punjab. This outcome is consistent with the preceding table, in which all three provinces—except Baluchistan—were grouped. Similarly, there is no significant mean difference between Khyber Pakhtunkhwa and Sindh as the p-value (0.741) is greater than the 5% level of significance. The p-value (0.000) is highly significant at 1% alpha showing that there is a significant mean difference exists between the Khyber Pakhtunkhwa and Baluchistan provinces. In the next row, Punjab is compared to the other provinces. The result for Punjab shows that there is no significant mean difference between Punjab and Khyber Pakhtunkhwa, whereas there is a meaningful difference exists between Punjab and Sindh and also between Punjab and Baluchistan. Next, Sindh is taken as a reference. As the p-value (0.741) is more than the 0.05 level of significance, the result indicates that there is no significant mean difference between Sindh and Khyber Pakhtunkhwa. Between Sindh and Baluchistan, as well as between Sindh and Punjab, there is a meaningful difference. Finally, at a 5% level of significance, we can see that Baluchistan differs significantly from the other three provinces.

Concluding the discussion of factors affecting child health after the detailed empirical analysis and tests, this study finds that health expenditures reflect a deep impact on improved child health in KPK. Due o a low health budget disbursement in provinces like Sindh and Baluchistan, the situation is quite opposite to that of Punjab and KPK. The people of Baluchistan are relatively more food insecure followed by Sindh, KPK, and Punjab. It is because of the reason that Punjab is having more opportunities for the people to earn their livelihood. Asset poverty in Baluchistan and Sindh is a serious matter of concern. There is a ritual of different groups' of dominant families that retard people to sell their properties to other people except them. That's why they do not even think of getting a fruitful amount to achieve their objectives. Sindh and Baluchistan are also lacking behind in the regional differentials, meaning that rural areas in their provinces are more backward and away from the basic facilities of life compared to KPK and Punjab, however, house ownership in Punjab is a serious matter of concern where a larger population lives in a rented house and they

allocate handsome money to rents and hence sacrifice health expenditures. House characteristics like electricity and clean water are alarming in Baluchistan and Sindh. Sindh has also been very prominent in lacking electricity however KPK is average among the provinces regarding these facilities. The basic reason for reporting a huge number of ill children in Punjab and Sindh and Baluchistan is the non-availability of clean water. The overall picture shows that KPK is a relatively normal province regarding child health issues followed by Punjab, Sindh, and Baluchistan.

5.9 Logistic Estimates of the Factors Affecting Child Deaths in Pakistan

In the context of the prior estimation of 'child health', it is also obvious that there is a high risk of a sick child that may expire due to some of the same selected socioeconomic factors. Here it must be noted that besides the socio-economic factors, child adverse health conditions increase the chance of child death. Therefore, there is a need to further explore the impact of the selected socio-economic factor with an addition of child health now as an independent variable and to check if there is any critical role of this factor in the child mortality rate.

This would be an addition to the scope of the existing study and it will address the issue of child health and its role more clearly to see the United Nation's sustainable development goals and vision. Later, the ground for the indirect relationships will be built and this issue would be further elaborated. Before proceeding to the indirect relationship among the selected sample of the group, let us see the impact of selected socio-economic factors on the child mortality rate. Here the dependent variable is taken as the health death (mortality). Being a binary variable it takes a value of 1 if a child died and a value of 0, if otherwise.

5.9.1 Economic Factors

Table 5.8 (a) shows the logit estimates of the model using the aggregate sample of the country. The table is subdivided into the economic, socio-demographic, and housing characteristics, of child death in Pakistan. in this case, child mortality is also a binary variable having a value of 1, if a child is dead and a value of 0, otherwise. Economic factors show a significant impact on child mortality including household health expenditures and total expenditures other than health. Other expenditures included spending on the goods and services that makes the living

environment more feasible for the survival of the child. Health expenses of the household show a significant negative relationship with child mortality showing that if the health expenditures increase, the chance of a child's death reduces.

Table 5.8 (a)
Logistic Estimates of Factors Affecting Child Death in Pakistan

Child Death (dependent variable)	Coef.	t-statistic
Economic Factors		
Health Expenditures	-0.129	-3.22**
Total Expenses	-0.231	-6.41**
Food Insecurity: Food Secure~0 (Base category)		
Mild food insecurity	0.157	3.01**
Severe food insecurity	0.195	4.25**
Asset Poverty: Asset Poor~0 (Base category)		
Mild asset poor	-0.096	-1.72
Average assets	-0.191	-3.62**
Mild asset rich	-0.371	-5.43**
Asset rich	-0.539	-6.27***
Health Expenditure Group: Low~0 (Base category)		
Mild low	0.157	2.54*
Mild high	-0.128	2.47**
High	-0.223	-1.99*
Socio-Demographic Factors		
Region	-0.09	-2.01*
House Ownership	0.017	1.03
Sex of Household	0.039	0.87
Health Gadgets	-0.431	-4.81**
Child Health	-0.255	-6.32**
Housing Characteristics		
Electricity	-0.164	-2.73***
Safe Drinking Water	-0.141	-2.57***
Toilet	-0.192	-2.56**
Rooms in House	-0.011	-0.72
Internet	0.133	1.27
Mobile	0.398	3.42***
Landline	-0.070	-0.30
Computer	-0.428	-3.52***
Sevrage	-0.059	-4.31***
Fuel for cooking	0.038	4.41***
Constant	-3.947	-9.38***
Pseudo r-squared *0.510*	*Obs :24809*	
Chi-square *557.402 (0.000)*		
****,**, and * shows significance at 1%,5% and 10% respectively.*		

Source: Author's calculations.

This outcome is in line with the economic theory of consumer demand for health determinants. The same outcome is reported for the other expenditures of the household. In factor is further analyzed by grouping the household based on the level of spending. The groups are compared to the group of households who spend a very minor portion of their income. We see that for group 2 (households who are categorized as mild low spenders) the impact is positive on the mortality. This is according to the theory that if a household doesn't spend much on health may cause a child to be dead on the high probability. As we move to other groups 3 and 4, who are

mild high and high-level spender shows the impact to be negative as they can provide better health facilities for their child. Another factor is asset poverty which is a very important characteristic of a household of indirect income. Households are divided into 5 different groups starting from the asset poor household to the asset rich. Compared to the base category of asset poverty as the household becomes from asset poor level to asset rich, the impact becomes negative and highly statistically significant. This means that asset-rich people have a low rate of child mortality in the sample and vice versa. Another economic factor is food insecurity in a household. Food insecurity is an important element in explaining the health that may cause death if not timely controlled. Food insecurity is also categorized into three different groups. Food secure household is considered as a base category against households facing mild food insecurity and serious food insecurity. According to the table, there is a highly significant p-value (0.002 and 0.00) for mild food insecurity and severe food insecurity respectively. We conclude that as food insecurity increases the probability of child mortality increases accordingly. Food insecurity leads to the allocation of funds more to meet the basic needs of the family and health factor is sacrificed which leads to an increase the change of adverse health and even the death of a child.

5.9.2 Demographic Factors

In addition to the economic factors, some socio-demographics also play a key role in determining the death rate of children under 5 years. Regional differentials show a negative role in child death rates explaining the variation in the death rate across the rural-urban differentials. House ownership, whether a household is living in his/her own house or on rent shows no impact on the child death rates. Similarly, the gender of the household also shows insignificant results in this regard. Technology, however, shows a significant negative relationship with child deaths. Technological gadgets like thermometers and other equipment available in the house tend to reduce the chance of child death in the study population. Now the most important variable i.e. child health shows a negative relationship with the mortality of children with a high significance at a 1% level of significance. This outcome endorses the fact that child health is very deeply associated with child deaths as children under 5 years are more vulnerable to adverse health conditions.

5.9.3 Housing Characteristics

Housing characteristics are also very important in defining the death trends of children in Pakistan. According to the logit model expressed in Table 5.8, the availability of electricity in the house, availability of safe drinking water to the house members, and proper toilet system connected to a systematic sewerage system show a significant negative relationship with the children's death rate in Pakistan. this means that if these facilities are properly available in a house shall reduce the chance of child deaths. House crowding proxied by several rooms in the house and internet facility is statistically insignificant in the aggregate sample. The mobile phone however shows a surprising result of positive nexus towards the child death rate. It is because the radiation of the mobile used by the pregnant woman affects the child's survival rate before and after birth. Similarly, it is seen that a house with an excessive number of mobile phones shows a Hight rate of child death in the segregated sample. At last, the type of fuel used for cooking and heating except natural gas shows a positive impact on child death in Pakistan. means that fuel other than natural gas is causing an increasing trend in the child death rate.

5.10 Marginal Effects of Factors Influencing Child Deaths in Pakistan

Table 5.8 (b) shows the probability derivatives (marginal effects) of the factors affecting child deaths reported in Table 5.8 (a). The probability derivates are estimated to see the degree of change in the dependent variables caused by a unit change in the set of independent variables. The probability of change is reported by the estimated marginal effects of the variable, but this must be kept in mind that these estimates are the expected probability of change in the dependent variable.

5.10.1 Economic factors

First of all economic factors are addressed following the child death rates in Pakistan. An increase in health expenditures by 1% reduces the expected probability of child death by 4.2%. besides that other expenses other than health also reduces the chance of child mortality by 3.1%. if we look deep into the expenditure groups, we see that as the expenditure share of the income on health-related goods and services increases by one per cent unit, the probability of child death reduces by 2.5% and 3.0% respectively. Looking into the other economic aspects like the food insecurity situation of the household shows a significant impact on the child death rates. A

person who is mild food insecure compared to a food secure person faces an expected increase of 2.1% in child mortality and if there is a 1% rise in food insecurity further it is likely to increase the chance of child death by 2.6%. similarly, the table also addresses the problem of asset poverty in the household. Asset poverty is taken as a base category against the further categories of the asset-rich household. According to the table, a household that is just above the extreme asset poor enhances a change of deaths by 1.4%.

Table 5.8 (b)
Marginal Effects of Factors Affecting Child Death in Pakistan

Child Death (dependent variable	**dy/dx**	**z-statistic**
Economic Factors		
Health Expenditures	-0.042	-2.82**
Total Expenses	-0.031	2.21 ***
Food Insecurity: Food Secure~0 (Base category)		
Mild food insecurity	0.021	2.92**
Severe food insecurity	0.026	4.14**
Asset Poverty: Asset Poor~0 (Base category)		
Mild asset poor	0.014	1.74
Average assets	-0.028	-3.12**
Mild asset rich	-0.051	-5.35**
Asset rich	-0.070	-6.33**
Health Expenditure Group: Low~0 (Base category)		
Mild low	0.020	2.53**
Mild high	-0.025	-2.28**
High	-0.030	-1.92*
Socio-Demographic Factors		
Region	-0.012	-2.01**
House	0.002	1.03
Gender	0.005	0.80
Health Gadgets	-0.057	-4.81**
Child Health	-0.034	-6.32**
Housing Characteristics		
Electricity	-0.022	-2.73**
Water	-0.019	-2.72**
Toilet	-0.026	-2.52**
Rooms	-0.002	-0.75
Internet	0.018	1.26
Mobile	0.053	3.48**
Landline	-0.009	-0.31
Computer	0.057	3.52**
Sevrage	-0.031	2.81**
Fuel	0.005	4.41**

*Note: dy/dx for factor levels is the discrete change from the base level. ***,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

While, as this value goes on increasing toward a household who is asset rich this impact on the expected decline in the death rates reaches 7.0%. As the household status changes with every possible increase in the assets, the rate of death decline shows values of 2.8% and 5.1 respectively. This is because of the reason that asset holdings are the secondary sources of revenue for the household.

5.10.2 Demographic Factors

Looking into the socio-demographic factors on child deaths. According to the table, the regional differences are significant and show that if there is a change in the regional change by 1%, the expected mortality changes by 1.2%. The gender of the household is insignificant in this regard, however technological gadgets at home show a negative impact of about 5.7% if there is an increase in the use of these instruments. This means that a house that possesses these gadgets is likely to reduce child mortality by 5.7%. child health which is the key variable in this regard shows a decrease of 3.4% in the child mortality rate if there is a 1% improvement in child health.

5.10.3 Housing Characteristics

Housing characteristics play a vital role in determining the magnitude of child mortality. The table suggests that the availability of electricity in the house, availability of safe drinking water to the house members, and proper toilet system connected to a systematic sewerage system show a significant negative relationship with the children's death rate in Pakistan. this means that if these facilities are properly available in a house shall reduce the chance of child deaths if the availability of electricity increases by 1% point, it tends to decrease the chance of child mortality by 2.2%, similarly, a unit per cent increase in the availability of safe drinking water can reduce the child mortality by 1.9% whereas the availability of proper toilet system is expected to reduce the probability of child mortality 2.6% that is a noteworthy ratio in the selected sample of the study. House crowding and internet facilities are insignificant in the current sample while a 1% increase in the use of cell phones in the house is expected to increase the mortality rate by 5.3% which is a high value. The impact of sewerage in the house is quite high i.e. 3.1% while the type of fuel other than natural gas for heating and cooking purposes increases the mortality chances by a very low amount of 0.5% but still, it plays its role in the child mortality rate. It is important to note that all the values of $(\frac{dy}{dx})$ for the factor levels is the discrete change from the base level.

5.11 Province-wide Logistic Model Estimates of Economic Factors Affecting Child Death

Table 5.9(a) shows the logit estimates of the provinces. In this case, child mortality is a binary variable having a value of 1, if a child is dead and a value of 0, otherwise.

Table 5.9(a)
Province-wide Logistic Estimates of the Factors of Child Death

Economic Factors								
Child death	**Punjab**		**KPK**		**Sindh**		**Baluchistan**	
(dependent variable)	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
Health Expenditures	-0.138	-2.91***	-0.071	2.50**	-0.290	-2.07**	-0.219	-1.64*
Total Expenditures	-0.146	-2.72***	0.023	0.25	0.161	2.13**	0.325	2.22**
Food Insecurity: Food Secure~0 (Base category)								
Mild food insecurity	0.447	4.91***	0.380	3.77***	0.630	3.18***	0.366	1.72*
Severe food insecurity	0.158	2.32**	0.464	4.12***	0.821	4.61***	0.705	4.10***
Asset Poverty: Asset Poor~0 (Base category)								
Mild asset poor	0.156	1.71*	0.022	1.80*	-0.014	-0.14	0.227	-2.60**
Average assets	-0.246	-2.62***	0.056	2.02**	-0.269	-2.46**	-0.250	-2.11**
Mild asset rich	-0.475	-4.53***	0.035	0.22	-0.457	-3.02***	-0.914	-3.63***
Asset rich	-0.700	-5.32***	-0.240	-1.19	-0.858	-4.08***	-0.494	-2.58***
Health Expenditure Group: Low~0 (Base category)								
Mild low	0.080	0.90	-0.442	-2.23**	-0.197	-1.95*	-0.304	2.71***
Mild high	-0.068	-2.83***	-0.479	-2.02**	-0.311	-1.82*	-0.238	2.45**
High	-0.047	-2.12**	-0.547	-1.88*	0.389	1.57	0.399	0.96
Demographic Factors								
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Region	-0.187	-2.82***	0.118	1.20	-0.229	-2.45**	0.151	0.98
House Ownership	-0.035	-2.50**	0.025	0.64	0.008	0.20	0.041	0.63
Sex of Household Head	-0.037	-2.84***	-0.136	-2.56***	0.073	0.56	-0.253	-1.97*
Health Gadgets	-0.460	2.33***	-0.115	-0.67	-0.319	-1.67*	-0.265	2.20**
Child Health	-0.167	-2.80***	-0.224	-2.40**	-0.347	-4.44***	-0.471	-2.91***
Housing Characteristics								
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Electricity	-0.036	2.55***	0.047	0.45	-0.250	-2.44**	-0.248	-2.33**
Water	-0.262	-2.23**	-0.248	-2.44**	-0.441	-2.57***	-0.315	-1.91*
Toilet	-0.712	-6.64***	0.072	0.34	-0.132	-0.89	-0.293	2.24**
Rooms	-0.031	-2.82***	-0.078	-2.50**	-0.112	-2.43**	-0.058	-1.26
Internet	-0.504	-3.56***	-0.230	-1.11	-0.107	-0.45	-0.653	-2.25
Mobile	0.213	1.37	0.506	1.79*	-0.176	-0.76	-0.191	-4.87***
Landline	-0.68	-2.48**	-0.562	-1.62*	-0.774	-1.43	-0.022	-2.43**
Computer	0.019	0.43	-0.428	-3.59***	-0.135	-0.52	-0.868	-1.20
Sverige	-0.164	-6.12***	0.019	0.53	-0.094	-3.81***	-0.321	-2.12**
fuel	0.018	1.61	0.049	1.72*	-0.025	-1.95**	0.073	1.91*
Constant	-3.339	-5.90***	-4.208	-3.90***	-2.543	-2.73***	-4.294	-2.79***
Pseudo r-square	*0.621*							
Chi-square	*129.2*	*(0.000)*						

****,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

5.11.1 Economic Factors

For Punjab province, the sample is based on 11781 households. The table addresses the selected determinants of child mortality that are more or less the same as child morbidity in the previous case. According to the table, health expenditures of a household reduce the level of child deaths. The coefficient of health expenditures is highly significant which proves its importance in reducing child mortality in Punjab. Expenditures other than health also play a significant role in child mortality by showing a high significance and a negative sign confirms that if a household increases the other spending upon the members of the house can reduce the chance of child death in Punjab. The table also investigates the in-depth analysis of different expenditure groups of households. The groups are divided based on the level of spending on health-related economic goods and services. The base category of the expenditures group is the poor people who spend very less compared to the other extreme of the high level of spending households. This table also shows that for the highest health expenditure groups the coefficients are negative and highly significant, which means that as the spending increase, the child mortality rates decline. Asset poverty however shows some meaningful results. According to o the outcome table a household that is asset poor shows an increase in the child death rate. But those households who are relatively asset rich compared to the asset-poor people show a negative impact on the child mortality rate. This phenomenon justifies the theory that assets are the secondary sources of income for households that may be liquified if required.

For the KPK province; Economic factors are showing a significant impact on child mortality including household health expenditures and total expenditures other than health. Other expenditures included spending on the goods and services that makes the living environment more feasible for the survival of the child. Health expenditures on the health of a household is showing a significant negative relationship with child death showing that if health expenditures increase, the chance of a child's death declines. This outcome is in line with the economic theory of consumer demand for health-related goods and services. Other household expenditures are reported as insignificant for the Khyber Pakhtunkhwa province. this factor is further analyzed by grouping the household based on the level of spending.

