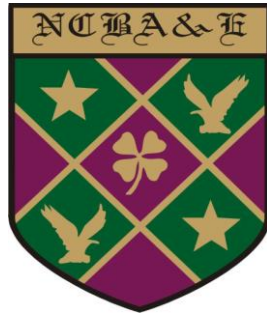


*National College of Business
Administration & Economics
Lahore*



**MEASUREMENT AND DECOMPOSITION
OF INEQUALITY OF OPPORTUNITY IN
MATERNAL AND CHILD HEALTHCARE
SERVICES IN PAKISTAN**

BY

HINA SAFDAR

**MASTER OF PHILOSOPHY
IN
ECONOMICS**

FEBRUARY, 2023

**NATIONAL COLLEGE OF BUSINESS
ADMINISTRATION & ECONOMICS**

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**A dissertation submitted to
Faculty of Social Sciences**

**In Partial Fulfillment of the
Requirements for the Degree of**

**MASTER OF PHILOSOPHY
IN
ECONOMICS**

February, 2023



*In the name of ALLAH,
The Most Beneficial,
The Most Merciful,*

**NATIONAL COLLEGE OF BUSINESS
ADMINISTRATION & ECONOMICS
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ECONOMICS**

Dissertation Committee:

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Member

Member

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National College of Business
Administration & Economics

DECLARATION

It is to declare that this research work has not been submitted for obtaining similar degree from any other university/college.

HINA SAFDAR
February, 2023

DEDICATED

TO

My Brother

Abdullah Safdar

ACKNOWLEDGEMENT

All praises and thanks to Almighty Allah, who has given us the wisdom and knowledge to identify the right path and reach the truth. With profound gratitude, I wish to thank some marvelous people who have encouraged and helped me through their presence.

I express my profound gratitude and indebtedness to my honorable supervisor, Dr. Zahid Pervaiz, Associate Professor, Department of Economics, for his ever-inspiring guidance and constructive suggestions throughout my studies. Without his positive feedback, this thesis would not have materialized.

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RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis entitled **“Measurement and Decomposition of Inequality of Opportunity in Maternal and Child Healthcare Services in Pakistan”** has been carried out and completed by **Ms. Hina Safdar** under my supervision during her **M.Phil. Economics** Programme.

(Dr. Zahid Pervaiz)
Supervisor

SUMMARY

Developing countries like Pakistan often have poor health outcomes because most people cannot access healthcare services. Accessing and using maternal and child healthcare services is essential for human development. However, inequality remains a persistent problem for many developing countries. Inequality in the use of maternal and child healthcare services has long been a barrier to universal access to healthcare services. Our work aims to analyze the inequality of opportunity in access to maternal and child healthcare services in Pakistan and explore the circumstance variables that contribute the most to the inequality. We used data sets from the Pakistan Demographic and Health Survey of 2013 and 2018 to investigate the inequality of opportunity in Pakistan's maternal and child healthcare services. For this study, three maternal and child healthcare indicators were chosen, including antenatal care visits, skilled birth attendants, postnatal care for maternal healthcare services, child immunization, diarrhea treatment, and fever/cough treatment for child healthcare services. This study applied the Human Opportunity Index (HOI) methodology to estimate the coverage rate of these opportunities that are discounted due to unequal allocations. At the same time, the shapely decomposition was used to determine the contribution of each circumstance to the inequality.

The results show that people's prevalence for healthcare services increased in two out of three maternal healthcare services. In contrast, in child healthcare services, the prevalence of only one healthcare service increased during the five-year survey. Results of the coverage rate show that the coverage rate only increased in antenatal care, skilled birth attendant, and child immunization. After analyzing the dissimilarity index results, we found that the inequality of opportunity has decreased for all of the chosen maternal healthcare services. However, inequality for child healthcare services increased for diarrhea and fever/cough treatment between 2013 and 2018. The change in HOI was caused by changes in the coverage rate and the dissimilarity index, as HOI is the universal coverage rate discounted by inequality. So, results show that universal coverage in antenatal care, skilled birth attendant, and child immunization increased from 2013 to 2018. According to the Shapley decomposition results, household wealth status, the mother's education, and place and region of residence were the most critical factors influencing IO in using MCHCS in Pakistan from 2013 to 2018.

Based on the results, to improve the use of maternal and child health services and to reduce inequalities in these services, the government will have to invest in (i) increasing the educational levels of women, (ii) improving the standard of living, and (iii) bringing maternal and child health services closer to rural populations.