The groups are compared to the group of households who spend a very minor portion of their income. We see that for group 2 (households who are categorized as mild low spenders) the impact is positive on the mortality. This is according to the theory that if a household doesn't spend much on health may cause a child to be dead on the high probability. As we move to other groups 3 and 4, who are mild high and high-level spender shows the impact to be negative as they can provide better health facilities for their child. Another factor is asset poverty which is a very important characteristic of a household of indirect income. Households are divided into 5 different groups starting from the asset poor household to the asset rich. Compared to the base category of asset poverty as the household becomes from asset-poor level to mild asset rich, the impact becomes negative and highly statistically significant. This means that as people tend to move towards the status of asset richness, they observe a low rate of child death in the sample and vice versa. Another economic factor is food insecurity in a household. Food insecurity is an important element in explaining the health that may cause death if not timely controlled. Food insecurity is also categorized into three different groups. Food secure household is considered as a base category against households facing mild food insecurity and serious food insecurity. According to the table, there is a highly significant p-value for the corresponding coefficients of mild food insecurity and severe food insecurity respectively. It is concluded that as food insecurity increases the probability of child mortality increases. It is because of a reason that food insecurity leads to the allocation of funds more to meet the other basic needs of the family and health factors sacrificed lead to an increase in the change of adverse health and even the death of a child.

Similarly, Sindh Province reflects a significant impact on child mortality including household health expenditures and total expenditures other than health. Other expenditures included spending on the goods and services that makes the living environment more feasible for the survival of the child. Health expenditures on the health of a household is showing a significant negative relationship with child deaths showing that if the health expenditures increase, the chance of a child's death declines. This outcome is in line with the economic theory of consumer demand for health-related goods and services. Other household expenditures are reported as insignificant for Sindh. This factor is further analyzed by grouping the household based on the level of spending. The groups are compared to the group of households who spend a very minor portion of their income. We see that for group 2 (households who are

categorized as mild low spenders) the impact is positive on the mortality. This is according to the theory that if a household doesn't spend much on health may cause a child to be dead on the high probability. As we move to other groups 3 and 4, who are mild high and high-level spender shows the impact to be negative as they can provide better health facilities for their child. Another factor is asset poverty which is a very important characteristic of a household of indirect income. Households are divided into 5 different groups starting from the asset poor household to the asset rich. Compared to the base category of asset poverty as the household becomes from asset-poor level to mild asset rich, the impact becomes negative and highly statistically significant. This means that as people tend to move towards the status of asset richness, they observe a low rate of child mortality in the sample and vice versa. Another economic factor is food insecurity in a household. Food insecurity is an important element in explaining the health that may cause death if not timely controlled. Food insecurity is also categorized into three different groups. Food-secure household is considered a base category against household facing mild food insecurity and serious food insecurity. According to the table, there is a highly significant p-value for the corresponding coefficients of mild food insecurity and severe food insecurity respectively. It is concluded that as food insecurity increases the probability of child mortality increases. This is because of a reason that food insecurity leads to the allocation of funds more to meet the other basic needs of the family and health factor is sacrificed leading to an increase in the chance of adverse health and even the death of a child.

Economic factors for Baluchistan are a little bit worrisome. The Table is showing a significant impact of health expenditures and other expenditures including spending on the goods and services that makes the living environment more feasible for the survival of the child. Health expenditures on the health of a household are showing a significant negative relationship with child mortality showing that if health expenditures increase, the chance of child death declines. Further analysis by grouping the household based on the level of spending shows that the groups who are spending a high proportion on goods and services other than health expenses may face a high rate of child death, but these groups are insignificant for the higher spending groups. Another factor is asset poverty which is a very important characteristic of a household of indirect income. Households are divided into different groups. Compared to the base category of asset poor level to mild asset rich, the impact

becomes negative and highly statistically significant. This means that as people tend to move towards the status of asset richness, they observe a low rate of child mortality in the sample and vice versa. Another economic factor is food insecurity in a household.

Food insecurity is an important element in explaining the health that may cause death if not timely controlled. Food insecurity is also categorized into three different groups. Food secure household is considered as a base category against households facing mild food insecurity and serious food insecurity. According to the table, there is a highly significant p-value for the corresponding coefficients of mild food insecurity and severe food insecurity respectively. It is concluded that as food insecurity increases the probability of child mortality increases. This is because of a reason that food insecurity leads to the allocation of funds more to meet the other basic needs of the family and health factor is sacrificed.

5.11.2 Demographic Factors

Table 5.9(a) shows the estimates of demographic factors affecting child deaths among the four provinces. According to the results concerning Punjab, the regional differentials or migration from rural to urban areas possesses a negative relationship with the child mortality rate. House ownership and the sex of a household Head (base category is male), both have a negative relationship with the child deaths rate in Punjab. Health-based technological gadgets also play a role in reducing the death factor. The health of children, which is an important element in this regard shows a counter effect in child mortality rates. Health Gadgets are always a source of first aid in the house. It reduces the instant death of patients as it provides an immediate source of medical care.

The rural-urban differentials and house owners of a household show no impact on child mortality in Khyber Pakhtunkhwa. Similarly, the gender of the household also shows a negative and statistically significant result in this regard, meaning that if a household is a male person it leads to reduce the chance of child death compared to those families that are headed by other than a male counterpart.

Literature in this regard explains that males are more technical and experienced in matters outside the house and they have an experience in public dealing. This factor is more prominent in the rural areas of the province. Technology,

however, shows an insignificant outcome on child deaths in Khyber Pakhtunkhwa. Now the most important variable i.e. child health shows an indirect relationship with the mortality of children with a high significance at a 1% level. This outcome endorses the fact that child health is very deeply associated with child deaths as children under 5 years are more vulnerable to adverse health conditions.

The situation is not much varying in Sindh. Urban Sindh is likely to be having a low death rate of children compared to rural areas because of the availability of health resources and other technological advancements while house ownership of a household shows no impact on child mortality in Sindh, these outcomes are verifying Wang (2012) The regional differences in the countries. Similarly, the gender of the household also shows no impact in this regard, meaning that if a household is male or female, that makes no difference in the child deaths in Sindh. Technology, however, shows a negative but significant outcome on child deaths in Sindh. Health gadgets have negative impacts on deaths i.e. houses with health instruments are likely to have less death of children as verified by Duke (2009). The most important variable i.e. child health shows a negative relationship with the mortality of children with a high statistical significance. An improved child's health (=1 if a child is healthy) is counter-effective on child mortality (=1 if the child is dead). This outcome endorses the fact that child health is very deeply associated with child deaths as children under 5 years are more vulnerable to adverse health conditions. This outcome is in line with Brockerhoff (2000), and Bryce et.al. (2003), etc.

In Baluchistan, the regional differentials show no significance between the regional probabilities of child deaths. House ownership of a household shows no impact on child mortality in Baluchistan. Similarly, the gender of the household also shows a positive impact in this regard, meaning that if a household is male as compared to female, the rate of child deaths reduces in Baluchistan Province. Technology, however, shows a negative but significant outcome on child deaths in Baluchistan. The use of technological gadgets in homes like a thermometer, blood pressure monitors, and other related items tends to reduce the chance of death in families. Baluchistan shows a similar trend given the child health and death co-relationship because child health is very deeply associated with child deaths as children under 5 years are more vulnerable to adverse health conditions.

5.11.3 Housing Factors

Discussing the household characteristics like electricity, availability of clean water for drinking, toilet facility, and sewerage system is also considered vital in child health care Miller (2017). The table shows the estimates of the binary Logit model for child death in four provinces of Pakistan. Considering Punjab we see a negative relationship between various household facilities like electricity, safe drinking water, proper toilets, and the Internet with the child death rate. Having these facilities improves child life hence causing a decline in deaths. However, mobile phones are having a positive impact on the death variable due to their harmful signal waves for small children. This outcome is in line with the findings of Jacob and Miller (2017). They also documented the same aspects while studying child mortality in European countries.

Housing characteristics are also very important in explaining the child death rate in KPK. According to the estimates of the logit model in Table 5.20(a), the availability of safe drinking water to the house members has a significant negative relationship with the child death rate. This means that clean water is the main source of concern that reduces the chance of child deaths in KPK. House crowding proxied by the number of rooms in the house and internet facility are statistically significant and positively associated with child mortality in this province as a house having more space to live reducing the rate of child deaths compared to congested houses. The reason is that congested houses are found to be dirtier compared to spacious houses as there are no separate compartments for cooking, washrooms, and other hygiene-related activities at home. Cell phones, however, show a surprising result i.e. positive towards child mortality. The reason is the same as that of Punjab province. In KPK, it is seen that a house with an excessive number of mobile phones shows a high rate of child death in the segregated sample of this province. The increase in the use of computers shows a rise in the deaths of children in KPK. On another hand, the type of fuel used for cooking and heating except natural gas shows an increase in child deaths in KPK due to the emission of smoke and hazardous gases from the type of fuel used.

Sindh province shows that the availability of safe drinking water to children has a significant negative relationship with child deaths, meaning that water is the main issue of concern that plays a vital role in reducing child deaths in the province. The number of rooms in the house and internet facility is statistically significant and

positively associated with the child mortality rate in Sindh province. Houses with more rooms to live in have a low rate of child deaths compared to houses with fewer rooms. Mobile phones, however, show a positive relationship with child death in Sindh. It is harmful radiation from the mobiles that adversely affect not only little children but also a pregnant woman and they may give birth to an unhealthy child.

A clean atmosphere is crucial in lowering child fatalities. Sevrage has a seriously detrimental effect on children's survival in Sindh. This implies that correct disposal of human waste lowers the level of bacteria and water pollution in the home, significantly lowering the risk of child fatalities.

Considering Baluchistan, the availability of safe drinking water is a problem of concern due to its backwardness. A smaller number of households are lucky enough to have this facility in the house. Table 5.20(a) shows a significant negative relationship between safe drinking water with child survival in Baluchistan. Similarly, the availability of electricity in the house also increases the number of children surviving. Most of the areas in Baluchistan are deserts. There is s high risk of snake bites and other hazardous insects due to the lack of visibility at night. Electricity plays an important role in this type of circumstance. Mobile phones as well as landline connections, however, show a surprising negative relationship with child death rate. The majority of people keep mobile just for communication purposes rather than to provide to children for entertainment purposes in Baluchistan. Sewerage plays a significant negative impact on child survival. This means that proper disposal of human waste reduces the germs and water contaminations in the house which deeply reduces the chances of child deaths. At last, the type of fuel for cooking and heating also leaves a meaningful impact on child deaths. In Baluchistan, households that used wood and coal or other means for cooking and heating purposes are reported to have life causalities inside the house mainly by suffocation or other disaster caused due to no safety measures in the house.

5.12 Province-wide Marginal Effects of Logit Model Estimates of Child Death

Table 5.9(b) reflects the marginal effects of the logit estimates given in Table 5.9(a). the probability derivates are calculated to see the change in the dependent variables caused by a unit change in the set of independent variables. The probability

of change is reported by the estimated marginal effects of the variable, but this must be kept in mind that these estimates are the expected probability of change in the dependent variable. As part (b) of the table reflects the same set of variables, therefore, here just the probability of change is reported, hence the justification of the kind of relationship among the variables is already explained in part (a) of Table 5.18. It is important to note that all the values of $(\frac{dy}{dx})$ for the discrete difference between factor levels and the base level.

Table 5.9 (b)
Province-wide Marginal Effects of Factors of Child Death

Economic Factors								
Child death	**Punjab**		**KPK**		**Sindh**		**Baluchistan**	
(dependent variable)	dy/dx	z-statistic	dy/dx	z-statistic	dy/dx	z-statistic	dy/dx	z-statistic
Health Expenses	-0.034	-2.11**	-0.071	2.80***	-0.089	-3.81***	-0.023	-1.60*
Total Expenditures	0.002	0.20	0.003	0.27	-0.043	-2.11**	0.035	2.23**
Food Insecurity: Food Secure~0 (Base category)								
Mild food insecurity	0.067	4.40***	0.050	3.67***	0.071	3.76***	0.032	1.92*
Severe food insecurity	0.022	2.21**	0.062	4.07***	0.083	2.55***	0.090	3.71***
Asset Poverty: Asset Poor~0 (Base category)								
Mild asset poor	0.025	1.75*	0.042	2.25**	0.002	0.17	0.037	2.33**
Average assets	-0.038	-2.56**	0.035	2.03**	-0.038	-2.45***	-0.040	-2.61***
Mild asset rich	-0.069	-4.35***	0.005	0.22	-0.060	-3.13***	-0.087	-3.60***
Asset rich	-0.094	-5.23***	-0.030	-1.16	-0.099	-4.72***	-0.054	-1.61*
Health Expenditure Group: Low~0 (Base category)								
Mild low	0.011	0.95	0.051	2.67***	-0.025	-1.65*	-0.032	2.15**
Mild high	-0.029	-2.42**	0.056	2.35***	-0.041	-1.83*	0.025	0.74
High	-0.026	-2.31**	0.065	1.94**	0.053	1.52	0.044	0.92
Demographic Factors								
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Region	-0.025	-2.81***	0.016	1.23	-0.031	-2.41***	0.016	0.93
House Ownership	-0.035	-2.92***	0.003	0.64	0.001	0.22	0.004	0.61
Sex of Household	-0.034	2.0**	-0.035	-2.54***	0.010	0.52	0.072	2.81***
Health Gadgets	-0.006	-0.4	-0.015	-0.62	-0.043	-1.62*	-0.041	-2.19**
Child Health	-0.162	-3.8***	-0.030	-2.44**	-0.047	-4.41***	-0.050	-2.96***
Housing Characteristics								
	Punjab		**KPK**		**Sindh**		**Baluchistan**	
Electricity	-0.050	-3.35***	0.006	0.31	-0.035	-2.54***	-0.034	-2.48***
Water	-0.035	-2.30**	-0.033	-2.74***	-0.063	-2.02**	-0.064	-3.73***
Toilet	-0.096	-6.61***	0.010	-0.33	-0.018	-0.81	-0.041	-2.12**
Rooms	-0.040	-3.02***	-0.010	-2.25***	-0.025	-2.23**	-0.006	-1.22
Internet	-0.068	-3.51***	-0.031	-1.10	-0.014	-0.42	-0.052	-2.01***
Mobile	0.029	1.32	0.067	1.83*	-0.024	-0.71	-0.032	-2.43***
Landline	-0.092	-2.40**	-0.075	-1.92**	-0.104	-1.44	-0.036	-2.17**
Computer	0.025	0.68	-0.057	-3.51***	-0.035	-1.26	0.068	-0.16
Sverige	-0.022	-6.16***	0.003	0.57	-0.043	-2.67***	-0.042	-2.23**
fuel	0.002	1.63*	0.045	2.17**	-0.014	-2.88***	0.008	1.94*

*Note: dy/dx for factor levels is the discrete change from the base level. ***,**, and * shows significance at 1%,5% and 10% respectively.*

Source: Author's calculations.

5.12.1 Economic Factors

Considering the economic factors of child deaths, Table 5.19 (b) shows the ultimate change caused by the independent variables in the model. Health expenditures in this regard play a vital role to reduce child deaths. In Punjab, this Impact is about 13.8% followed by Sindh (29%) and Baluchistan (21.9%). The impact of health expenditure in KPK is less (7.1%) compared to other provinces. As far as the critical economic factors are concerned, food insecurity is one of the many factors. The people of Sindh (82%) and Baluchistan (70%) are highly affected by the problem of food insecurity due to recent floods and other lack of interest by the government. child deaths are obvious in these provinces compared to Punjab where food insecurity brings about 15% of the child death rate. Similarly, asset poverty is a major contributor to the increasing deaths of children in Baluchistan (22.7%) and Punjab (15.6%). Whereas, this impact is vice-versa for the wealthy people in all provinces. Here a point of concern is that households with high spending on the health-related problem show a decline in the child death rates in all provinces but in this regard, Sindh (38%) and Baluchistan (39%) are the most prominent provinces where the role of health expenditures is noteworthy.

5.12.2 Demographic Factors

According to Table 5.9(b), the regional differences are insignificant along with the ownership of the house. Both of these factors show incidence on the dependent variable. Gender of the household is showing a reducing impact on child mortality, meaning that if a household head is male, child death is expected to decline by 3.4% compared to the female.

However, technological gadgets at home show no impact on child mortality in this Punjab. Child health is the key variable in this regard and it is obvious that a child with poor health has a greater chance of death compared to the healthy one. Improved child health reduces the probability of child death by 16.2%. The results for Punjab are in line with Ogunlesi, 2010.

The next province is KPK. According to the table, the regional differences are insignificant along with the ownership of the house. A household head, if male, is likely to have a 3.5% less chance of child death compared to a female head. This outcome is obvious in KPK as this province is highly enrichededed with cultural norms and values. The male is designated as heading authorities while females are

more restricted to performing the in-house obligations. However, health gadgets at home show no impact on child mortality in this province. Like the other provinces, KPK also reflects the same outcome for child health leading to child deaths and reducing it likely by 3%.

Sindh however shows no incidence of house ownership and Gender bias of a house head upon child deaths. On the other hand, rural-urban residency shows a change in child deaths by 3.1% i.e. rural region is likely to be having a low death rate of children compared to rural areas because of the availability of health resources. The use of technological gadgets is somehow helpful in reducing deaths by 4.3% in Sindh. Child health is the key variable in this regard and it is obvious that a child with poor health has a greater chance of death compared to the healthy one. The table shows that if there is a 1% improvement in child health, this will reduce the chance of child death by 4.7%.

Region and house ownership don't matter in Baluchistan. However, the gender of the household head shows a reducing impact on child deaths, meaning that houses with male heads are expected to show a decline in the deaths of children by 7.2% compared to female heads. Health gadgets at home show a 4% decline in child mortality. Child health is the key variable in this regard and it is obvious that a child with poor health has a greater chance of death compared to the healthy one. In Baluchistan, the chance of an unhealthy child's death is 5% more compared to a healthy child.

5.12.3 Housing Characteristics

Table 5.9(b) reflects the marginal effects of housing characteristics on child mortality among the four provinces. The table shows that the availability of electricity in the house, the availability of safe drinking water, and a proper toilet system connected to a systematic sewerage mechanism reduce the child death rate in Punjab. Electricity facility tends to reduce the chance of child mortality by 5%. Similarly, the availability of safe drinking water reduces the probability of child deaths by 3.5% compared to those who are confronted with the problem of contaminated water. A proper toilet system on the other hand is expected to reduce child mortality by 9.6% which is a noteworthy ratio in the selected sample of Punjab. Internet facility plays a vital role by providing the know-how to households and they can keep themselves

safe from externalities. Therefore, households having internet facilities reduce child death probability by 6.8%. The impact of sewerage in the house is 2.2% in Punjab.

In KPK, ensuring that kids have access to clean water cuts the likelihood of child fatalities by 3.3%. The number of rooms in a home is predicted to lower the likelihood of child death in this province by 1%. According to the data the use of cell phones tends to increase the mortality rate by 6.7% which is a high value. According to the study by Wigle et. al (2007) and Larik et. al. (2016), instead of mobile, if the landline is functional at the house, the data shows a counter effect on the mortality rate i.e. due to its viability and no radiation landline is expected to reduce the mortality rate by 7.5%. The type of fuel for cooking and heating purpose other than natural gas for heating and cooking purposes increases the mortality chances by 4.5%, which is a noteworthy rate of change.

Looking into the Sindh province, the marginal effects of having electricity facilities led to reducing the chance of child deaths by 3.5%. Similarly, a 1% increase in the availability of safe drinking water led to reducing the chance of child death by 6.3% in Sindh. House crowding (number of rooms) is highly significant in explaining the changes in the child mortality rates in Sindh. A 1% increase in the house's spacious capacity provides an environment for the children to survive by 2.5% more than otherwise. The impact of sewerage in the house is quite high. Sindh is always lagging in the hygienic ecosystem. Unfortunately, this province experiences a very bad sewerage system which is not only in the rainy seasons but also in normal times this province faces serious problems with sewerage, and hence a lot of people got seriously ill, especially children. Acceding to the outcome of the table if there is a 1% increase in the proper sewerage system, the probability of child mortality is expected to be reduced by 4.3% as compared to the otherwise conditions. Sindh accommodates a lot of rural areas where the fuel is for the purpose. Fuel other than natural gas for cooking is expected to reduce the child mortality rate by 1.4%.

The marginal effects of housing characteristics in Baluchistan are not much different from other provinces. According to the estimates in Table 5.9(b), the availability of electricity in the house, the availability of safe drinking water to a child, and a proper toilet system connected to a systematic sewerage system tend to reduce the child death rate in Baluchistan. Availability of electricity tends to decrease the chance of child mortality by 3.4%, similarly, the availability of safe drinking

water can reduce child mortality by 6.4% whereas the availability of a proper toilet system is expected to reduce the probability of child mortality by 4.1%. House crowding is not a point of concern in Baluchistan. Internet facility is vital in reducing child deaths by 5.2%. This is because people tend to provide preliminary medication and first aid by knowing from online sources. Landline availability makes it easy to contact people around in case of an emergency. It is, therefore, an increase in the landline connection provisions to the households that decreases the chance of expected child deaths by 3.2%. The impact of sewerage in the house is quite high i.e. 4.2% in declining the mortality chances in Baluchistan. Baluchistan is also lacking in resources for heating and cooking fuel. Most of the remote areas still depend upon the dung cakes and wood etc. that are extremely harmful to special little children. The results of the tables show that these fuels tend to rise the probability of child mortality by 0.8% in these areas.

This study concludes that Sindh Province possesses a significant impact on health expenditures as this province is confronted with many problems like deficiency of power supply, mismanagement of drainage system, etc. Sindh is also showing a key result that safe drinking water is very must for child death cases. Baluchistan is also not much different from Sindh. This province lacks the attention of the policymakers, unfortunately. Food insecurity is a very serious issue in Baluchistan followed by Singh and other provinces. It is because of the negligence of the government to provide a budget to this province so that the people of Baluchistan enjoy at least the necessities of life. Surprisingly asset poverty plays a vital role in Sindh followed by Punjab. The asset poor in these provinces are reported to have more child deaths compared to other provinces. Baluchistan and Sindh are also very backwards in the provision of clean water for drinking to their dwellers. The Situation in KPK and Punjab is absurd to regard regarding child deaths taking regarding rural areas. The provinces are still lacking facilities in their rural and remote areas. Concerning child death, the hierarchy of the provinces is the same as that of the child health situation in Pakistan.

The overall robustness of the variables considered in this study are checked by employing the omnibus test also called likelihood ratio test. In this type of test the forward adding of the factor to the model is employed. By considering an additional exogenous variable in the model the test statistic (χ^2) is checked against its

significance. If upon the addition of a new variable in the model improves the coefficient of the χ^2, that is also statistically significant, meaning that the additional variable increases the efficiency of the existing model by enhancing the predictor power of the model. The outcome of robust test for the logistic model is reflected in Appendix, Table A-3 (a) and (b). Table A-3 (a) shows the step wise model significance when each variable is added to the logit model. Step 1 shows the valve of chi-square with only one exogenous factor added to the model i.e., the health expenditure: shown in Table A-3 (b). The chi-square value is 141.23 in step 1 of the forward step wise process. After adding the second variable in step 2, of the model the value of the coefficient of chi-square is increased to 276.34 with highly significance. This shows that the overall efficiency of the model has improved. Similarly, upon adding an additional variable in each step the efficiency of the model increases, hence shows that the model is efficient in estimating the explaining the dependent variable.

5.13 Haye's Process of Indirect Relationship Among the Variables

'Sewall Wright's method of analysis using path coefficients, which describes direct and indirect causation to determine the genetically generated color combinations in a species of pigs, is linked to the origins of the mediation process in 1920. (Wright 1920). He defines mediation as the result of the coefficients. Woodworth's "Stimulus Organism Response (SOR) theory," which was introduced after eight years, contends that numerous mediating processes operating within an organism cause interference between the stimulus and the response subject (Woodworth 1928). According to certain seminal studies, mediating factors mediate the causal connection between the dependent and explanatory variables by interfering with them. It is impossible to overstate the importance of mediating factors. Since it is obvious, mediating factors serve as an introduction to the knowledge of cause-and-effect mechanisms. Many other domains, including testing for interventional science, practical research connected to therapy, and the creation of psychological concepts, particularly for behavioural psychology, are supported by mediating processes of indirect effects (MacKinnon, Fairchild, and Fritz 2007). When considering the full or partial mediating relationships among the variables, this third idea of mediation's application is the most pertinent area of study. Specifically, partial mediation process observations provide a clear consequence for empirically testing the indirect effects in the study (Rucker et al. 2011). The mediators are helpful for theory creation in other

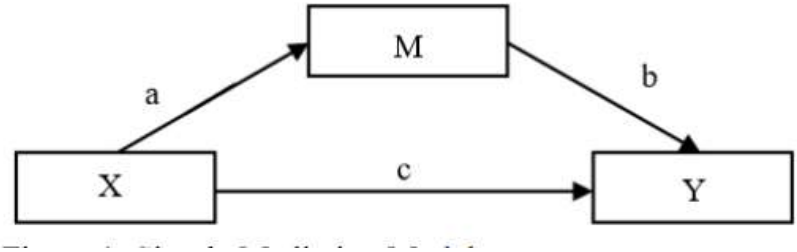
domains, so we suggest that the social sciences could also benefit greatly from this special method.

5.14 The Hayes's Mediation Process

The indirect relationship mediation method adds one or more intervening variables to the actual regression equation, which is an expansion of standard linear regression models. A mediating factor explains how an intervening effect produces its result variable. A mechanism by which X (an independent variable) affects Y (a dependent variable or outcome variable), to put it simply, is the mediating process (Hayes 2013:7). In the mediation process, researchers assume that the explanatory variable (X) influences the mediator (M), which in turn influences the outcome variable (Y). In other words, they assume that there is an indirect rather than a direct relationship between the independent and dependent variables. A simple mediation concept model between X, M, and Y is shown in Figure 5.1.

The explanatory variable (X) and the outcome variable (Y) may or may not be directly related. When no other variable can have an impact on the link between X and Y variables, there is a direct effect.

Figure 5.1
Mediation Concept Between X, M, and Y Variables



When the relationship between X and Y is influenced by another variable or is "mediated" by other factors, this is an indirect form of effect. The lines "a," "b," and $"c"$ in Figure 5.1, respectively, show the magnitude of the regression coefficients, the correlation coefficient between X and M, M and Y, and X and Y. While the magnitudes of coefficients $"a"$ and $"b"$ illustrate the indirect effect of X on Y, coefficient $"c"$ depicts the direct effect of X on Y. Figure 5.1 shows that the entire impact of X on Y is equal to $"c + a*b"$ (Baron and Kenny 1986). According to this graph, the link between X and Y is considered to be a direct relationship if either $"a"$

or "b" is zero *(Total effect = c + a*b = c + 0 = c).* The percentage of the effect that is contributed by the mediator according to the following formula is represented by the ratio of the indirect effect *(a*b)* and overall effect *(a*b + c)* (Hayes 2013).

$$P_M = \frac{a * b}{a * b + c}$$

5.14.1 Conditions for a Mediation Process

Under the following circumstances, according to Baron and Kenny (1986), a variable that serves as a mediator in the causal relationship is revealed if regression analysis reveals a statistically significant nexus at the first three levels;

1. The explanatory variable, X, predicts Y, which is a statistically significant predictor of the outcome variable.

2. A statistically significant predictor of the mediating factors, i.e., X predicts M, is the explanatory variable. The mediator continues to be the explanatory variable's outcome variable in this situation.

3. While adjusting for the influence of X, the mediator variable is a statistically significant predictor of the outcome variable, i.e. M predicts Y. In this instance, the mediator variable is acting as an explanatory variable in the model for the result variable. These three actions need to provide instant results. if, then. The mediation process cannot be taken for granted and is either unlikely to succeed or impossible if any one of these three associations is statistically insignificant. The technique moves on to the fourth phase once statistical significance in the model has been established.

4. Either a full mediation or a partial mediation model is evaluated to explain the observed influence of the mediator on the relationship between X and Y. After accounting for M, a full mediation model is evident when X is no longer statistically significant and has no further impact on Y; that is when the correlation between X and Y is diminished and X and Y are no longer statistically significant.

On the other hand, a partial mediation model is significant if the effect of X on Y is still statistically significant but diminished. The general rule is that the mediator's effect increases as coefficient "c" decrease.

The first step of the causal stepwise procedure, which states that X must cause Y for a mediational effect to exist, has drawn considerable criticism. It was created and made popular by Baron and Kenny (1986). Even though X has no impact on Y, MacKinnon et al. (2007) show how a mediation effect could still occur. Similar to this, Rucker et al. (2011) created a model based on simulations that shows there is a strong indirect effect between X and Y even when there isn't a direct connection. Saunders and Blume (2018) recommend a single-step procedure in which mediators are treated as covariates to create a model that can incorporate multiple mediators. How mediators are handled here clearly differs from MacKinnon's approach. While variables are related to X and Y, they are not part of the causal chain connecting X and Y, according to MacKinnon's (2018) research. As was previously noted, mediators are distinct variables that act as the central component of the link between X and Y variables by serving to explain a cause between X and Y. While the other ways are frequently employed as a supplement to Baron and Kenny's (1986) technique, mediation remains the principal approach despite some criticism and despite the method's four steps for measuring the process' effectiveness. These include the bootstrapping method developed by Stine in 1989, the empirical M-test given by Holbert and Stephenson in 2003, and the Sobel test invented by Sobel (1982). The Sobel test and bootstrapping approach are of particular relevance among all of these methods.

5.14.2 The Sobel-Test

Sobel's basic test is described here (1982). A hypothesis that the link between the explanatory (X) and outcome (Y) variables is mediated by another variable (Y), i.e., that X and Y have an indirect relationship, is examined using the Sobel test. To put it another way, the Sobel test determines whether adding a mediator (M) to the regression model significantly lessens the impact of the explanatory variable (X) on the dependent variable (Y), (Preacher 2020). The test hypothesizes that the presence of entire or partial mediation is supported if there is no statistically significant difference between the total effect and the direct effect after the addition of a mediator (Allen 2017). Utilizing the Sobel test is easy. It is performing three key actions;

1. Run a simple linear regression model to account for the mediator's response to the explanatory variable (X) (M). The unstandardized regression coefficient says (a), and the standard error of the coefficient is (Sa).

2. To determine how the mediating variable (M) and explanatory variable (X) affect the result variable, run another linear regression model (Y). Standard errors (Sb) and the unstandardized regression coefficient (b) are mentioned.

3. The test statistic for the Sobel test, standard error, and the level of significance, or p-value, are computed using a computer calculator for the Sobel test, such as that found at http://quantpsy.org/sobel/sobel.htm. Sobel (1982) suggested the following formula, which is the ratio of the product of "a" and "b" to the following standard error;

$$Z = \frac{a * b}{\sqrt{(b^2 * S_a^2 + a^2 * S_b^2)}}$$

The Sobel test statistic's "Z-Score" is calculated using the formula above. A calculated Z-score is considered statistically significant if it is outside the threshold range of 1.96 for a two-tailed alpha of 0.05 and 2.58 for a two-tailed alpha of 0.01. However, several academics have questioned the Sobel test, pointing out that it is based on the standard normal distribution or z-scores, and that conducting it for the mediation process necessitates quite a big sample size (Kenny et al. 1998; MacKinnon et al. 2002).

Researchers (Hayes 2013; Preacher and Hayes 2004) suggested using a bootstrap method to examine the mediation impact to get over this normalcy issue. The bootstrapping techniques, invented by B. Efron in 1979, are computer-based methods that enable resampling of a large set of numerous small samples (such as 1000, 2000, 3000, and up to 5000 samples, etc.) with replacement formulas from the original sample to provide an estimate of the robust standard errors and subsequently produce a confidence interval (Efron 1979; Hayes 2009). When compared to other techniques, bootstrapping is more authentic, offers the maximum power, and reduces the likelihood of type-1 error (Hayes 2009; 2013).

5.14.3 Hayes Process Macro on SPSS

Andrew F. Hayes offers "Process Macro," a bootstrapping statistical software program. Additionally, this functions as SAS and SPSS extension (Hayes 2013). The relationship between the explanatory and outcome variables is studied using this program to determine the impact of a single and numerous mediating or moderating

factors. The total, indirect, and direct consequences of the relationship between X and Y are calculated by Process Macro. Additionally, the Process Macro is employed with both continuous dependent variables (linear regression analysis) and categorical/dichotomous dependent variables, in contrast to the Sobel test, which only considers a continuous outcome variable (Y) (logistic regression analysis).

5.14.4 Steps in Mediation Analysis Process

This approach is indicated by the letter "*c*" if an explanatory variable (X) predicts the outcome variable (Y). Let's assume that a path is indicated by the letter *"a"* when an independent variable (X) predicts the mediator (M). While accounting for the impact of an explanatory variable (X), the mediator (M) predicts the dependent variable (Y); this path is indicated by the letter *"b"*. Three distinct regression studies are carried out using SPSS to analyze these three routes. They are as follows:

(a) First regress (Y) on (X).

(b) Regress *(M) on (X).*

(c) Regress *(Y) on (X) and (M).*

Using a bootstrap standard error and confidence intervals, the mediation effect is examined. The indirect effect being zero as opposed to the alternative of a mediator's influence being non-zero is the null hypothesis for the process. The rule for testing the hypothesis is that the null hypothesis cannot be rejected if zero is located between the bootstrap upper limit and lower limit. If a zero value lies outside the upper and lower limits the null is rejected, validating the inclusion of the mediator the multiplication of pathways "a" and "b" yields the direct effect of this process. The size of path "c" is determined by the direct effect. By adding the direct and indirect channels, the total effect going from the independent variable to the dependent variable is calculated. At the end of the process, the validation is checked for full or partial mediation. This is done by checking the significance of the “a”, “b”, and “c” paths. path “a” and path “b” are mutually statistically significant and path “c”, then the mediation is said to be a partial mediation. If path “c” is insignificant while path “a” and path “b” is significant then it is a sign of the full mediation.

5.15 Hayes's Process of Economic Variables to Find an Indirect Relationship Between Child Health and Child Death

Unlike the previous literature, this study focuses on the mediating role of some selected economic factors instead of considering them as dependent or explanatory variables. This study also focuses on the nexus of child health that led to child death. Among many, this study considers asset poverty and food insecurity as mediators. Some other economic factors are also vital in explaining the child health and death nexus i.e. health expenditures by the household head.

The SPSS Process Macro is used in this study to test the null hypothesis that there is no indirect association between the variables. Different coefficients and tests that explain indirect, direct, and total effect magnitudes as well as partial effect magnitudes are provided under the Process Macro Tab. This study uses the SPSS Process Macro following Andrew F. Hayes' Process Macro version 4.0. The variables list comprises the dependent variable; child mortality (CM), the independent variable; child health (CH), and three mediators; health expenditures (HE), asset poverty (AP), and Food insecurity (FI). There are several models suggested by A. Hayes. This study employs Model 4. which considers a single mediator in the estimation process. (See Hayes, 2013 for other models). As a general rule, the null hypothesis cannot be accepted or rejected if "zero" falls within the 95% confidence interval, which means that mediation cannot be assumed, and vice versa.

As previously mentioned, the SPSS Hayes Process Macro employs several phases and tests. First, two regression analyses are conducted, the first for the explanatory variable (X) on the mediator (M), and the second for the explanatory variable (X) and mediator (M) on the dependent variable (Y). The findings of the mediation analysis are shown in the following tables along with the independent variable's direct and indirect impacts on the dependent variable, as well as the bootstrapped 95% confidence interval.

5.15 Estimates of Hayes's Process for Indirect Relationships Between Child Health and Child Death (Mediator: Health Expenditures)

Table 5.10 shows the bootstrap estimates of the indirect relationship between child health and child death. health expenditures as a mediator. The table explains sequential causal effects by showing three types of regression path analysis. Path *"a"*

refers to a relationship running from child health to health expenditures. The coefficient of *0.33* is showing a significant relationship between child health and the health expenditures of a household. Another path is *"b"* which shows a causal relationship running from health expenditures to child mortality. The coefficient of *0.38* is highly statistically significant.