LIST OF ABBREVIATIONS

ANC	Antenatal Care
CHCS	Children’s Healthcare Services
CI	Child Immunization.
CMR	Child Mortality Rate
CSDH	Commission on Social Determinants of Health
DE	Distribution Effect
DNHF	Distance to the Nearest Health Facility.
DHS	Demographic and Health Survey.
D-index	Dissimilarity Index
DT	Diarrhea Treatment
F. Edu.	Father’s Education
F.Emp.S.	Father’s Employment Status
FCT	Fever or cough Treatment
GC	Gender of Child
GHH	Gender of Household Head
H. Edu.	Husband’s Education
H. Emp. S.	Husband’s Employment Status
HH	Household
HOI	Human Opportunity Index
IO	Inequality of Opportunity
IOs	Inequality of Opportunities
EMM	Exposure to Mass Media
M.Edu.	Mother’s Education

M.Emp.S.	Mother's Employment Status
MCHCS	Maternal and Child Health Care Services
MHCS	Maternal Health Care Services
MMR	Maternal Mortality Rate
NLC	Number of Living Children
PDHS	Pakistan Demographic Health Survey
Reg.	Region of Residence
Res.	Place of Residence
SBA	Skilled birth Attendant
SE	Substitution Effect
WI	Wealth Index
WB	World Bank
WHO	World health Organization

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Equality of opportunity is a situation when everyone has equal access to health, education, nourishment, etc. (Sen, 1985, 1988). Over the past few decades, economists have paid much attention to equal opportunities. This concept is based on equal rights for everyone and the absence of discrimination. It requires that one generation's social status no longer depends upon the previous generation's situation. Roemer gave the concept of equal opportunity in 1996. According to him, inequality is primarily due to individual effort and circumstances. Circumstances are those factors that are not in an individual's control, such as the gender of a person, their parents' education, income, the geographical area where they live, and religion. Inequality occurs due to efforts being morally justifiable, but the inequality arising due to circumstances is called inequality of opportunity and is unjustifiable and must be compensated. So, according to this, to create effective equal-opportunity policies, it is necessary to differentiate between types of equality, either it arises due to efforts or circumstances (Roemer, 1996, 1998; Pervaiz and Akram, 2018).

World Bank (2006) stated that "Unequal opportunity caused by circumstances at birth (parent's socioeconomic background, ethnicity, gender, caste, religion, and place of origin) which are beyond the individual's control is widely seen as intrinsically unfair. Unfairness bothers people and can lead to social conflict and further states that inequality in some particular circumstances (notably but not exclusively inherited wealth) can be economically inefficient".

Health equity is always at the top of the list of priorities for global development. Minimizing health inequalities has always been a top priority for policymakers in developed and underdeveloped nations. According to the World Bank Report, "Health is not only a fundamental aspect of human welfare, but inequality in health frequently reinforces and reproduces inequality in domains such as income, education, and employment" (World Bank, 2006). However, it appears that inequalities in opportunities due to circumstances faced by individuals, such as their cast, religion, socioeconomic background of parents, and ethnicity, play a significant role in determining how health inequalities arise through time and across the generations. It has led to a growing interest in the literature based on equal opportunity and its empirical application to equality in health services as a

result of the research on different policies to eliminate health disparities (Donni et al., 2014; Fleurbaey and Schokkaert, 2009; Rosa Dias, 2009; Rosa Dias and Jones, 2007; Trannoy et al., 2010).

Health inequality arising from inequality of circumstances is considered intrinsically unfair. Maternal and child health is a well-acknowledged indicator to judge the health status of a society. Maternal health is deemed crucial to the survival and well-being of the mother, child, and community. Investments to increase the healthcare services offered to mothers during and after childbirth have substantially decreased maternal mortality rates (MMR) (Filippi et al., 2006).

According to the WHO, maternal health is “women’s health during pregnancy, childbirth, and the postpartum period. It includes all the treatment women receive during pregnancy, childbirth, and weeks after delivery”. (WHO, 2012). It has three essential components: antenatal care, skilled birth attendant, and postnatal care. Antenatal care consists of regular visits and check-ups that help doctors or midwives treat and prevent pregnancy-related health issues. Skilled birth attendance recommends that a skilled birth attendant should assist all births. At the same time, postnatal care prevents complications after childbirth.

In any society’s healthcare system, child health is always the priority and essential aspect (Boyle et al., 2006). According to WHO, immunization is a “process whereby a person is made immune or resistant to an infectious disease, typically by administering a vaccine. Vaccines stimulate the body’s immune system to protect the person against subsequent infection or disease” (WHO, 2016). Child immunization is considered the most effective and successful intervention in medical science to prevent communicable diseases and the under-five mortality rate (Omer et al., 2009). Through immunization, we can control the widespread disorders in children that provide shelter to children, mothers, and communities (Stevenson, 2009). Child immunization has played a vital role in preventing many infectious diseases worldwide. If the children get the vaccination timely, it can protect them from contagious diseases and reduce the risk of transmission to other children (Kennedy et al., 2011).