Table 5.10
Haye's Process of Mediation Between Child Health and Child Mortality

Variable	Coef.	t-statistic	LLCI	ULCI
CH→CM	0.331	8.3 ***	0.253	0.408
CH→HE	0.382	23 ***	0.351	0.413
CH→HE→CM	-0.039	-2.3 ***	-0.007	-0.071

Effects	Coef.	Boot LLCI	Boot ULCI
Direct	0.331	0.253	0.408
Indirect*	0.150	0.003	0.027

Based on 5000 bootstrap samples for a 95% confidence interval

Source: Author's calculations.

The third Path is *"c"* which represents the causality running from child health to child mortality. This is also called the direct effect between the dependent and independent variables. In this case, the third relation shows the causality running from child health to child mortality controlling for health expenditures. Statistics show that the coefficient of 0.039 is significant. The magnitudes of the direct and indirect paths, where the indirect path is the result of paths "*a*" and *"b"* are added to determine the model's overall effect. Now, the models based on 5000 bootstrapping's direct and indirect effects are explained.

A negative sign in the Hayes process outcome might not always signify a poor correlation between the variables. The interpretation of the sign is dependent on the direction of the hypothesised link between the variables and the direction of the regression coefficients applied in the study. The specific study issue and the direction of the hypothesised link determine the interpretation of the negative sign in the mediation analysis. A suppressor effect may be implied by a negative sign in some circumstances, which may be construed as proof that the mediator acts in the opposite direction of the relationship that is hypothesised. In other circumstances, a negative sign can be taken as proof of a direct effect that opposes the mediator's indirect effect; MacKinnon et al. (2000).

5.15.1 The Direct-Effect

This investigates whether or not a third variable is mediating the link between the (CH) and (CM) and whether it is direct. If a value "zero" does not fall between the bootstrap lower limit and bootstrap upper limit confidence intervals $(0.253, 0.408)$ based on the 95% confidence interval, Table 5.10 indicates that the direct effect is 0.33. As a result, we disprove the null hypothesis that there is a causal link between child health and child mortality in the model. The coefficient of path *"c"* is therefore statistically significant.

5.15.2 The Indirect-Effect

The null hypothesis that there is no indirect association between the independent (CH) and dependent (CM) variables is also examined in Table 5.10. With 95% bootstrap confidence intervals $(Boot\ LLCI)$ ranging from 0.003 (lower limit) to 0.027, the table indicates that the indirect effect is *"0.15"* (upper limit). The null hypothesis is disproved since "zero" does not fall inside the 95% confidence interval bootstrap boundaries. In other words, we conclude that household health spending mediates the association between children's health and mortality, with *"a*b"* being statistically significant.

5.15.3 The Total Effect

This is defined as the combined influence of all model components, including both indirect and direct effects. It is the direct effect plus the indirect effect $(a * b) + (c)$. According to the given formula, the total effect produced by a model shown in Table 5.19 is *0.48*, meaning that there is a noteworthy effect exists in this relationship model. As the direct, as well as indirect paths, are showing significance, therefore, this type of mediation is called a partial mediation process.

Table 5.11 shows the bootstrap estimates of the indirect relationship between child health and child mortality via. 'asset poverty' as a mediator. This table explains a sequential effect by showing three types of regression path analysis. Path *"a"* refers to a relationship running from child health to asset poverty. The coefficient of *0.039* is insignificant meaning that path *"a"* is not valid. Another path is *"b"* which shows a causal relationship running from asset poverty to child Death.

5.14 Estimates of Hayes's Process for Indirect Relationships Between Child Health and Child Death *(Mediator: Asset Poverty)*

Table 5.11
Haye's Process of Mediation Between Child Health and Child Mortality

Variable	Coef.	t-statistic	LLCI	ULCI
CH→CM	0.341	8.71 ***	0.264	0.417
CH→AP	0.039	1.85	-0.081	0.002
CH→AP→CM	0.179	14.34 ***	-0.203	-0.154
Effects	Coef.	Boot LLCI		Boot ULCI
Direct	0.341	0.261		0.415
Indirect*	0.007	-0.001		0.015
Based on 5000 bootstrap samples for a 95% confidence interval				

Source: Author's calculations.

The coefficient of *0.179* is highly significant. The third Path is *"c"* which represents the causality running from child health to child death. This is also called the direct effect between the dependent and independent variables. In this case, the third relation shows the causality running from child health to child mortality. health expenditures. The coefficient of 0*.341* is significant. The total effect of the model is calculated by summing the magnitudes of the direct path and indirect paths where the indirect path is the product of path *"a"* and path *"b".* Now the direct and indirect impact of the models based on 5000 bootstrap simulations is explained as follows;

5.14.1 The Direct Effect

This investigates whether or not a third variable is mediating the link between the (CH) and (CM) and whether it is direct. Table 5.11's findings indicate that the direct effect is 0.341, provided that a value of "zero" does not fall within the bootstrap upper limit and lower limit confidence intervals of $(0.261, 0.415)$. In other words, a direct association between (CH) and the coefficient of path "c" is *statistically* significant (CM).

5.14.2 The Indirect Effect

The indirect relationship between the independent (CH) and dependent (CM) variables is examined to test the null hypothesis that there is no indirect relationship. The indirect impact is "0.007," according to Table 5.20, with bootstrap confidence intervals ranging from -0.001 (lowest limit) to 0.015. (upper limit). The null hypothesis is accepted because "zero" is inside the bootstrap boundaries of the 95% confidence range. In other words, we conclude that the households' asset poverty does

not mediate the association between child health and child mortality; thus, "$a * b$" is statistically unimportant.

5.14.3 The Total Effect

The total effect of the model explains the effect of the entire model i.e. an indirect and direct effect. It is the sum of the indirect effect $(a * b)$ and direct effect (c). According to the given formula, the total effect produced by a model is 0.348, meaning that there is a noteworthy effect exists in this relationship model. As the direct, as well as indirect paths, are showing significance, therefore, this type of mediation is called a partial mediation process.

5.15 Estimates of Hayes's Process for Indirect Relationships Between Child Health and Child Death *(Mediator: Food Insecurity)*

Table 5.12
Haye's Process of Mediation Between Child Health and Child Mortality

Variable	Coef.	t	LLCI	ULCI
CH→CM	0.315	8.13 ***	0.242	0.395
CH→FI	0.138	10.92 ***	0.113	0.163
CH→FI→CM	0.199	9.98 ***	0.160	0.238
Effects	Coef.		Boot LLCI	Boot ULCI
Direct	0.314		0.242	0.395
Indirect*	0.127		0.020	0.035
Based on 5000 bootstrap samples for a 95% confidence interval				

Source: Author's calculations.

Table 5.12 shows the bootstrap simulations of the indirect relationship between child health and child mortality. food insecurity as a mediator. Path *"a"* reflects a relationship running from child health to food insecurity. The coefficient (*0.138)* is showing a significant relationship between child health and food insecurity in a household. Path *"b*" shows a relationship running from food insecurity to child mortality. The coefficient *(0.199)* is significantly showing a significant relationship between food insecurity and child death. Path *"c"* represents the causality running from child health to child death. Patch *"c"* is also called the direct effect between the dependent and independent variables. The total effect of the model is calculated by summing the magnitudes of the direct and indirect paths where the indirect path is the product of path *"a"* and path *"b"*. The direct and indirect impact of the models based on 5000 bootstrapping is explained as follows;

5.15.1 The Direct Effect

This investigates whether there is a direct relationship between the (CH) and (CM) without any mediation from other variables. Table 5.12's findings demonstrate that the coefficient of direct effect is (0.315) and that a value of "zero" does not fall within the bootstrap upper and lower confidence intervals (0.242 and 0.395) based on a 95% confidence interval. As a result, we reject the null hypothesis, according to which there is a direct correlation between child health and child mortality. In other words, the indirect association between the variables and the coefficient of path "c" is statistically significant.

5.15.2 The Indirect Effect

The model takes the null hypothesis into account, which states that there is no indirect association between the independent variable (CH) and the dependent (CM). Table 5.12 shows the coefficient of indirect effect (0.127) with bootstrap confidence intervals of 0.020 (lower limit) and 0.035 (upper limit). As per the guidelines of the model “zero” does not fall in these confidence interval bootstrap bounds, hence the null hypothesis is rejected. In other words, it is concluded that food insecurity mediates the relationship between child health and child death.

5.15.3 The Total Effect

The total effect in a model is the sum of all direct and indirect effects. It is the direct effect path plus the indirect effect path $(a * b) + (c)$. The overall effect (0.468) that the model in Table 5.12 generates, as indicated by the calculation, indicates that there is a significant indirect association between the variables. It is known as a partial mediation process since both the direct and indirect paths are demonstrating importance.

5.16 Conclusion for the Outcome of Haye’s Process

A bootstrapping method is applied to examine the mediating role of some selected economic factors i.e. health expenses, asset poverty, and food insecurity between child health and child deaths. First, the regression analysis's findings indicate that using health spending as a mediator, child health is a very significant predictor of child mortality (0.33). Based on the indirect 5000 bootstrap simulations, the results of the second model reveal that health spending reduces the likelihood of child deaths by 15%. The mediator (0.150/0.481) is responsible for almost 31% of the overall

influence on child mortality. This outcome shows that for households to be rational consumers, health expenditures must be given the same weight as expenditures on other essential consumer items. The return on health expenses is intangible but leads to a healthy human being and a quality workforce. On the other hand, there is no significant mediating role of asset poverty between child health and child death. Food insecurity, however, has a significant mediating role between child health and child death by increasing the probability of child deaths by 12%. Hence the model concludes that food insecurity and health expenditures are relatively more critical factors in reducing child health-led deaths in Pakistan.

CHAPTER 6

CONCLUSION

6.1 Introduction

An important factor that has a significant impact on how often children die is the evaluation of their health. Because of this, it is highly acknowledged by both the World Health Organization and the United Nations, who have highlighted it as a

critical aim under the Sustainable Development Goals (SDGs) vision. By enhancing the availability of a healthy workforce in the nation, the objective of improving child health and lowering child mortality essentially underlines the consumer demand for health services. Metrics for child health and the monitoring of child fatalities are closely related.

Today, the majority of child health data and the issues associated with it come from demographic observations, which are a main source in many developing countries throughout the world. However, due to the high cost of conducting such surveys, many countries rely on international organizations to provide health-related data from the global child statistics database. Around the world, a wide range of demographic factors is used as significant benchmarks to evaluate children's health and socioeconomic position. Many organizations study health and socioeconomic results in many regions and countries all over the world using child health, a sensitive indicator of socioeconomic heterogeneity. As a result, it covers all facets of the policy. This is so that the government may use these elements as tuning points to improve the child health result, which not only represents the health of children but also the health of the entire community. The development of successful strategies and effective planning, therefore, benefit from indicators of child health that result in mortality. The environment in which a family lives, as well as its social factors and financial state, all have a significant impact on the health of the child. The primary element affecting a child's health and its repercussions is where they live. The individual responsible must therefore give housing difficulties top priority if they want to improve child health. A primary problem with housing is the provision of clean water for drinking, a sanitary environment, an efficient sanitation system to minimize pollution, and energy for dwellings and the services they can use (Mosley and Chen 1984).

Mosely claims that the sum of these elements creates a biological component mix that directly affects a child's life. Changes in these sociodemographic aspects of the household, therefore, have a greater effect on children's health. The empirical population measurement method can also be used to confirm these evaluations. In contrast, a different demographic statistic called life expectancy emphasizes certain analogous societal processes but is a false signal because it is not only difficult to measure but also a derived function of several other variables. For these reasons, child

health determinants are commonly used to demonstrate how regional differences in health standards exist (Wagstaff et. al. 2004).

On the other side, it is believed that child mortality is a consequence of ill health, social health inequities, and socioeconomic situations. The improvement of children's health is one of the Sustainable Development Goals (SDGs) set forward by the UN, which is not surprising. The UN is thinking of evaluating and keeping track of the progress achieved in reaching this goal by exerting pressure on developing countries to improve population health facilities by reducing health inequities.

Pakistan, a developing nation, is working to significantly improve the planned attainment of these objectives. According to the World Bank (2010), Pakistan has the eighth-highest rate of child deaths worldwide when it comes to the UN's health goal. In the same year, one out of every ten children (under the age of five) died. Thus, Pakistan faces a problem in improving the data on children's health. Health services have been declining over the past few decades, given the state of the health sector. The problem of this sector's inconsistent performance is brought on not just by the government's inadequate investment in it, but also by the pressure that the growing population places on it. This has made it possible for the private sector to close the gap between the imbalanced supply and demand for healthcare. In this aspect, the private sector's influence has greatly increased. People spend 98 per cent of their own money on health-related expenses, showing Pakistan to have the greatest proportion of pocket payments to total health expenditures (World Health Organization, 2010). The burden of disease, parental conditions, and socioeconomic position is doubled in Pakistan. The state of public health services demonstrates an unequal distribution of health incentives between the rural and urban areas of the nation. In terms of primary health care, rural residents who lack basic amenities are at a bigger disadvantage. For example, the majority of people who live in Pakistan's distant rural areas did not fully benefit from the government's program for immunizing infants and young children under the age of five. Although the standard of living, life expectancy, and other health indicators indicate an improvement, this progress is not constant. There are obvious differences in health outcomes across the nation. Children who are stunted account for one out of every five children in South Asian nations, which is a considerable percentage. According to a poll on poverty alleviation, the country's health system costs it around 1% of its GDP (Pakistan Alleviation Fund, 2010).

Pakistan should make substantial efforts to meet the goals established to fulfil its obligation as a signatory to the UN's Millennium Development Goals.

Pakistan does not meet the program's health objectives, according to a World Health Organization (WHO) assessment. Although there has been growth during the previous 65 years, there have been gaps in key health metrics when compared to other industrialized nations. To enable the provinces of Pakistan to meet sustainable goals despite several obstacles, including the fiscal deficit, a lack of vision in the local government system, the general state of the economy, accountability issues, and the state of law and order, health reforms are currently in the transition phase. By examining the direct and indirect channels of social, economic, and demographic elements affecting child health, this article attempts to evaluate Pakistan's success with the implications of its health policies.

6.2 Key Findings

This study employs a review of the existing literature to dig out the issue of child health that probably leads to child death in Pakistan by assessing some critical economic, social, and demographic factors that play an important role in the assessment of child health in Pakistan. By this, Pakistan should achieve the expected target of the United Nation’s Sustainable Development Goals (SDGs) by the year 2030.

This study employs the most recent micro-level data collected by the government to investigate the factors determining child health in Pakistan. Grossman (1972) initially addresses the concept of medical care demand by individuals, households, and communities. The determinants of child health and mortality are categorized in socio-economic characteristics, demographic, and housing characteristics by this study.

Pakistan shows a high level of child death rates in South Asia in the past decade. Pakistan is the world's fifth most populated country of the world its population is exceeding 225.2 million spread over four provinces. According to the UNICEF Report 2019, Pakistan is facing a major disparity in child survival rates. Although the death rate of children under five years shows a decline still it remains at 67 deaths per 1000 live births, which is still high compared to the target value of 40 deaths. Many children in Pakistan suffer the consequences of a lack of sufficient maternal healthcare facilities causing due to low income, inflation, and lack of

awareness about the basic healthcare measures. Health coverage across the country is limited as a result of some serious inequities existing in government health services due to demographic, geographic, economic, social, and infrastructural constraints. Child health is a major determinant of child deaths. Both of these factors are interconnected because children under five are vulnerable to diseases and they have a very weak immune system, therefore, studying health with connection to mortality is worthless.

This study is an addition to the existing literature on child Heath in Pakistan with a different empirical investigation. direct and indirect models. This study assesses social, economic, and housing factors of child health according to the geographical conditions of Pakistan. This study aims to assess the direct and indirect channels of the effectiveness of selected determinants affecting child health in Pakistan. Unlike the existing literature, this study extends the model of child health by introducing new dimensions i.e. asset poverty and global food insecurity of households. The data from Household Integrated Economic Survey (2018-19) is analyzed, which is the latest survey so far issued by Pakistan. This survey facilitates detailed information on demographic, health, and economic indicators covering 24809 families. For assessing the factors determining the child's health two types of methods are applied. For the direct assessment, the binary Logit model is employed. Whereas, for indirect effects, Haye's process (model # 4) of mediation is applied.

The study concludes that economic factors play a vital role in explaining varying child health in Pakistan. Expenditures on consumer health sow a deep impact on improving child health and most probably reducing child death by 12.8%. Food insecurity shows a great matter of concern in explaining the child's health outcome. The data shows that child health and mortality problems are of more concern where the household is insecure about food in Pakistan. This study concludes that a household that is severely food insecure faces about 45% more cases of adverse child health compared to food-secure people. Similarly, the health expenses of the children significantly reduce the magnitude of the child's adverse health conditions. The study concludes that about 12% improvement is observed in child health resulting in effective health expenditures. Asset poverty is very effective in reducing adverse child health problems. The results also documented that asset-rich households counter effects adverse child health by about 52% compared to asset-poor households.

However, the provincial outcome suggests that asset poverty is uneven i.e. some provinces like Baluchistan and Sindh are not affected much by the asset poverty status of the households. Besides the economic factors, the socio-economic factors show the results as expected. The regional disparity in Pakistan shows a significant difference in the magnitude of child health. The urban areas are showing a lower number of child sicknesses compared to the urban areas. This is because of the reason that despite the lower income of the households in cities, the provision of basic health facilities is available. The study also concludes that child health issues and death are reported to be high in families headed by a male counterpart. This result is interpreted as a male person being relatively more active and physically strong to handle multi-tasking and performing outdoor tasks well. In rural areas, females are reluctant to go outside the house because of culture and other norms in the Asian belt. There is a common practice in most areas that people tend to use medical gadgets at home. This study derives a conclusion that about 4.6% improvement in child health is observed in the house where some health gadgets like thermometers, blood pressure monitors, etc. are available at home. This is a sort of first aid for a patient before reaching the hospital.

The housing characteristics perspective of child health is also very reflective. Availability of electricity in the house tends to reduce child adverse health cases by 36.8% at the country level. The importance of electricity is observed in the fact that Punjab shows a highly significant improvement of about 43% followed by Khyber Pakhtunkhwa in which a 21% improvement is observed in child health conditions due to the availability of electricity. As the new era is highly equipped with electric machines, therefore, electricity alternatively means the functioning of machines at the hospitals and at home as well. Unfortunately, electricity load shedding in the country due to the miss management of the power sector has been affecting the health sector adversely. Similarly, the most important element in determining good health is water. The human body is a composition of 90% of water. Water intake is a direct source of any disease in the human body. As children are very sensitive to the environment, contaminated water directly affects the health of humans.

This study concludes that about 21% of health is secured by the provision of safe and clean water for drinking in Pakistan. Khyber-Pakhtunkhwa is self-sufficient in water. This province does not face any problem with clean water but Punjab, followed by Baluchistan and Sindh worsened in this regard. Contamination due to the

poor living in urban areas is a serious matter of concern. According to the results, about 10% of clean water is counter-effective in improving the health of a child in Punjab. Sindh shows 9.5% while in Baluchistan this impact is near 100%. Water is not only used for drinking but it is a source of flushing the wastes out of the homes. Toilet in this regard is an important element. Toilet facility at home is an important factor of health but toilet with a proper sevrage system is even a blessing for the poor households. This study concludes a meaningful impact of toilet facilities on the health of children. The study shows that there is a 12.4% low chance of child illness if a household is being provided with a toilet facility at home. There is another noteworthy outcome from the statistics that rural areas are not that much affected by the non-availability of toilets. The reason is that there is a common practice in the rural areas of the country to throw waste away from the houses and the majority of the houses are lacking toilets, meaning that they have reduced the chance of waste contamination. But due to a lack of a proper sevrage system, this effect is cancelled out as poor sevrage contains germs and insects that cause more threats to the children's health than having a toilet. Housing with a sufficient number of people living also affects health concerns. House crowing is a term introduced in this study. This is a proxy for the number of people living per room capacity in the house. In urban areas, due to the high population level, people use to live in small houses and apartments. While the poor lives in cottages. If the house is overcrowded there are problems with hygiene. Small houses have open kitchen systems, a low number of washrooms, and combined bedrooms that cause severe issues of health and suffocation for the dwellers. Children, being sensitive counterparts are very vulnerable to this type of situation. This scenario is a bit different in rural areas. The houses are low crowded in villages, but these houses have a very low infrastructure of rooms and other accommodations that creates the same situation as urban areas.

Houses, despite their infrastructural characteristic, other facilities like the internet, computers, mobile phone, and type of fuel also contributes to improving child health. Due to the uneven population and regional differentials, the results of these variables show uneven results. Internet and computers are effective in homes as it contributes as a substitute facility od first aid at home in critical conditions but in some situation, the internet and excessive use of mobiles phone become a curse for small children and pregnant women. The radiation of wireless technology and the screen rays of the gadgets is very harmful to the child's health in this regard. Overall

this study concludes that despite the infrastructural and demographic factors affecting the child's health, economic factors are very important in explaining this problem. It is because every facility whether at home or related to external matters of concern like the provision of technology is directly linked to the financial status of a household. It is therefore concluded that asset poverty and food insecurity proxied by the income of a household are very vital in explaining the health status of the children and the other family members too. With this, it is documented that this study contributed to a fruitful inclusion of new dimensions of child health by looking into some indirect channels of the explanatory variables.

This study concludes that Compared to 68% of children in the highest wealth quintile, children in the lowest wealth quintile are less likely to obtain urgent treatment for anti-respiratory infection (ARI) (36%), receiving therapy either the same day or the next. When ARI symptoms arise in children, they are less likely in Baluchistan (62%), Punjab (86%), Sindh (85%), and Khyber PakhtunKhwa (84%) to seek guidance or treatment. Acute respiratory infections (ARIs) were reported by 14% of children under the age of five in the PDHS 2017–18. (see Figure 1 in appendix). This study highlighted the major factor for this i.e. type of fuel use for cooking and house crowding. Children are vulnerable to fuel emissions and congested houses with no proper ventilation. This study also explains the role self medication or having medical gadgets at home especially in the rural areas of the country where hospital facility is not available at sudden times. According to (PDHS 2017-18), The prevalence of diarrhea in children under five has been declining, falling from 23% in the 2012–13 PDHS to 19% in the 2017–18 PDHS. Between 2012–13 and 2017–18, the percentage of people seeking advice or treatment for diarrhea improved to 71%. Just 6% of children under five in the PSLM 2018–19 reported having diarrhea in the previous 15 days. Of these, 53% got ORS and 84% were sent to a medical facility.

Child health is a serious matter in explaining child deaths. The results more or less provide the same conclusion but again looking into this matter, child health associated with other economic factors explains child morbidity under five at best. While looking into the UN sustainable development goal of reducing child mortality, there is a need to explore the root cause and channels to overcome this problem. And this study very effectively explains those channels.

6.3 Concluding the Outcome of Mediators in Explaining Child's Health-Mortality Nexus

Haye's process of mediation is a novel characteristic of this study besides the inclusion of two new dimensions of asset poverty and food insecurity in the existing literature. Haye's process is used to find out the empirical evidence of the indirect nexus among the critical economic factors that explain child health leading to mortality. Adverse health is a serious matter of concern for children under five as they have a very weak immune system. It is, therefore, this study tries to find a link between child health and child death mediating by selected economic factors. There are a lot of factors that affect this link but some of the critical economic factors are very effectively concluded from the Logistic regression models. This study looks at whether asset poverty, health expenditures, and food insecurity play as mediators or not. This gives a new dimension to the already existing literature in this area of research.

Haye's process of mediation is spread over more than 80 models depending on the number of mediators and moderators. This study employs model 4, for having one mediator at a time between the dependent and outcome variable. This study employs three models alternatively for including three mediators in explaining the relationship between child health and child deaths in Pakistan. The study concludes that health expenditures by the household effectively mediate the nexus between the health and mortality of children under five. The total model effects come out to be 48%. This model also concludes that health expenditure mediates for about 15% of child health improvement and reduces the chances of mortality. This is a matter of keen interest that spending on acquiring proper health facilities reduces the mortality rates in Pakistan. As discussed that all factors are linked with the household's financial status and secondary assets of the household are considered as a backup for the cash outlays. When asset poverty is considered a mediating factor, the results are significant but not that effective. This outcome put it to the conclusion that people tend to utilize more liquid assets to meet their urgent medical needs. In addition to that food, insecurity is considered a critical factor nowadays keeping in view the economic situation of the country. The total impact of the model is 42% in which food insecurity mediates the relation between child health and mortality by 12.7%. this outcome led us to the conclusion that while looking for an improvement in child health, asset poverty

should be targeted, despite only looking into the child health issue. The mediating process provides us with a deep insight into the matter of concern. This method is a more efficient way of investigation and a more robust estimator for policymakers to devise an effective economic policy.

This outcome of the study is verified by the PDHS (2017-18). According to the survey report, the poorest quintile seeks care for child health 21.9 points more frequently than the richest quintile. More research is necessary to determine the patterns of non-financial factors that contribute to rich households.

Answer to the first question of this study is that the economic condition of a household is a major factor that directly affects the child's health condition and other social and demographic factors are secondary in this regard.

Answer to the second question of this study is that it direct association among the variables is not necessary, some time indirect factors are also play a critical role. Here various factors like housing characteristics and newly added factors like food insecurity and asset poverty play the role of indirect factors that are derived from the financial status of the household.

Answer to the third question is that children are very vulnerable to diseases like malaria, typhoid and tuberculosis as mentioned in the various health reports. These diseases become deadly if not taken care off. Therefor this study concludes that the adverse child health that may lead to death can be reduced by some mediators like health expenditures, proper food intake and non-monetary assets that are the sources of support for a household to reduce the child mortality rates and realize the proper child health care system in the house.

6.4 Policy Implications and Recommendations

Pakistan is one of the world's developing nations. 64% of the population of this country lives in rural, undeveloped areas. About 14,000 women perish from avoidable medical and pregnancy complications each year and nearly 476,000 children under the age of five pass away from needless health issues. By ensuring effective prevention and the necessary health treatment, these horrible deaths of children and women may be prevented. A crucial requirement on a priority basis is easy access to nutrition services as well as maternity and child health facilities.

The government has always played a big part in healthcare in Pakistan. The 18th amendment to the constitution of Pakistan gave the provinces control over several ministries, including the ones for population welfare and health. This offers the provinces the chance to carry out some strategic planning as well as some local resource management and development.

The poor health of children under the age of five is mostly due to insufficient sanitation and drinkable water facilities, low health spending even by Asian standards (0.9% of GDP in Pakistan compared to 1.4%; World Bank study), and housing characteristics. Together, these factors contribute to the nation's current situation of insufficient and substandard healthcare. As a result, this has significantly increased the demand for Pakistan's already overworked healthcare system, particularly in the provinces with the fewest resources and where child death rates are particularly high. There must be a unified national agenda with a vision for enhancing the health of women and children through affordable, high-quality, essential healthcare services that are provided through a resilient and responsive health system to achieve the Goals of lowering child mortality and improving health. The government must ensure that everyone has access to healthcare, education, clean water, and sanitary facilities in addition to upholding all of the country's other responsibilities regarding international health.

The priority steps indicated below should be followed by the national strategy;

a. The government must provide full coverage of slums and rural areas to promote local access to high-quality primary healthcare. The hiring of new healthcare professionals, such as midwives and female healthcare workers, ensures the provision of well-resourced healthcare infrastructure.
b. The government must improve the referral procedure and the delivery of essential drugs, vaccinations, and other supplies to put into practice a plan for a system of effective and high-quality healthcare.
c. To lower obstacles to care seeking by the most disadvantaged members of society, the authorities should boost their financial accessibility by establishing and strengthening the links between social security institutions and Income Support Programs.
d. Social mobilization and political will are required to improve the understanding of child health at the provincial and district levels as well as

among the ruling party and the legislature. This can be done through advocacy, seminars, symposiums, international conferences, and orientation sessions. A range of media platforms needs to be employed to raise awareness of these health issues. It is necessary to get in touch with community-based organizations, local elders, notable individuals, professionals, religious leaders, etc. for the aforementioned goal.

e. It's time to start microfinance initiatives for the underprivileged. Microloans for individuals and community programs like the current "AHSAS program" are crucial in helping disadvantaged households build wealth.
f. The "SEHAT HEALTH CARD" initiative, started by the government, provides poor people with hand-in-hand help in acquiring access to top-notch medical facilities. Since "health" is now the most expensive item in Pakistan, these economic measures must be implemented over an extended period since they have a significant impact on the general public.
g. It is difficult to manage the housing infrastructure, but it is not impossible to construct it so that each room must have sufficient ventilation. It must have a suitable storage system. so that everyone has a strong immune system, especially the young.
h. It is difficult to manage the housing infrastructure, but it is not impossible to construct it so that each room must have sufficient ventilation. It must have a suitable storage system. so that everyone has a strong immune system, especially the young.

REFERENCES

Abu-Ouf, N. M., & Jan, M. M. (2015). The impact of maternal iron deficiency and iron deficiency anaemia on a child's health. *Saudi Medical Journal*, *36*(2), 146–149. https://doi.org/10.15537/smj.2015.2.10289

Acheson, K. J., Schutz, Y., Bessard, T., Ravussin, E., Jequier, E., & Flatt, J. P. (1984). Nutritional influences on lipogenesis and thermogenesis after a carbohydrate

meal. *American Journal of Physiology-Endocrinology And Metabolism*, *246*(1), E62-E70.

Ahmed, S., & Fielding, D. (2019). Changes in maternity leave coverage: Implications for fertility, labour force participation and child mortality. *Social Science & Medicine*, *241*, 112573.

Ahmad, R., & Faridi, M. Z. (2020). Socio-economic and demographic factors of poverty alleviation in Pakistan: A case study of Southern Punjab. *Review of Economics and Development Studies*, *6*(2), 425-438.

Yucel, A. G. (2022). Applied Econometrics: by Dimitrios Asteriou and Stephen G. Hall, Red Globe Press (2021). Paperback. ISBN: 978-1-352-01202-6.

Aksit, B., & Aksit, B. (1989). Sociocultural determinants of infant and child mortality in Turkey. *Social Science & Medicine*, *28*(6), 571-576.

Aladenola, O. O., & Adeboye, O. B. (2010). Assessing the potential for rainwater harvesting. *Water resources management*, *24*(10), 2129-2137.

Alderman, H., Behrman, J. R., Lavy, V., & Menon, R. (2001). Child health and school enrollment: A longitudinal analysis. *Journal of Human Resources*, 185-205.

Alderman, H., Orazem, P. F., & Paterno, E. M. (2001). School quality, school cost, and the public/private school choices of low-income households in Pakistan. *Journal of Human Resources*, 304-326.

Alsan, M., Schoemaker, L., Eggleston, K., Kammili, N., Kolli, P., & Bhattacharya, J. (2015). Out-of-pocket health expenditures and antimicrobial resistance in

low-income and middle-income countries: an economic analysis. *The Lancet infectious diseases*, *15*(10), 1203-1210.

Ali, S. A., Feroz, A., Abbasi, Z., Ali, S. A., Allana, A., Hambidge, K. M., … Saleem, S. (2021). Perceptions of women, their husbands and healthcare providers about anaemia in rural Pakistan: Findings from a qualitative exploratory study. PLoS ONE, 16(4 April 2021), 1–28. https://doi.org/10.1371/journal.pone.0249360

Ali, S. S., Tahir, S., & Arif, G. M. (1999). Dynamics of growth, poverty, and inequality in Pakistan [with Comments]. *The Pakistan Development Review*, 837-858.

Ali, A., & Şenturk, İ. (2019). Justifying the impact of economic deprivation, maternal status and health infrastructure on under-five child mortality in Pakistan: An empirical analysis. *Bulletin of Business and Economics (BBE)*, *8*(3), 140-154.

Allendorf, K. (2007). Do women's land rights promote empowerment and child health in Nepal? *World Development*, *35*(11), 1975-1988.

Alpu, O., & Fidan, H. (2004). Sequential probit model for infant mortality modelling in Turkey. *Journal of Applied Sciences*, *4*(4), 590-595.

Alsan, M., & Goldin, C. (2019). Watersheds in child mortality: The role of effective water and sewerage infrastructure, 1880–1920. *Journal of Political Economy*, *127*(2), 586-638.

Aly, H. Y., & Grabowski, R. (1990). Education and child mortality in Egypt. *World Development*, *18*(5), 733-742.

Amate-Fortes, I., Guarnido-Rueda, A., & Molina-Morales, A. (2016). Determinants of child health inequalities in developing countries: a new perspective. *Society*, *53*(6), 641-646.

Amin, R. (1988). Infant and child mortality in Bangladesh. *Journal of biosocial science*, *20*(1), 59-65.

Amouzou, A., & Hill, K. (2004). Child mortality and socioeconomic status in sub-Saharan Africa. *African population studies*, *19*(1), 1-11.

Anand, V., Biondich, P. G., Liu, G. C., Rosenman, M. B., & Downs, S. M. (2004, January). Child health improvement through computer automation: the CHICA system. In *Medinfo* (pp. 187-191).

Andersen, R., & Newman, J. F. (1973). Societal and individual determinants of medical care utilization in the United States. *The Milbank Memorial Fund Quarterly. Health and Society*, 95-124.

Antai, D., & Moradi, T. (2010). Urban area disadvantage and under-5 mortality in Nigeria: the effect of rapid urbanization. *Environmental Health Perspectives*, *118*(6), 877-883.

Anyanwu, J. C., & Erhijakpor, A. E. (2009). Health expenditures and health outcomes in Africa. *African Development Review*, *21*(2), 400-433.

Apodaca, C. (2008). Preventing child malnutrition: Health and agriculture as determinants of child malnutrition. *Journal of Children and Poverty*, *14*(1), 21-40.

Arif, G. M. (2004). Child health and poverty in Pakistan. *The Pakistan Development Review*, 211-238.

Arif, G. M., Ali, S. M., Nasir, Z. M., & Arshad, N. (2001). *An Introduction to the 1998-99 Pakistan Socio-economic Survey (PSES)* (No. 2001: 04). Pakistan Institute of Development Economics.

Arntzen, A., Moum, T., Magnus, P., & Bakketeig, L. S. (1996). Marital status as a risk factor for fetal and infant mortality. *Scandinavian Journal of social medicine*, *24*(1), 36-42.

Almond, D., & Currie, J. (2011). Killing me softly: The fetal origins hypothesis. *Journal of economic perspectives*, *25*(3), 153-172.

Asano, M., Basieva, I., Khrennikov, A., Ohya, M., & Tanaka, Y. (2012). Quantum-like dynamics of decision-making. *Physica A: Statistical Mechanics and its Applications*, *391*(5), 2083-2099.

Asif, A. M., & Akbar, M. (2020). Inequalities in child health care in Pakistan: measurement and decomposition analysis of maternal educational impact. *Public Health*, *183*, 94-101.

Asif, M. F., Meherali, S., Abid, G., Khan, M. S., & Lassi, Z. S. (2022). Predictors of Child's Health in Pakistan and the Moderating Role of Birth Spacing. *International Journal of Environmental Research and Public Health*, *19*(3), 1759.

Atuoye, K. N., Dixon, J., Rishworth, A., Galaa, S. Z., Boamah, S. A., & Luginaah, I. (2015). Can she make it? Transportation barriers to accessing maternal and

child health care services in rural Ghana. *BMC health services research*, *15*(1), 1-10.

Azhar, B. M. (2021). Child Health Issues in Pakistan Types of Child Health Issues in Pakistan, https://www.marham.pk/healthblog/child-health-issues-in-pakistan/.

Azuh, D. E., Chinedu, S., Samuel, O. W., Azuh, A., Joshua, G., & Amoo, E. O. (2019). Factors influencing the survival of under-five children among women visiting government health care facilities in semi-urban communities in Nigeria. *Cogent Arts & Humanities*, *6*(1), 1686800

Badshah, S., Mason, L., McKelvie, K., Payne, R., & Lisboa, P. J. G. (2008). Risk factors for low birth weight in the public hospitals at Peshawar, NWFP-Pakistan. BMC Public Health, 8, 1–33. https://doi.org/10.1186/1471-2458-8-197

Baird, S., Friedman, J., & Schady, N. (2011). Aggregate income shocks and infant mortality in the developing world. *Review of Economics and Statistics*, *93*(3), 847-856.

Barredo, L., Agyepong, I., Liu, G., & Reddy, S. (2015). Ensure healthy lives and promote well-being for all at all ages. *UN Chronicle*, *51*(4), 9–10.