Diarrhea, fever, and cough also affect children’s health. Diarrhea is a significant contributor to causing death in children, especially in developing countries. It is possible to save the lives of millions of children at risk of death from diarrhea with a holistic plan that guarantees that all children in need receive essential prevention and care interventions (Wardlaw et al., 2010). In children younger than 36 months, febrile diseases (fever and cough)

are prevalent and have potentially serious consequences (Hamilton and John, 2013).

Pakistan is a developing country and has shown high inequality over time. These inequalities are of different kinds, such as health inequality, income inequality, education inequality, and gender inequality. A high level of inequality may have negatively affected the welfare of individuals (Pervaiz and Akram, 2018). IO may contribute to the imbalance of outcomes. So there is a need to study the issue of health inequality in the context of Pakistan.

1.2 PROBLEM STATEMENT

Each day, thousands of people die from diseases that could be precluded. Maternal and child mortality are considered the leading causes of these deaths. These deaths include the low uptake of maternal and child health services. Maternal mortality is unacceptably high. The global Maternal mortality rate (MMR) in 2020 was estimated at 223 maternal deaths per 100,000 live births; about 287,000 women died during and following pregnancy and childbirth in 2020; every day, approximately 800 women died from preventable causes related to pregnancy and childbirth - meaning that a woman dies around every two minutes (WHO,2023). In 2021, 38.09 per 1,000 or approximately 5.0 million children die globally under-5 years due to the unavailability of healthcare services (UNICEF, 2023).

The annual maternal mortality rate in Pakistan is 154 per 100,000 live births (WHO, 2023), and the under-five mortality rate is 63.3 per 1000 live births (UNICEF, 2019). The country's higher maternal and child mortality rates may result from insufficient reproductive health facilities and poor vaccination coverage (PDHS, 2018). In our study, we will measure inequality of opportunity (IO) in maternal and child healthcare services (MCHCS) and the decomposition of inequality on the dataset of PDHS 2012-13 and 2017-18.

1.3 RESEARCH QUESTION

This study is going to answer the following research questions.

- What is the prevalence rate of Inequality of Opportunity (IO) in maternal health services in Pakistan?
- What is the prevalence rate of IO in child health services in Pakistan?
- What is the marginal contribution of circumstances to the inequality of maternal and child healthcare services in Pakistan?

1.4 STUDY OBJECTIVE

This study aims to determine how unequal access to and use of maternal and child healthcare services is affected by unequal opportunities.

1.4.1 Specific Objectives

- 1) To estimate maternal and child healthcare services coverage and utilization rate among women and children.
- 2) To estimate IO in maternal and child healthcare services among women and children in Pakistan.
- 3) To determine the contribution of the determinants of inequality of opportunity in maternal and child healthcare among women and children.

1.5 SIGNIFICANCE OF THE STUDY

There have been numerous research undertakings on the inequality of income and wealth in Pakistan. However, literature based on measuring inequality of opportunity (IO) in maternal and child healthcare services (MCHCS) with the help of the Human Opportunity Index (HOI) and then the decomposition of the disparity through Shepley's decomposition technique is rare in Pakistan. In our study, we use HOI to measure IO in MCHCS in Pakistan, and then we decompose inequality with the help of Shapley decomposition on the data sets of PDHS 2012-13 and 2017-18.

1.6 JUSTIFICATION OF STUDY

The research aims to discover differences in maternal and child healthcare opportunities among women and children, which will assist policymakers in implementing compensatory policies to reduce opportunity gaps. Furthermore, this study contributed to the literature by depicting the utilization of opportunity disparities to address maternal and child health in an underdeveloped nation.

1.7 ORGANIZATION OF STUDY

Besides chapter 1, which presents the study's introduction, chapter 2 presents the history and performance of maternal and child healthcare services in Pakistan. Chapter three consists of a literature review. Chapter four contains the theoretical framework and methodology. Empirical results and a discussion of the results are in chapter five. Chapter six presents the conclusion and policy implications of our study.

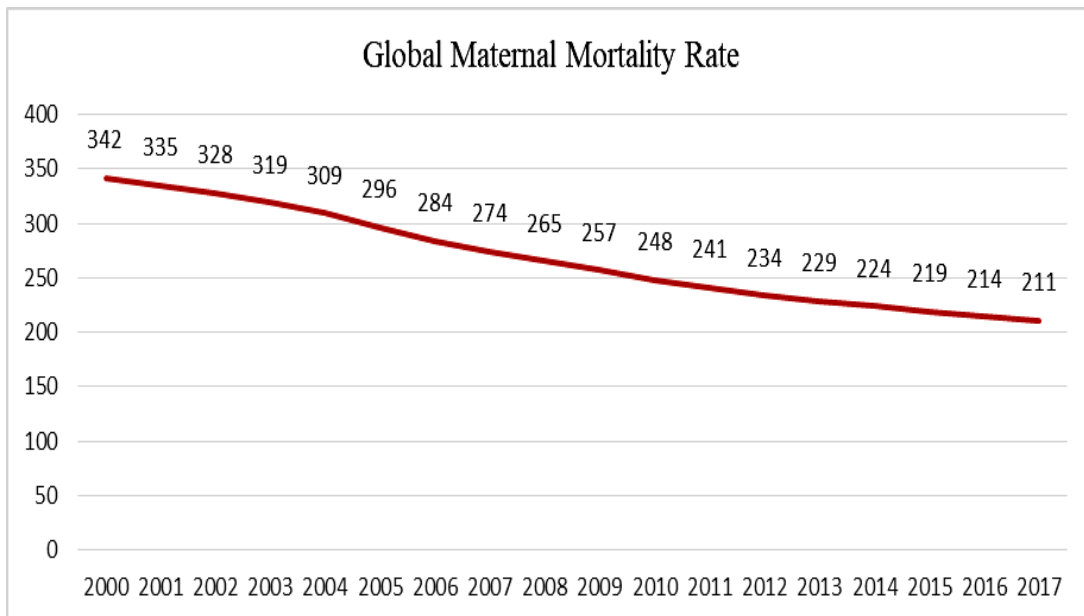
CHAPTER 2

AN OVERVIEW OF MATERNAL AND CHILD HEALTHCARE SERVICES

Education and health are two of the most significant indicators of human capital development, which is crucial for socioeconomic development. The health sector is essential to efforts to reduce poverty and inequality (Pervaiz and Chaudhary). Health indicators are a top priority for achieving the Millennium Development Goals (MDGs). Maternal and child health care (MCHC) has become a global public health issue in the 21st century, primarily due to the MDGs and the Sustainable Development Goals (SDGs). According to “International Conference on Population and Development Action Program” (ICPD), “every woman has the right to enjoy good reproductive health, and every birth should be safe” (United Nations, 1994). The “International Conference on Safe Motherhood” (ICPD) in 1987 and the “Millennium Development Goals” (MDGs) in 2000 both acknowledged the importance of reproductive health. The “International Conference on Safe Motherhood” set a target of reducing maternal mortality to one-half by the year 2000, while the ICPD set a target of a reduction in maternal mortality to at least half of the 1990 levels by the year 2000 and an increased one-half reduction by 2015 (WHO, 2004). Unfortunately, many developing countries, including Pakistan, failed to achieve these goals, including the MDGs, in 2015. After that, SDGs were designed to reduce maternal and child mortality rates. These goals aimed to reduce the maternal mortality ratio to less than 70 per 100,000 live births, the under-5 mortality rate to 25 per 1,000 live births, and the epidemics of polio, hepatitis, and other contagious diseases by 2030 (WHO, 2015).

2.1 MATERNAL MORTALITY RATE

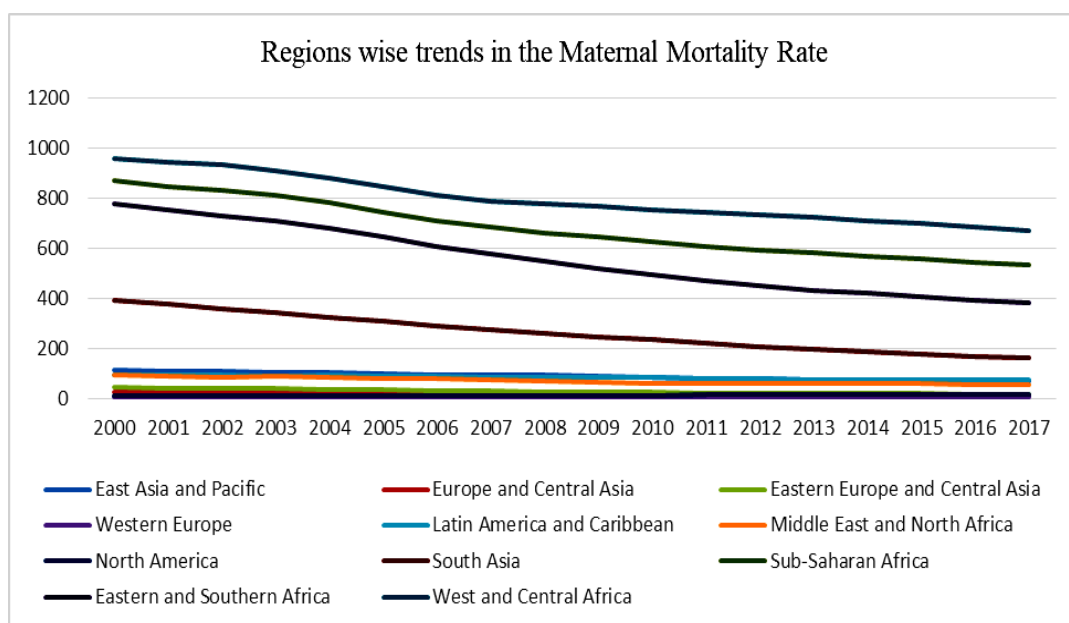
Maternal mortality (MM) is deaths due to problems during pregnancy or childbirth.