Basit, K. A., Fawwad, A., Tahir, B., Davey, T., Mustafa, N., & Basit, A. (2021). temporal trends of diabetes and associated cardiovascular risk factors in a rural area of Baluchistan; the most deprived province of Pakistan from 2002 to 2017. *khyber medical university journal*, *13*(Suppl. 1), S3-S3.

Béatrice, N., Lise, G., Victoria, Z. M., & Louise, S. (2012). Longitudinal patterns of poverty and health in early childhood: exploring the influence of concurrent, previous, and cumulative poverty on child health outcomes. *BMC Pediatrics*, *12*(1), 1-13.

Becher, H., Müller, O., Jahn, A., Gbangou, A., Kynast-Wolf, G., & Kouyaté, B. (2004). Risk factors of infant and child mortality in rural Burkina Faso. *Bulletin of the World Health Organization*, *82*, 265-273.

Becker, G. S. (1965). A Theory of the Allocation of Time. *The economic journal*, *75*(299), 493-517.

Behrman, J. R. (1988). Intrahousehold allocation of nutrients in rural India: Are boys favoured? Do parents exhibit inequality aversion? *Oxford Economic Papers*, *40*(1), 32-54.

Behrman, J. R., & Deolalikar, A. B. (1987). Will developing country nutrition improve with income? A case study for rural South India. *Journal of Political Economy*, *95*(3), 492-507.

Behrman, J. R., & Deolalikar, A. B. (1988). Health and nutrition. *Handbook of development economics*, *1*, 631-711.

Baker, F. B. (1987). Methodology review: Item parameter estimation under the one-, two-, and three-parameter logistic models. *Applied Psychological Measurement*, *11*(2), 111-141.

Bekemeier, B., Dunbar, M., Bryan, M., & Morris, M. E. (2012). Local health departments and specific maternal and child health expenditures: relationships

between spending and need. *Journal of Public Health Management and Practice*, *18*(6), 615-622.

Bhutta, Z. A., & Hafeez, A. (2015). What can Pakistan do to address maternal and child health over the next decade? *Health Research Policy and Systems*, *13*(1), 1–7. https://doi.org/10.1186/s12961-015-0036-5

Bloom, D. E., & Williamson, J. G. (1998). Demographic transitions and economic miracles in emerging Asia. *The World Bank Economic Review*, *12*(3), 419-455.

Boehmer, U., & Williamson, J. B. (1996). The impact of women's status on infant mortality rate: A cross-national analysis. *Social Indicators Research*, *37*(3), 333-360.

Bogin, B., & Macvean, R. B. (1981). Body composition and nutritional status of urban Guatemalan children of high and low socioeconomic class. *American Journal of Physical Anthropology*, *55*(4), 543-551.

Bolstad, W. M., & Manda, S. O. (2001). Investigating child mortality in Malawi using family and community random effects: a Bayesian analysis. *Journal of the American Statistical Association*, *96*(453), 12-19.

Brenneman, A., & Kerf, M. (2002). Infrastructure & poverty linkages. *A Literature Review'', The World Bank, Washington, DC*.

Briones, K. (2017). How many rooms are there in your house? *Constructing the Young Lives Wealth Index*, *43*.

Brockerhoff, M. (1995). Fertility and family planning in African cities: The impact of female migration. *Journal of biosocial science*, *27*(3), 347-358.

Brockerhoff, M., & Eu, H. (1993). Demographic and socioeconomic determinants of female rural to urban migration in Sub-Saharan Africa. *International migration review*, *27*(3), 557-577.

Brockerhoff, M., & Hewett, P. (2000). Inequality of child mortality among ethnic groups in sub-Saharan Africa. *Bulletin of the World Health Organization*, *78*, 30-41.

Brockerhoff, M., & Yang, X. (1994). Impact of migration on fertility in sub-Saharan Africa. *Social Biology*, *41*(1-2), 19-43.

Bryce, J., El Arifeen, S., Pariyo, G., Lanata, C. F., Gwatkin, D., Habicht, J. P., & Multi-Country Evaluation of IMCI Study Group. (2003). Reducing child mortality: can public health deliver? *The Lancet*, *362*(9378), 159-164.

Byass, P., De Courten, M., Graham, W. J., Laflamme, L., McCaw-Binns, A., Sankoh, O. A., ... & Zaba, B. (2013). Reflections on the global burden of disease 2010 estimates. *PLoS Medicine*, *10*(7), e1001477.

Caldwell, J. C., & Caldwell, P. (1977). The role of marital sexual abstinence in determining fertility: a study of the Yoruba in Nigeria. *Population studies*, *31*(2), 193-217.

Caldwell, J., & McDonald, P. (1982). Influence of maternal education on infant and child mortality: levels and causes. *Health policy and education*, *2*(3-4), 251-267.

Canning, P., Courage, M. L., Frizzell, L. M., & Seifert, T. (2007). Obesity in a provincial population of Canadian preschool children: differences between 1984 and 1997 birth cohorts. *International Journal of Pediatric Obesity*, *2*(1), 51-57.

Case, A., & Paxson, C. (2010). Causes and consequences of early-life health. *Demography*, *47*(1), S65-S85.

Case, A., Lubotsky, D., & Paxson, C. (2002). Economic status and health in childhood: The origins of the gradient. *American Economic Review*, *92*(5), 1308-1334.

Case, A., Lubotsky, D., & Paxson, C. (2002). Economic status and health in childhood: The origins of the gradient. *American Economic Review*, *92*(5), 1308-1334.

Casey, P. H., Szeto, K. L., Robbins, J. M., Stuff, J. E., Connell, C., Gossett, J. M., & Simpson, P. M. (2005). Child health-related quality of life and household food security. *Archives of Paediatrics & adolescent medicine*, *159*(1), 51-56.

Currie, J., & Hyson, R. (1999). Is the impact of health shocks cushioned by socioeconomic status? The case of low birth weight. *American economic review*, *89*(2), 245-250.

Currie, J., & Moretti, E. (2007). Biology as destiny? Short-and long-run determinants of intergenerational transmission of birth weight. *Journal of Labor Economics*, *25*(2), 231-264.

Cebu Study Team. (1992). A child health production function estimated from longitudinal data. *Journal of development economics*, *38*(2), 323-351.

Chen, Y., & Li, H. (2009). Mother's education and child health: Is there a nurturing effect? *Journal of health economics*, *28*(2), 413-426.

Chilupula, N. F. (2020). Demographic and Socio-economic Determinants of Child Mortality Zambia: Prospects of Dying Before the Fifth Birthday.

Chung, H., & Muntaner, C. (2006). Political and welfare state determinants of infant and child health indicators: an analysis of wealthy countries. *Social science & medicine*, *63*(3), 829-842.

Connor, R. (2015). *The United Nations world water development report 2015: water for a sustainable world* (Vol. 1). UNESCO publishing.

Cook, J. T., Black, M., Chilton, M., Cutts, D., Ettinger de Cuba, S., Heeren, T. C., ... & Frank, D. A. (2013). Are food insecurity's health impacts underestimated in the US population? Marginal food security also predicts adverse health outcomes in young US children and mothers. *Advances in Nutrition*, *4*(1), 51-61.

Cook, J. T., Frank, D. A., Casey, P. H., Rose-Jacobs, R., Black, M. M., Chilton, M., ... & Cutts, D. B. (2008). A brief indicator of household energy security: associations with food security, child health, and child development in US infants and toddlers. *Pediatrics*, *122*(4), e867-e875.

Cornelißen, T., & Sonderhof, K. (2009). Partial effects in probit and logit models with a triple dummy-variable interaction term. *The Stata Journal*, *9*(4), 571-583.

Cramer, P., & Gaul, R. (1988). The effects of success and failure on children's use of defence mechanisms. *Journal of Personality*, *56*(4), 729-742.

Cuevas-Nasu, L., Rivera-Dommarco, J. A., Shamah-Levy, T., Mundo-Rosas, V., & Méndez-Gómez Humarán, I. (2014). Food insecurity and nutritional status of preschool children in Mexico. *Salud Pública de México*, *56*, s47-s53.

Cunha, A. L. A. (2021). Child survival, Under-five mortality. Lancet, 362(9387), 917. https://doi.org/10.1016/s0140-6736(03)14312-7

Currie, C. (Ed.). (2008). *Inequalities in young people's health: HBSC international report from the 2005/2006 Survey* (No. 5). World Health Organization.

Currie, J., & Neidell, M. (2005). Air pollution and infant health: what can we learn from California's recent experience? *The Quarterly Journal of Economics*, *120*(3), 1003-1030.

Das, P., Basu, M., Tikadar, T., Biswas, G. C., Mridha, P., & Pal, R. (2010). Client satisfaction on maternal and child health services in rural Bengal. *Indian Journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*, *35*(4), 478.

Duke, T., Subhi, R., Peel, D., & Frey, B. (2009). Pulse oximetry: technology to reduce child mortality in developing countries. *Annals of tropical paediatrics*, *29*(3), 165-175.

Di Cesare, M., Bhatti, Z., Soofi, S. B., Fortunato, L., Ezzati, M., & Bhutta, Z. A. (2015). Geographical and socioeconomic inequalities in women and children's nutritional status in Pakistan in 2011: an analysis of data from a nationally representative survey. *The Lancet Global Health*, *3*(4), e229-e239.

Eberstein, I. W. (1989, September). Demographic research on infant mortality. In *Sociological Forum* (Vol. 4, No. 3, pp. 409-422). Kluwer Academic Publishers-Plenum Publishers.

Editor, G., & Watson, R. R. (2010). Handbook of Disease Burdens and Quality of Life Measures. Handbook of Disease Burdens and Quality of Life Measures, 1–16. https://doi.org/10.1007/978-0-387-78665-0

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological methods*, *12*(1), 1.

Ekenze, S. O., Anyanwu, K. K., & Chukwumam, D. O. (2009). Childhood trauma in Owerri (southeastern) Nigeria. *Nigerian Journal of Medicine: journal of the National Association of Resident Doctors of Nigeria*, *18*(1), 79-83.

Esrey, S. A., Potash, J. B., Roberts, L., & Shiff, C. (1991). Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health Organization*, *69*(5), 609.

Esrey, S. A., Potash, J. B., Roberts, L., & Shiff, C. (1991). Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health Organization*, *69*(5), 609.

Evans, G. W. (2003). The built environment and mental health. *Journal of urban health*, *80*(4), 536-555.

Fay, M., Leipziger, D., Wodon, Q., & Yepes, T. (2005). Achieving child-health-related Millennium Development Goals: The role of infrastructure. *World Development*, *33*(8), 1267-1284.

Filmer, D., & Pritchett, L. (1999). The effect of household wealth on educational attainment: evidence from 35 countries. *Population and development review*, *25*(1), 85-120.

Fink, G., Günther, I., & Hill, K. (2011). The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986–2007. *International journal of epidemiology*, *40*(5), 1196-1204.

Folasade, I. B. (2000). Environmental factors, the situation of women and child mortality in southwestern Nigeria. *Social science & medicine*, *51*(10), 1473-1489.

Fotso, J. C. (2006). Child health inequities in developing countries: differences across urban and rural areas. *International journal for equity in health*, *5*(1), 1-10.

Fremont, W. P., Nastasi, R., Newman, N., & Roizen, N. J. (2008). The comfort level of paediatricians and family medicine physicians diagnosing and treating child and adolescent psychiatric disorders. *The International Journal of Psychiatry in Medicine*, *38*(2), 153-168.

French, R. J., & Schultz, J. E. (1984). Water use efficiency of wheat in a Mediterranean-type environment. I. The relation between yield, water use and climate. *Australian Journal of Agricultural Research*, *35*(6), 743-764.

Galiani, S., Gertler, P., & Schargrodsky, E. (2005). Water for life: The impact of the privatization of water services on child mortality. *Journal of political economy*, *113*(1), 83-120.

Gamper-Rabindran, S., Khan, S., & Timmins, C. (2010). The impact of piped water provision on infant mortality in Brazil: A quantile panel data approach. *Journal of Development Economics*, *92*(2), 188-200.

Gerald, B. (2018). A brief review of independent, dependent and one-sample t-tests. *International Journal of Applied Mathematics and Theoretical Physics*, *4*(2), 50-54.

Gerntholtz, L., Porteous, T., Ijaz, S., Neff, Z., & Reidy, A. (2018). Shall I Feed My Daughter, or Educate Her? Human Rights Watch, 1–81. Retrieved from https://www.hrw.org/report/2018/11/12/shall-i-feed-my-daughter-or-educate-her/barriers-girls-education-pakistan

Gertler, P. (2004). Do conditional cash transfers improve child health? Evidence from PROGRESA's control randomized experiment. *American economic review*, *94*(2), 336-341.

Getachew, A., Guadu, T., Tadie, A., Gizaw, Z., Gebrehiwot, M., Cherkos, D. H., ... & Gebrecherkos, T. (2018). Diarrhoea prevalence and sociodemographic factors among under-five children in rural areas of North Gondar Zone, Northwest Ethiopia. *International Journal of Pediatrics*, *2018*.

Glewwe, P., & Jacoby, H. G. (1995). An economic analysis of delayed primary school enrollment in a low-income country: the role of early childhood nutrition. *The Review of Economics and Statistics*, 156-169.

Gokhale, M. K., Kanade, A. N., Rao, S., Kelkar, R. S., Joshi, S. B., & Girigosavi, S. T. (2004). Female literacy: the multifactorial influence on child health in India. *Ecology of food and nutrition*, *43*(4), 257-278.

Gonzalez Davila, O. (2010). Food security and poverty in Mexico: the impact of higher global food prices. *Food Security*, *2*(4), 383-393.

Gonzalez Davila, O. (2010). Food security and poverty in Mexico: the impact of higher global food prices. *Food Security*, *2*(4), 383-393.

Graham, W. J., & Adjei, S. (2010). A call for responsible estimation of global health. *PLoS Medicine*, *7*(11), e1001003.

Graham, W. J., Ahmed, S., Stanton, C., Abou-Zahr, C. L., & Campbell, O. M. (2008). Measuring maternal mortality: an overview of opportunities and options for developing countries. *BMC Medicine*, *6*(1), 1-8.

Grossman, M. (2017). 1. On the Concept of Health Capital and the Demand for Health. In *Determinants of Health* (pp. 6-41). Columbia University Press.

Guilkey, D. K., & Riphahn, R. T. (1998). The determinants of child mortality in the Philippines: estimation of a structural model. *Journal of Development Economics*, *56*(2), 281-305.

Hall, D., & Lobina, E. (2009). Public policy options for financing sewerage systems. *Water and Sanitation Services: Public Policy and Management*, 88-105.

Hanmer, L., Lensink, R., & White, H. (2003). Infant and child mortality in developing countries: analysing the data for robust determinants. *The Journal of Development Studies*, *40*(1), 101-118.

Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: does the method matter? *Psychological Science*, *24*(10), 1918-1927.

Heaton, T. B., Forste, R., Hoffmann, J. P., & Flake, D. (2005). Cross-national variation in family influences on child health. *Social Science & Medicine*, *60*(1), 97-108.

Heckman, J. J. (2007). The economics, technology, and neuroscience of human capability formation. *Proceedings of the National Academy of Sciences*, *104*(33), 13250-13255.

Hill, K., & Upchurch, D. M. (1995). Gender differences in child health: evidence from the demographic and health surveys. *Population and development review*, 127-151.

Higginbotham, S., Holmes, R., Stone, H., Beil, J., Datu, G. B., Costa, S., & Paul, S. (2000). Adoption of protective behaviours among persons with recent HIV infection and diagnosis-Alabama, New Jersey, and Tennessee, 1997-1998. *Morbidity and Mortality Weekly Report*, *49*(23), 512-515.

Hobcraft, J. (1993). Women's education, child welfare and child survival: a review of the evidence. *Health transition review*, 159-175.

Hoddinott, J., & Kinsey, B. (2001). Child growth in the time of drought. *Oxford Bulletin of Economics and Statistics*, *63*(4), 409-436.

Hosseinpoor, A. R., Mohammad, K., Majdzadeh, R., Naghavi, M., Abolhassani, F., Sousa, A., ... & Vega, J. (2005). Socioeconomic inequality in infant mortality

in Iran and across its provinces. *Bulletin of the World Health Organization*, *83*, 837-844.

Houweling, T. A., & Kunst, A. E. (2010). Socio-economic inequalities in childhood mortality in low-and middle-income countries: a review of the international evidence. *British medical bulletin*, *93*(1), 7-26.

Ilyas, M., Ahmad, H. K., Afzal, M., & Mahmood, T. (2010). Determinants of manufacturing value added in Pakistan: An application of bounds testing approach to cointegration. *Pakistan Economic and Social Review*, 209-223.

Ilyas, S., Abid, G., & Ashfaq, F. (2020). Ethical leadership in sustainable organizations: The moderating role of general self-efficacy and the mediating role of organizational trust. *Sustainable Production and Consumption*, *22*, 195-204.

Institute of Medicine. (2003). The Health Care Delivery System. The Future of the Public's Health in the 21st Century, (Dc), 212–267.

Iram, U., & Butt, M. S. (2006). Understanding the health and nutritional status of children in Pakistan: A study of the interaction of socioeconomic and environmental factors. *International Journal of Social Economics*.

Jaccard, J., Turrisi, R., & Jaccard, J. (2003). *Interaction effects in multiple regression* (No. 72). Sage.

Jacob, B. A., Ludwig, J., & Miller, D. L. (2013). The effects of housing and neighbourhood conditions on child mortality. *Journal of health economics*, *32*(1), 195-206.

Jalan, J., & Ravallion, M. (2003). Does piped water reduce diarrhoea for children in rural India? *Journal of Econometrics*, *112*(1), 153-173.

Jayasuriya, R., & Wodon, Q. (Eds.). (2003). *Efficiency in reaching the millennium development goals*. World Bank Publications.

Jasti, S., Dudley, W. N., & Goldwater, E. (2008). SAS macros for testing statistical mediation in data with binary mediators or outcomes. *Nursing Research*, *57*(2), 118-122.

Jones, A. D., Ngure, F. M., Pelto, G., & Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in nutrition*, *4*(5), 481-505.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic Perspectives*, *5*(1), 193-206.

Khan, J. R., & Awan, N. (2017). A comprehensive analysis of child mortality and its determinants in Bangladesh using frailty models. *Archives of Public Health*, *75*(1), 1-10.

Khan, M. Z. K., Rahman, A., Rahman, M. A., & Renzaho, A. (2021). Impact of droughts on child mortality: a case study in Southern African countries. *Natural hazards*, *108*(2), 2211-2224.