Source: WHO, UNICEF - 2017

Figure 2.1: Global Maternal Mortality Rate (MMR) (per 100,000 births)

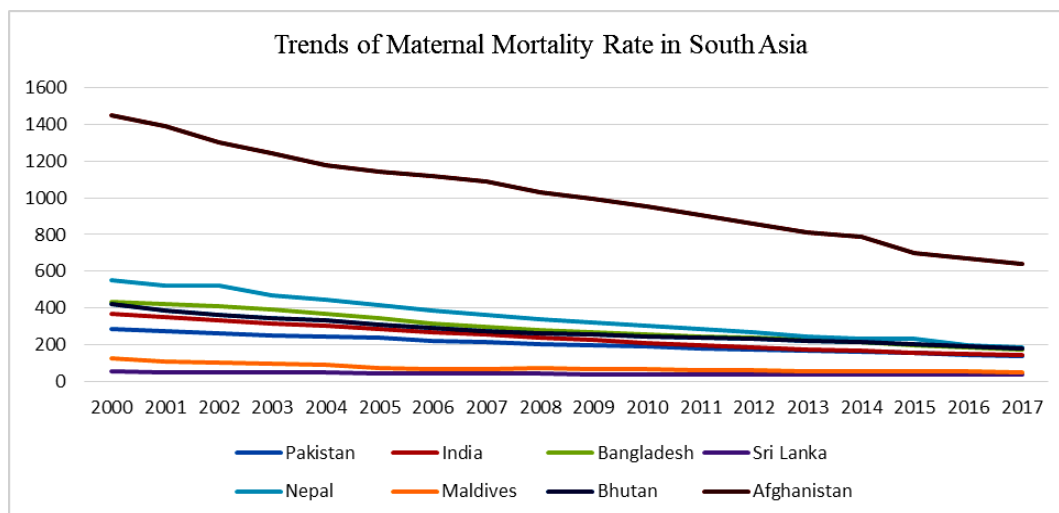
Figure 2.1 presents the trend of maternal mortality rate (MMR) from 2000 to 2017. According to United Nations (UN) inter-agency estimates, the global maternal mortality ratio declined by 38 percent – from 342 deaths to 211 deaths per 100,000 live births. It means that the average rate of decrease is 2.9% per year. Even though this is a good number, it is less than half of the 6.4 percent annual rate needed to reach the SDG of 70 maternal deaths for every 100,000 live births.



Source: WHO, UNICEF – 2017

Figure 2.2: Regions Wise Trends in the Maternal Mortality Rate

Figure 2.2 shows that there has been significant progress in reducing MMR since 2000. Between 2000 and 2017, South Asia achieved the most outstanding overall percentage reduction in MMR, with a decrease of 59 percent (from 395 to 163 maternal deaths per 100,000 live births). Sub-Saharan Africa substantially decreased by 39 percent in maternal mortality during this period.



Source: WHO, UNICEF - 2017

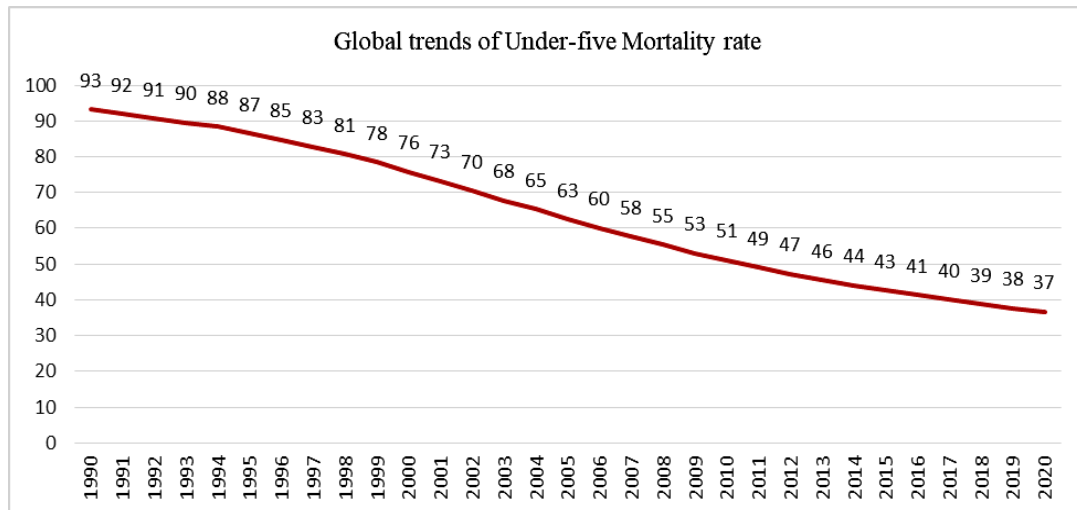
Figure 2.3: Trends of Maternal Mortality Rate in South Asia (2000 to 2017)

Figure 2.3 shows the trends in MMR in South Asia from 2000 to 2017. Sri Lanka made significant progress in maternal and child health (MCH). It had the lowest MMR in 2000 and maintained it until 2017. Bhutan has made tremendous progress in reducing MM. Bhutan's MMR was higher than Pakistan's in 2000, but it had the 3rd lowest MMR in the region in 2017. After the reduction, Bangladesh and India had almost the same rates in 2000 and still had the same rates in 2017. The Maldives made significant progress in reducing MMR, with the 2nd lowest MMR in the region. Afghanistan had the highest MMR from 2000 to 2017. Despite the 70% reduction, it still has the highest MMR in South Asia. Following Afghanistan, Nepal, Bhutan, Bangladesh, and India, Pakistan has the 6th highest burden of MM in the region.

2.2 CHILD MORTALITY RATE

The child mortality rate (CMR), or under-five mortality rate (U5MR), refers to the probability of a child dying between birth and exactly five years of age, expressed per 1,000 live births. In 2020, 5.0 million children under five years of age died. It translates to 13,800 children under the age of five dying every day in 2020. Globally, infectious diseases, including pneumonia,

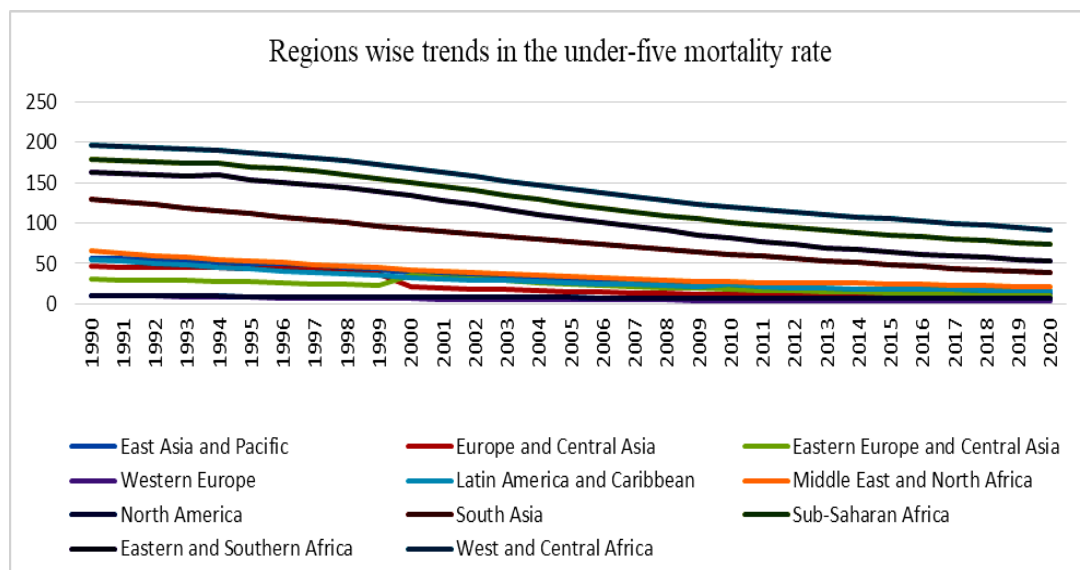
diarrhea, and malaria, remain a leading cause of under-five deaths, preterm birth, and intrapartum-related complications.



Source: WHO, UNICEF – 2021

Figure 2.4: Global trends of Under-five Mortality rate (1990-2020)