Khalid, F., & Abbasi, A. N. (2018). Challenges faced by Pakistani healthcare system: Clinician's perspective.

Kim, D. Y., Park, J., & Morrison, A. M. (2008). A model of traveller acceptance of mobile technology. *International Journal of Tourism Research*, *10*(5), 393-407.

Kim, T. K. (2017). Understanding one-way ANOVA using conceptual figures. *Korean Journal of Anesthesiology*, *70*(1), 22-26.

Ki-moon, B. (2015). Access to essential medicines, vaccines, and health technologies. World Health Organization, (November), 1–9. Retrieved from www.euro.who.int/SDGs

Klerman, G. L., Olfson, M., Leon, A. C., & Weissman, M. M. (1992). Measuring the need for mental health care. *Health Affairs*, *11*(3), 23-33.

Kockelman, K. M., & Kweon, Y. J. (2002). Driver injury severity: an application of ordered probit models. *Accident Analysis & Prevention*, *34*(3), 313-321.

Kols, A., Gorar, Z., Sharjeel, M., Midhet, F., Nazir, R., Kumar, D., & Fareed, A. (2018). Provincial differences in levels, trends, and determinants of childhood immunization in Pakistan. *EMHJ*, *24*(4), 333-344.

Krieger, N., Smith, K., Naishadham, D., Hartman, C., & Barbeau, E. M. (2005). Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health. *Social science & medicine*, *61*(7), 1576-1596.

Kunitz, S. J., & Pesis-Katz, I. (2005). Mortality of White Americans, African Americans, and Canadians: the causes and consequences for the health of welfare state institutions and policies. *The Milbank Quarterly*, *83*(1), 5-39.

Kuruvilla, S., Schweitzer, J., Bishai, D., Chowdhury, S., Caramani, D., Frost, L., ... & Bustreo, F. (2014). Success factors for reducing maternal and child mortality. *Bulletin of the World Health Organization*, *92*, 533-544.

Kusek, J. Z., & Rist, R. C. (2004). *10 Steps to Result-Based Monitoring and Evaluation*.

Larik, R. S. A., Mallah, G. A., Talpur, M. M. A., Saeed, A., Ali, F., Larik, A. K. S., & Karim, S. (2016). Adverse Effects of Cell Phone Radiation on Human Health. *International Journal of Scientific Engineering Research*, *7*(10), 480-486.

Lee, J., & Mannering, F. (2002). Impact of roadside features on the frequency and severity of run-off-roadway accidents: an empirical analysis. *Accident analysis & prevention*, *34*(2), 149-161.

Li, B., Chen, C., & Hu, B. (2016). Governing urbanization and the new urbanization plan in China. *Environment and Urbanization*, *28*(2), 515-534.

Lin, P. W., & Stoll, B. J. (2006). Necrotising enterocolitis. *The Lancet*, *368*(9543), 1271-1283.

Lu, Y. (2010). Rural-urban migration and health: Evidence from longitudinal data in Indonesia. *Social science & medicine*, *70*(3), 412-419.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual review of psychology*, *58*, 593.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual review of psychology*, *58*, 593.

Mahaffey, K. R., Annest, J. L., Roberts, J., & Murphy, R. S. (1982). National estimates of blood lead levels: United States, 1976–1980: association with selected demographic and socioeconomic factors. *New England Journal of Medicine*, *307*(10), 573-579.

Mahapatra, P., Shibuya, K., Lopez, A. D., Coullare, F., Notzon, F. C., Rao, C., & Szreter, S. (2007). Civil registration systems and vital statistics: successes and missed opportunities. *The Lancet*, *370*(9599), 1653-1663.

Mahsud-Dornan, S. (2007). Pakistan, population programs and progress. Ulster Medical Journal, Vol. 76, pp. 122–123.

Maitra, C., Hodge, A., & Jimenez Soto, E. (2016). A scoping review of cost-benefit analysis in reproductive, maternal, newborn and child health: What we know and what are the gaps? *Health Policy and Planning*, *31*(10), 1530-1547.

Maitra, P., & Pal, S. (2007). Early childbirth, health inputs and child mortality: Recent evidence from Bangladesh. *Health Inputs and Child Mortality: Recent Evidence from Bangladesh (June 2007)*.

MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding and suppression effect. *Prevention Science*, *1*, 173-181.

McDonald, C. J., Overhage, J. M., Barnes, M., Schadow, G., Blevins, L., Dexter, P. R., ... & INPC Management Committee. (2005). The Indiana Network for patient care: a working local health information infrastructure. *Health Affairs*, *24*(5), 1214-1220.

Melgar-Quinonez, H., & Hackett, M. (2008). Measuring household food security: the global experience. *Revista de Nutrição*, *21*, 27s-37s.

Mercer, R. (2002). Violence against Women in Pakistan: A Framework for Analysis. The Antiquaries Journal, 82, 358–365. https://doi.org/10.1017/S000358150007390X

Merrick, T. W. (1985). The effect of piped water on early childhood mortality in urban Brazil, 1970 to 1976. *Demography*, *22*(1), 1-24.

Mikkelsen, L., Phillips, D. E., AbouZahr, C., Setel, P. W., De Savigny, D., Lozano, R., & Lopez, A. D. (2015). A global assessment of civil registration and vital statistics systems: monitoring data quality and progress. *The Lancet*, *386*(10001), 1395-1406.

Ministry of National Health Services Regulations and Coordination. (2022).

Miller, A. B., Sears, M. E., Morgan, L. L., Davis, D. L., Hardell, L., Oremus, M., & Soskolne, C. L. (2019). Risks to health and well-being from radio-frequency radiation emitted by cell phones and other wireless devices. *Frontiers in public health*, *7*, 223.

Monjon, S., & Waelbroeck, P. (2003). Assessing spillovers from universities to firms: evidence from French firm-level data. *International Journal of Industrial Organization*, *21*(9), 1255-1270.

Mosley, W. H., & Chen, L. C. (1984). An analytical framework for the study of child survival in developing countries. *Population and development review*, *10*, 25-45.

Mturi, A. J., & Curtis, S. L. (1995). The determinants of infant and child mortality in Tanzania. *Health policy and planning*, *10*(4), 384-394.

Mueller, N. C., & Nowack, B. (2008). Exposure modelling of engineered nanoparticles in the environment. *Environmental Science & Technology*, *42*(12), 4447-4453.

Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and social psychology*, *89*(6), 852.

Mahmood, N., & Kiani, M. F. K. (1994). Health care determinants of child survival in Pakistan. *The Pakistan Development Review*, *33*(4), 759-771.

Mwabu, G. (2009). The production of child health in Kenya: a structural model of birth weight. *Journal of African Economies*, *18*(2), 212-260.

Nadia, A. (2019). Maternal and newborn health in Pakistan: risks, challenges, and the way forward | South Asia @ LSE. *London School of Economics*.

Nakamura, Y. (2019). The Role of Maternal and child health (MCH) Handbook in the Era of sustainable development goals (SDGs). *Journal of Global Health Science*, *1*(1).

Nandy, S., Irving, M., Gordon, D., Subramanian, S. V., & Smith, G. D. (2005). Poverty, child undernutrition and morbidity: new evidence from India. *Bulletin of the World Health Organization*, *83*, 210-216.

Newacheck, P., Jameson, W. J., & Halfon, N. (1994). Health status and income: the impact of poverty on child health. *Journal of School Health*, *64*(6), 229-234.

Noorani, Q. A., Azam, I., Shaikh, B. T., Ranasinghe, T., Abbas, S., Wali, S., … Javed, W. (2013). Role of community-based savings groups (CBSGs) enhancing the utilization of community midwives in the Chitral district of Pakistan. *BMC Pregnancy and Childbirth*, *13*, 1–29.

Noh, J. W., Kim, Y. M., Akram, N., Yoo, K. B., Park, J., Cheon, J., ... & Stekelenburg, J. (2018). Factors affecting complete and timely childhood immunization coverage in Sindh, Pakistan; A secondary analysis of cross-sectional survey data. *PloS one*, *13*(10), e0206766.

Ntoimo, L. F. C., Brian, I., Ekwo, C., Yaya, S., Imongan, W., & Okonofua, F. E. (2021). Building community ownership of maternal and child health interventions in rural Nigeria: A community-based participatory approach. *African Journal of Reproductive Health*, *25*(3s), 43-54.

Ntoimo, L. F. C., Brian, I., Ekwo, C., Yaya, S., Imongan, W., & Okonofua, F. E. (2021). Building community ownership of maternal and child health interventions in rural Nigeria: A community-based participatory approach. *African Journal of Reproductive Health*, *25*(3s), 43-54.

Nutrition International. (2022). *Government of Pakistan and Nutrition International launch new implementation research to advance maternal health and nutrition, https://www.nutritionintl.org/news/all-news/government-of-pakistan-and-nutrition-international-launch-new-implementation-resear*.

Nutrition, P. M., & Zaidi, A. (2022). Ensuring Every Child Develops to Their Full Potential. In *UNICEF Pakistan*.

Nzioki, J. M., Onyango, R. O., & Ombaka, J. H. (2015). Socio-demographic factors influencing maternal and child health service utilization in Mwingi: a rural semi-arid district in Kenya. *American Journal of Public Health Research*, *3*(1), 21-30.

Ogunlesi, T. A., & Olanrewaju, D. M. (2010). Socio-demographic factors and appropriate healthcare-seeking behaviour for childhood illnesses. *Journal of tropical paediatrics*, *56*(6), 379-385.

Olsen, R. J., & Wolpin, K. I. (1983). The impact of exogenous child mortality on fertility: a waiting time regression with dynamic regressors. *Econometrica: Journal of the Econometric Society*, 731-749.

Oniyangi, O., & Omari, A. A. (2006). Malaria chemoprophylaxis in sickle cell disease. *Cochrane Database of Systematic Reviews*, (4).

Pakistan Household Integrated Economic Survey *(various issues)*

Panis, C. W., & Lillard, L. A. (1994). Health inputs and child mortality: Malaysia. *Journal of Health Economics*, *13*(4), 455-489.

Paul, V. K., Sachdev, H. S., Mavalankar, D., Ramachandran, P., Sankar, M. J., Bhandari, N., ... & Kirkwood, B. (2011). Reproductive health, and child health and nutrition in India: meeting the challenge. *The Lancet*, *377*(9762), 332-349.

Pearl, R., & Reed, L. J. (1930). The logistic curve and the census count of 1930. *Science*, *72*(1868), 399-401.

Pickett, K. E., & Pearl, M. (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiology & Community Health*, *55*(2), 111-122.

Pollock, L. A. (1990). Embarking on a rough passage: the experience of pregnancy in early-modern society. *Women as mothers in pre-industrial England*, 39-67.

Polyzou, E., Jones, N., Evangelinos, K. I., & Halvadakis, C. P. (2011). Willingness to pay for drinking water quality improvement and the influence of social capital. *The Journal of Socio-Economics*, *40*(1), 74-80.

Poros, M. (2010). Modern Migrations. In *Modern Migrations*. Stanford University Press.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate behavioural research*, *42*(1), 185-227.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate behavioural research*, *42*(1), 185-227.

Qazi, M. S. (2019). Study on Review of HIV Treatment, PPTCT & Pediatric Services. Unicef, (September).

Rafiei, M., Nord, M., Sadeghizadeh, A., & Entezari, M. H. (2009). Assessing the internal validity of a household survey-based food security measure adapted for use in Iran. *Nutrition Journal*, *8*(1), 1-11.

Rao, S. R., Pandey, A., & Shajy, K. I. (1997). Child mortality in Goa: A cross-sectional analysis. *Social Biology*, *44*(1-2), 101-110.

Ravallion, M. (2007). "Achieving Child-Health-Related Millennium Development Goals: The Role of Infrastructure"—A Comment. *World Development*, *35*(5), 920-928.

REPRODUCTIVE, MATERNAL, NEWBORN, CHILD, AND ADOLESCENT HEALTH, Pakistan RMNCAH investment case, Mortality, C., & Mortality, R. C. (2015). Reduce Child Mortality by 2015. *The World Bank*, 2014–2015.

Ridder, G., & Tunalı, İ. (1999). Stratified partial likelihood estimation. *Journal of Econometrics*, *92*(2), 193-232.

Rinne, S. T., Rodas, E. J., Rinne, M. L., Simpson, J. M., & Glickman, L. T. (2007). The use of biomass fuel is associated with infant mortality and child health in trend analysis. *The American Journal of tropical medicine and Hygiene*, *76*(3), 585-591.

Rinne, S. T., Rodas, E. J., Rinne, M. L., Simpson, J. M., & Glickman, L. T. (2007). The use of biomass fuel is associated with infant mortality and child health in trend analysis. *The American Journal of tropical medicine and Hygiene*, *76*(3), 585-591.

Rizvi, A., Bhatti, Z., Das, J. K., & Bhutta, Z. A. (2015). Pakistan and the millennium development goals for Maternal and Child Health: progress and the way forward. *Paediatrics and international child health*, *35*(4), 287-297.

Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation analysis in social psychology: Current practices and new recommendations. *Social and personality psychology compass*, *5*(6), 359-371.

Rudan, I., Gibson, J. L., Ameratunga, S., Arifeen, S. E., Bhutta, Z. A., Black, M., ... & Webster, J. (2008). Setting priorities in global child health research investments: guidelines for implementation of CHNRI method. *Croatian medical journal*, *49*(6), 720-733.

Rudan, I., Kapiriri, L., Tomlinson, M., Balliet, M., Cohen, B., & Chopra, M. (2010). Evidence-based priority setting for health care and research: tools to support policy in maternal, neonatal, and child health in Africa. *PLoS medicine*, *7*(7), e1000308.

Ruiz, K. B., Biondi, S., Oses, R., Acuña-Rodríguez, I. S., Antognoni, F., Martinez-Mosqueira, E. A., ... & Molina-Montenegro, M. A. (2014). Quinoa biodiversity and sustainability for food security under climate change. A review. *Agronomy for sustainable development*, *34*(2), 349-359.

Rutstein, S. O. (2000). Factors associated with trends in infant and child mortality in developing countries during the 1990s. *Bulletin of the World Health Organization*, *78*(10), 1256-1270.

Rijnhart, J. J., Twisk, J. W., Eekhout, I., & Heymans, M. W. (2019). Comparison of logistic-regression-based methods for simple mediation analysis with a dichotomous outcome variable. *BMC medical research methodology*, *19*, 1-10.

Sahu, K. K., Manar, M., & Singh, S. (2014). Assessment of health care facilities for maternal and child health care at Bal Mahila Chikitsalyas in Lucknow district, India. *IJBAR*, *5*(1), 26-28.

Saier Jr, M. H., Tam, R., Reizer, A., & Reizer, J. (1994). Two novel families of bacterial membrane proteins concerned with nodulation, cell division and transport. *Molecular microbiology*, *11*(5), 841-847.

Saira, A., Wilson, L. A., Ezeh, K. O., Lim, D., Osuagwu, U. L., & Agho, K. E. (2021). Factors associated with non-utilization of postnatal care among newborns in the first 2 days after birth in Pakistan: a nationwide cross-sectional study. Global Health Action, 14(1), 1–23.

Sastry, N. (1996). Community characteristics, individual and household attributes, and child survival in Brazil. *Demography*, *33*(2), 211-229.

Saunders, D. E., Hayward, R. D., Phipps, K. P., Chong, W. K., & Wade, A. M. (2003). Surveillance neuroimaging of intracranial medulloblastoma in children: how effective, how often, and for how long? *Journal of Neurosurgery*, *99*(2), 280-286.

Schellekens, J., & Van Poppel, F. (2012). Marital fertility decline in the Netherlands: Child mortality, real wages, and unemployment, 1860–1939. *Demography*, *49*(3), 965-988.

Scott, S. P., Chen-Edinboro, L. P., Caulfield, L. E., & Murray-Kolb, L. E. (2014). The impact of anaemia on child mortality: an updated review. *Nutrients*, *6*(12), 5915-5932.

Sede, P. I., & Ohemeng, W. (2015). Socio-economic determinants of life expectancy in Nigeria (1980–2011). *Health economics review*, *5*(1), 1-11.

Sedgwick, P. (2014). One-way analysis of variance: post hoc testing. *BMJ*, *349*.

Steel, P. W., Macfarlane, S. B., Szreter, S., Mikkelsen, L., Jha, P., Stout, S., ... & Monitoring of Vital Events (MoVE) writing group. (2007). A scandal of invisibility: making everyone count by counting everyone. *The Lancet*, *370*(9598), 1569-1577.

Shi, A. (2000). How access to urban potable water and sewerage connections affects child mortality. *Available at SSRN 629124*.

Shiell, A. (1991). *Poverty and inequalities in health* (No. 086chedp).

Shin, H. (2007). Child health in Peru: the importance of regional variation and community effects on children's height and weight. *Journal of Health and social behaviour*, *48*(4), 418-433.

Sreeramareddy, C. T., Shidhaye, R. R., & Sathiakumar, N. (2011). Association between biomass fuel use and maternal report of child size at birth-an analysis of 2005-06 India Demographic Health Survey data. *BMC public health*, *11*(1), 1-10.

Stephenson, R., Matthews, Z., & McDonald, J. W. (2003). The impact of rural–urban migration on under-two mortality in India. *Journal of Biosocial Science*, *35*(1), 15-31.

Strauss, J., & Thomas, D. (1995). Human resources: Empirical modelling of household and family decisions. *Handbook of development economics*, *3*, 1883-2023.

Stynes, D. J., & Peterson, G. L. (1984). A review of logit models with implications for modelling recreation choices. *Journal of Leisure Research*, *16*(4), 295-310.

Subbarao, K., & Raney, L. (1995). Social gains from female education: a cross-national study. *Economic development and cultural change*, *44*(1), 105-128.

Subbarao, K., & Raney, L. (1995). Social gains from female education: a cross-national study. *Economic development and cultural change*, *44*(1), 105-128.

Subhan, S., & Ahman, E. (2012). The economic and demographic effects on housing tenure choice in Pakistan. *American International Journal of Contemporary Research*, *2*(7), 15-24.

Sufian, A. J. (1990). Socioeconomic factors and fertility in the Eastern Province of Saudi Arabia. *Biology and Society: the journal of the Eugenics Society*, *7*(4), 186-193.