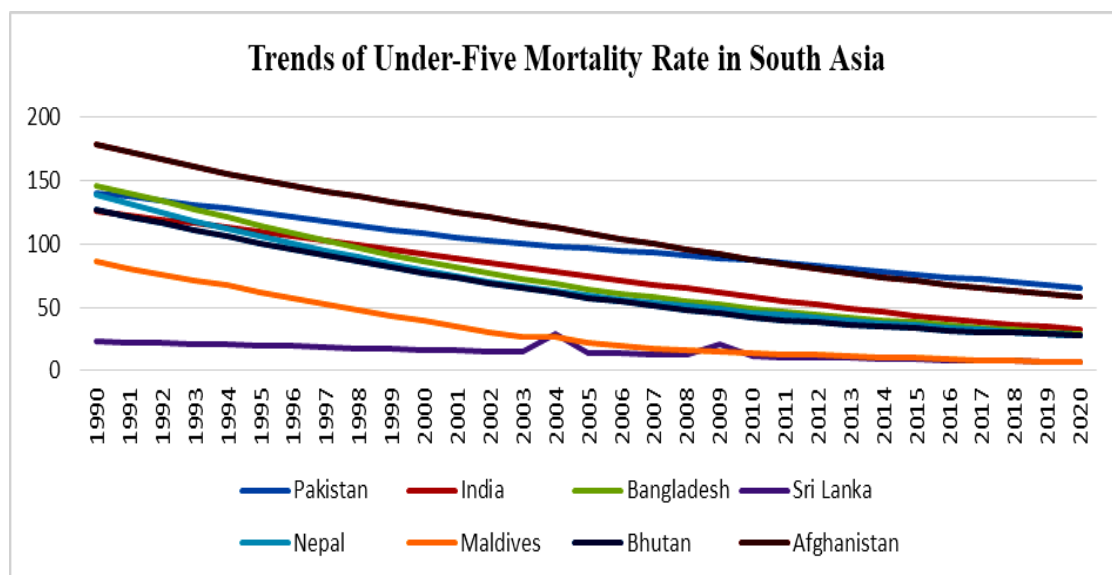
Figure 2.4 shows the global trend of CMR from 1990 to 2020. The global U5MR decreased 61 percent between 1990 and 2020, from 93 deaths per 1,000 live births to 37. Even though there has been a lot of progress, saving more children is still a critical issue. Every day, about 13,800 children under five died in 2020. It is an unacceptably high number of primarily preventable child deaths.



Source: WHO, UNICEF – 2021

Figure 2.5: Regions wise Trends in the Under-Five Mortality Rate from 1990 to 2020

Figure 2.5 shows that there has been significant progress in reducing the Child mortality rate (CMR) since 1990. Between 1990 and 2020, South Asia achieved the most outstanding overall percentage reduction in U5MR, with a decrease of 70 percent (from 93 to 38 child deaths per 1,000 live births). Sub-Saharan Africa substantially decreased by 65 percent in maternal mortality during this period.



Source: WHO, UNICEF – 2021

Figure 2.6: Trends of Under-Five Mortality Rate in South Asia (1990 to 2020)

Figure 2.6 shows the trends in U5MR in South Asian countries from 1990 to 2020. The Maldives made tremendous progress in reducing U5MR from 1990 to 2020, as it decreased from 86 to 6 per 1,000 live births. Pakistan showed a feeble improvement in the reduction in U5MR, as Pakistan was third in 1990, followed by Bangladesh and Afghanistan. Still, in 2000, Pakistan shared the highest burden of U5MR in South Asia, with 65 cases per 1,000 live births.

2.3 PAKISTAN’S HEALTH POLICIES FOR MATERNAL AND CHILD HEALTH

Pakistan’s Ministry of Health launched the “Social Action Program Project” (SAPP) in the early 1990s. The first “Social Action Program” was introduced in 1994. The government of Pakistan agreed to raise the level of public spending. The objective of this program was to improve basic education and primary healthcare, increase girls’ school enrollment, and focus on primary education. It also aimed to shift resources from the government to private NGOs to strengthen the welfare of the population (World Bank, 1994).

The second SAPP was launched in 1998. It aimed to improve primary healthcare, sanitation, and basic education by raising public spending. These initiatives improved child immunization, contraceptive use, girls' school enrollment, and health (World Bank, 1998). Ministry of Health introduced the "Lady Health Workers" program (LHW) in 1994. It was implemented through the Prime Minister's "Program for Family Planning and Primary Care" as a part of a national strategy to improve health services in the country. It was set up at the federal, provincial, and district levels (Jalal, 2011). This program's recruitment and training of lady health workers were undertaken to spread essential health services in rural areas and urban slums. Currently, 110,000 LHW in the country visit women at their homes and make them aware of the need to uptake maternal and child health services. LHWs coordinate with traditional birth attendants to ensure mothers receive adequate antenatal care (ANC). LHWs had provided primary health services to more than half the country's population by 2007. It has increased child immunization coverage from 57% in 2000 to 68% in 2008 (Hafeez et al., 2010).

The "Maternal, Newborn, and Child Health Program" (MNCH) was introduced in 2005. It deployed community midwives to improve skilled birth attendance in rural and poor socioeconomic regions and to reduce maternal and child mortality rates in the country. It further implemented the strategy of protecting the population from harmful diseases by promoting public health programs and providing curative healthcare facilities (Ministry of Health, 2009). In 2010, the "Ministry of Population Welfare" was decentralized under the "18th Amendment of the constitution," Constitution," and all powers all responsibilities and powers were transferred to the provinces. Now, "Reproductive Health Service Centers" and "hospital-based service outlets" are the main clinical parts of the "Population Welfare Program" (Ministry of Health, 2013). In 2014, a health insurance scheme was introduced at the national level to provide finance for maternity services and protect people living below the poverty line from health shocks (Akseer et al., 2017).