Sufian, A. J. M., & Johnson, N. E. (1989). Son preference and child replacement in Bangladesh: A new look at the child survival hypothesis. *Journal of biosocial science*, *21*(2), 207-216.

Suryadhi, M. A. H., Abudureyimu, K., Kashima, S., & Yorifuji, T. (2019). Effects of household air pollution from solid fuel use and environmental tobacco smoke on child health outcomes in Indonesia. *Journal of Occupational and environmental medicine*, *61*(4), 335-339.

Susuman, A. S. (2012). Child mortality rate in Ethiopia. *Iranian Journal of public health*, *41*(3), 9.

Stone, E. C., Garfield, R., Vasconcelos, M. I., & Craveiro, V. A. (2000). Primary health care lessons from the Northeast of Brazil: the Agentes de Saúde Program. *Revista Panamericana de Salud Pública*, *7*, 293-301.

Szwarcwald, C. L., de Andrade, C. L. T., & Bastos, F. I. (2002). Income inequality, residential poverty clustering and infant mortality: a study in Rio de Janeiro, Brazil. *Social science & medicine*, *55*(12), 2083-2092.

Tanaka, S. (2005). Parental leave and child health across OECD countries. *The Economic Journal*, *115*(501), F7-F28.

Tang, D., Li, T. Y., Liu, J. J., Chen, Y. H., Qu, L., & Perera, F. (2006). PAH–DNA adducts in cord blood and fetal and child development in a Chinese cohort. *Environmental health perspectives*, *114*(8), 1297-1300.

Tapia Granados, J. A. (2008). Macroeconomic fluctuations and mortality in postwar Japan. *Demography*, *45*(2), 323-343.

Thomasen, K. (2016). Advancing women's sexual and reproductive rights in Europe – a snapshot of legal and policy progress from 1986 to 2016. *Entre Nous - The European Magazine for Sexual and Reproductive Health*, *85*(6), 14–15.

Tolhurst, R., & Nyonator, F. K. (2006). Looking within the household: gender roles and responses to malaria in Ghana. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, *100*(4), 321-326.

Tolhurst, R., Amekudzi, Y. P., Nyonator, F. K., Squire, S. B., & Theobald, S. (2008). "He will ask why the child gets sick so often": The gendered dynamics of intra-household bargaining over healthcare for children with fever in the Volta Region of Ghana. *Social science & medicine*, *66*(5), 1106-1117.

Torres-Arreola, L. P., Constantino-Casas, P., Flores-Hernández, S., Villa-Barragán, J. P., & Rendón-Macías, E. (2005). Socioeconomic factors and low birth weight in Mexico. *BMC Public Health*, *5*(1), 1-7.

Trevisanuto, D., Raggi, R., Bavuusuren, B., Tudevdorj, E., Doglioni, N., & Zanardo, V. (2011). Investments for medical equipment in a mother and child health hospital: correlation with the level of services/departments. *The Journal of Maternal-Fetal & Neonatal Medicine*, *24*(2), 234-238.

Tristanti, I., Nisak, A. Z., Khoirunnisa, F. N., Wigati, A., & Kusumastuti, D. A. (2020, July). The Effectiveness of Using Gadgets on Pregnant Women. In *1st International Conference on Science, Health, Economics, Education and Technology (ICoSHEET 2019)* (pp. 288-291). Atlantis Press.

Turtle, L., Bali, T., Buxton, G., Chib, S., Chan, S., Soni, M., ... & Solomon, T. (2016). Human T cell responses to Japanese encephalitis virus in health and disease. *Journal of Experimental Medicine*, *213*(7), 1331-1352.

Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kaźmierczak, A., Niemela, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Landscape and urban planning*, *81*(3), 167-178.

UNICEF. (2020). Looking ahead: Child survival and the Sustainable Development

Goals. *The Lancet Global Health*, *2*(9), e521–e530.

United Nations. (2018). Transforming Our World: The 2030 Agenda for Sustainable Development. *A New Era in Global Health*, 1–19.

Wagstaff, A., & Van Doorslaer, E. (2000). Equity in health care finance and delivery. *Handbook of health economics*, *1*, 1803-1862.

Wagstaff, A., Bustreo, F., Bryce, J., Claeson, M., & WHO–World Bank Child Health and Poverty Working Group. (2004). Child health: reaching the poor. *American Journal of public health*, *94*(5), 726-736.

Wang, L. (2003). Determinants of child mortality in LDCs: empirical findings from demographic and health surveys. *Health policy*, *65*(3), 277-299.

Wang, L. (2003). Determinants of child mortality in LDCs: empirical findings from demographic and health surveys. *Health policy*, *65*(3), 277-299.

Wang, X. L., Yuan, C. Z., Shen, C. P., Wang, P., Adachi, I., Aihara, H., ... & Zupanc, A. (2007). Observation of Two Resonant Structures in e+ e−→ π+ π− ψ (2 S) via Initial-State Radiation at Belle. *Physical review letters*, *99*(14), 142002.

Wang, Y., Zhu, J., He, C., Li, X., Miao, L., & Liang, J. (2012). Geographical disparities of infant mortality in rural China. *Archives of Disease in Childhood-Fetal and Neonatal Edition*, *97*(4), F285-F290.

Westgard, C. M., Rogers, A., Bello, G., & Rivadeneyra, N. (2019). Health service utilization, perspectives, and health-seeking behaviour for maternal and child health services in the Amazon of Peru, a mixed-methods study. *International journal for equity in health*, *18*(1), 1-12.

Wickham, S., Anwar, E., Barr, B., Law, C., & Taylor-Robinson, D. (2016). Poverty and child health in the UK: using evidence for action. *Archives of disease in childhood*, *101*(8), 759-766.

Wigle, D. T., Arbuckle, T. E., Walker, M., Wade, M. G., Liu, S., & Krewski, D. (2007). Environmental hazards: evidence for effects on child health. *Journal of Toxicology and environmental health, part B*, *10*(1-2), 3-39.

Woo, E. H., White, P., & Lai, C. W. (2016). Impact of information and communication technology on child health. *Journal of Paediatrics and child health*, *52*(6), 590-594.

Woo, E. H., White, P., & Lai, C. W. (2016). Impact of information and communication technology on child health. *Journal of Paediatrics and child health*, *52*(6), 590-594.

Woodworth, R. S. (1928). How emotions are identified and classified.

World Bank. (2010). *Global monitoring report 2010: The MDGs after the crisis*. The World Bank.

World Bank. (2017). *Global Financial Development Report 2017/2018: Bankers without Borders*. The World Bank.

World Health Organization. (1978). *Declaration of alma-ata* (No. WHO/EURO: 1978-3938-43697-61471). World Health Organization. Regional Office for Europe.

World Health Organization. (2010). *World health statistics 2010*. World Health Organization.

World Health Organization. (2013). Ending Preventable Child Deaths from Pneumonia and Diarrhoea by 2025 The Integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD). Retrieved from the World Health Organization website.

World Health Organization. (2015). *Trends in maternal mortality: 1990-2015: estimates from WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*. World Health Organization.

Wright, G. W., & Simon, R. M. (2003). A random variance model for detection of differential gene expression in small microarray experiments. *Bioinformatics*, *19*(18), 2448-2455.

Wu, W. Q., Wang, W., Li, Z. B., Liu, P., & Wang, Y. (2014). Application of generalized estimating equations for crash frequency modelling with temporal correlation. *Journal of Zhejiang University SCIENCE A*, *15*(7), 529-539.

Appendix

Table-A-1: Test for Multicollinearity of Explanatory Variables of Logit Regression Model

Variables	Coefficients	S.D	t-statistics	Collinearity Statistics	
				Tolerance	VIF
(Constant)	0.071	0.026	2.785		
House Ownership	-0.005	0.003	-2.087	0.928	1.077
Gender	0.000	0.007	0.035	0.946	1.057
Fuel	0.069	0.009	7.355	0.879	1.137
Water	-0.020	0.008	-2.500	0.971	1.030
Technology	-0.007	0.003	-2.512	0.497	2.013
Assets Poverty	8.087E-7	0.000	7.676	0.857	1.167
Health Expenditure	7.309E-7	0.000	9.578	0.616	1.622
Total Expenditure per month	-0.002	0.002	-0.700	0.703	1.422
Rooms	0.006	0.007	0.827	0.717	1.394
Internet	-0.005	0.012	-0.457	0.937	1.067
Mobile Phone	0.008	0.002	5.205	0.961	1.041
Toilet	0.043	0.004	12.18	0.813	1.230
Food Insecurity	0.071	0.026	2.785	0.928	1.077

Source: Authors's Calculations.

Table-A-2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Child Health	24809	0.00	1.00	0.226	0.4185
Child Mortality	24809	0	1	0.16	0.369
Health Expenditures	24809	10.00	160000.00	13848.8590	27055.39011

Food Insecurity	24809	1.00	3.00	1.6064	0.83454
Total Expenditure	24809	612.08	1073338.92	40126.7497	44135.43359
Health Expenditure Group	24809	1.00	4.00	2.2463	1.09349
Assets Poverty Group	24482	1	5	2.99	1.410
Gender of HH	24809	1	4	1.06	0.384
Technology for self-Medication	24809	0	3	1.34	0.674
House Ownership	24809	1	5	1.42	1.045
Water Availability	24809	0	1	0.86	0.347
Fuel for Cooking	24809	0	1	0.89	0.313
Toilet Facility	24809	0	1	0.87	0.331
Sewerage Facility	24809	1	9	3.39	1.680
House Crowding	24809	1	15	2.36	1.384
What is the main fuel used for cooking?	24809	1	9	2.41	1.946
Mobile Facility	24809	1	2	1.06	0.235
Landline Facility	24809	1	2	1.98	0.136
Internet Facility	24809	1	2	1.68	0.468

The table A-2 shows the descriptive statistics for the exogenous factors associated with the health and deaths of child under 5 years. Except for the health expenditures and expentures in total are cetagorical, therefore, the minimum and maximum reflect the value fluctuation between certain threshold values of the dummies. The health expenditures are counted in rupees per month having a mean value of 13848 Rs. However, the mean of the total expenditures of the household is counted to be approximately 40126 Rs. Other factors can be judged by the tendency of the mean value to the extreme e.g., toilet facility to the households is ranging from 0-1, the mean shows that nearly 80% of the households are equipped with this facility at their houses.

Table A-3 (a): Omnibus Tests of Model Coefficients

		χ^2 Coefficient	df	Significance
Step 1	Step	141.231	1	0.000
	Block	141.231	1	0.000
	Model	141.231	1	0.000
Step 2	Step	135.117	1	0.000
	Block	276.348	2	0.000
	Model	276.348	2	0.000
Step 3	Step	86.648	1	0.000
	Block	362.997	3	0.000
	Model	362.997	3	0.000
Step 4	Step	79.364	1	0.000
	Block	442.361	4	0.000
	Model	442.361	4	0.000
Step 5	Step	42.193	1	0.000
	Block	484.553	5	0.000
	Model	484.553	5	0.000
Step 6	Step	39.472	1	0.000
	Block	524.025	6	0.000
	Model	524.025	6	0.000
Step 7	Step	10.392	1	0.001
	Block	534.417	7	0.000
	Model	534.417	7	0.000

Table A-3(b): Forward Stepwise Addition of Variables in the Model (Likelihood Ratio test)

		B	S.E.	Wald	df	Significance
Step 1[a]	Health Expenditures	0.070	0.010	118.889	1	0.000
	Constant	-1.329	0.018	5321.824	1	0.000
Step 2[b]	Health Expenditures	0.070	0.010	125.798	1	0.000
	Food Insecurity	0.210	0.018	137.594	1	0.000
	Constant	-1.676	0.035	2245.458	1	0.000
Step 3[c]	Health Expenditures	0.070	0.010	124.652	1	0.000
	Feul	0.070	0.007	88.967	1	0.000
	Food Insecurity	0.190	0.018	110.725	1	0.000
	Constant	-1.819	0.039	2216.745	1	0.000
Step 4[d]	Health Expenditures	0.070	0.010	54.714	1	0.000
	Total Expenditures	0.000	0.000	79.367	1	0.000
	Fuel	0.073	0.008	95.560	1	0.000
	Food Insecurity	0.230	0.019	152.301	1	0.000
	Constant	-1.995	0.044	2072.659	1	0.000
Step 5[e]	Health Expenditures	0.070	0.010	51.943	1	0.000
	Total Expenditures	0.010	0.002	87.028	1	0.000
	Fuel	0.075	0.008	100.422	1	0.000
	sewerage	0.060	0.009	42.452	1	0.000
	Food Insecurity	0.229	0.019	149.504	1	0.000
	Constant	-2.207	0.055	1612.189	1	0.000
Step 6[f]	Electricity	0.345	0.056	37.389	1	0.000
	Health Expenditures	0.070	0.010	51.365	1	0.000
	Total Expenditures	0.010	0.002	87.563	1	0.000
	Fuel	0.073	0.008	92.655	1	0.000
	sewerage	0.058	0.009	38.822	1	0.000
	Food Insecurity	0.245	0.019	168.085	1	0.000
	Constant	-2.525	0.076	1097.318	1	0.000
Step 7[g]	Electricity	0.357	0.057	39.836	1	0.000
	water	-0.145	0.044	10.556	1	0.001
	Health Expenditures	0.070	0.010	51.062	1	0.000
	Total Expenditures	0.010	0.002	78.071	1	0.000
	Fuel	0.075	0.008	97.043	1	0.000
	sewerage	0.057	0.009	37.875	1	0.000
	Food Insecurity	0.237	0.019	155.149	1	0.000
	Constant	-2.402	0.085	798.000	1	0.000

a. Variable(s) entered on step 1: Health Expenditures

b. Variable(s) entered on step 2: Food insecurity
c. Variable(s) entered on step 3: Type of Fuel
d. Variable(s) entered on step 4: Total Expenditure
e. Variable(s) entered on step 5: Sewerage Facility
f. Variable(s) entered on step 6: Electricity Availability
g. Variable(s) entered on step 7: Water Availability

Figure 1: Child health care (pneumonia)

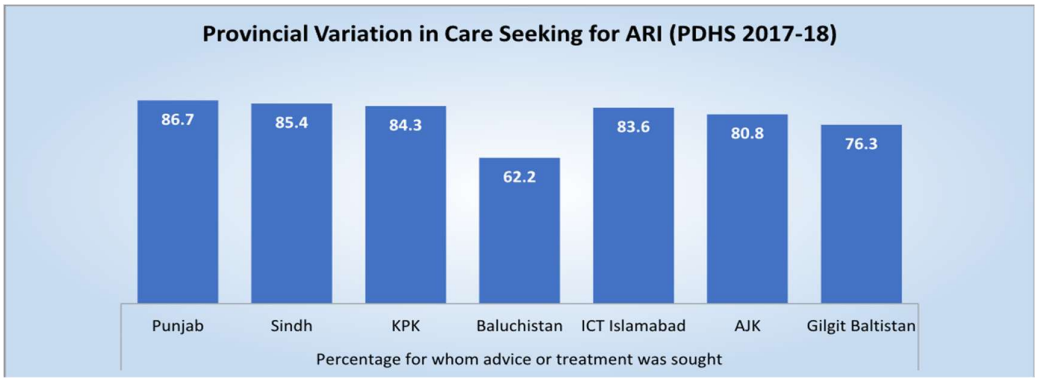


Figure 2: Child health care (diarrhea)

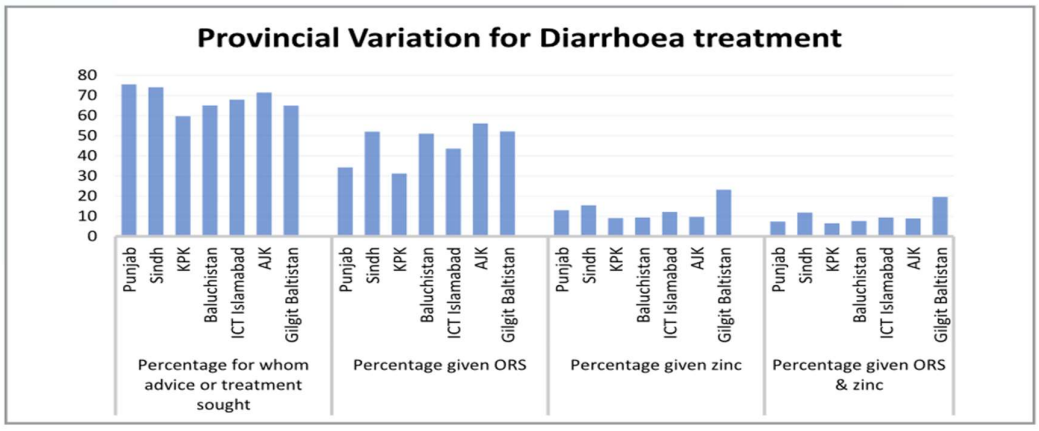
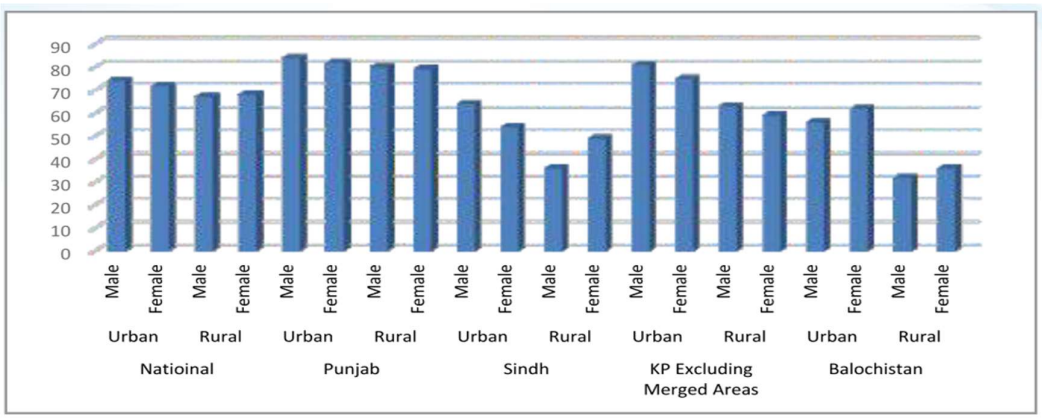


Figure 3: Percentage of children vaccinated at time of survey



Source: PSLM 2018-19

- **Annex-A: Male Questionnaire of HIES (2018-19).**
- **Annex -B: Female Questionnaire of HIES (2018-19).**