The health system is constantly interrupted due to social, economic, political, and cross-border difficulties. The National Health Vision, 2016–2025, prioritizes universal health coverage (UHC) among Pakistan's health objectives. It is consistent with state programs and strategies such as the Poverty Control Program and pro-poor social protection activities (WHO, 2021).

Since 2018, the UHC Partnership (UHC-P) has been assisting in formulating a national quality plan for health services to increase healthcare service delivery and raise performance accountability. UHC-P supports the creation of provincial healthcare workforce strategic plans in 2019 to address the disparity in the numbers, skill mix, and deployment of the healthcare

workforce. From 2019, the UHC-P will focus on enhancing resource allocation across multiple levels of health care, supporting the formulation of a health funding plan, expanding both the nationwide and provincial health insurance systems, and promoting primary healthcare in Pakistan.

The program's vision is;

“To improve the health of all Pakistanis, particularly women and children, by providing universal access to affordable, quality essential health services delivered through a resilient and responsive health system, capable of attaining the Sustainable Development Goals and fulfilling its other global goals health responsibilities” (WHO, 2021).

Despite these policies, overcoming Pakistan's health problems seems suspicious and distrustful. Even though for some of the MDGs, Pakistan's progress may have been somewhat satisfactory, for most indicators, its performance is not quite adequate. One of the reasons for slow progress could be low levels of public sector allocations for the social sectors (e.g., health, education, and water and sanitation).

2.4 MATERNAL HEALTH CARE SERVICES

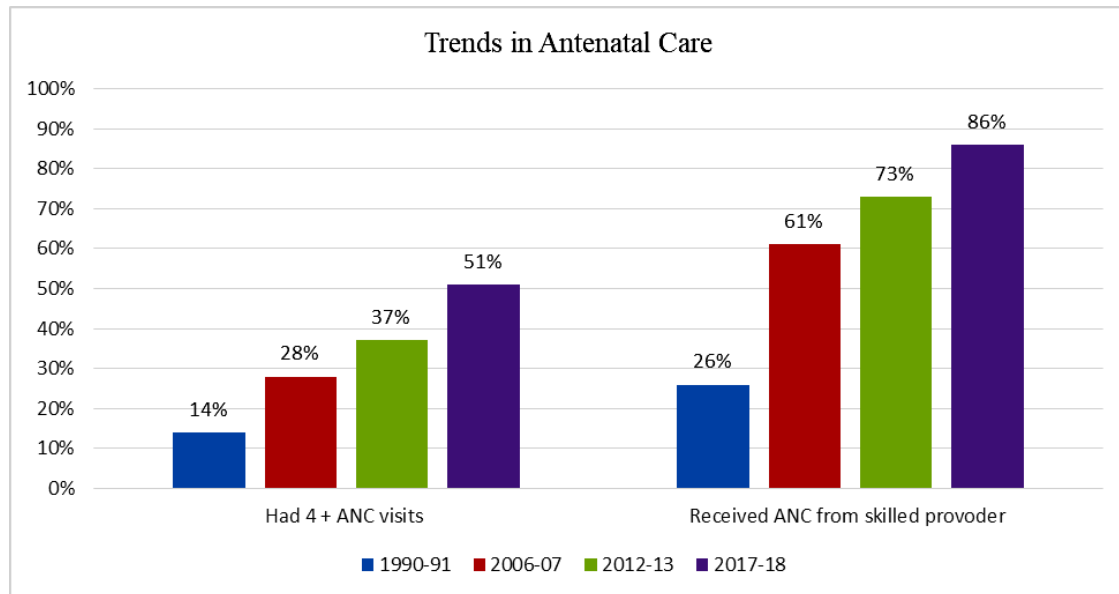
Maternal health is women's health during pregnancy, childbirth, and postpartum. It is a public health and socio-economic burden for the nation (Conde-Agudelo et al., 2005). It has become a global concern because the lives of millions of women of reproductive age can be saved through maternal healthcare services. Maternal healthcare services include antenatal care (ANC), delivery, and postnatal care (PNC). Maternal health is defined by the World Health Organization (WHO) as;

“Health of women during pregnancy, childbirth and the postpartum period.” (WHO, 2006).

2.4.1 Antenatal Care

Antenatal care (ANC) is essential for monitoring pregnancy and reducing the mortality rate for both the infant and the mother. ANC, PN, and delivery in the presence of SBA play a significant role in determining outcomes for maternal health. ANC from a qualified health care professional is especially critical for pregnancy monitoring and reducing mortality and morbidity risk for the child and mother during pregnancy, birth, and postpartum (6 weeks after delivery). The World Health Organization (WHO)

recommended that ANC start during the first trimester of pregnancy, with at least four and optimally eight visits.



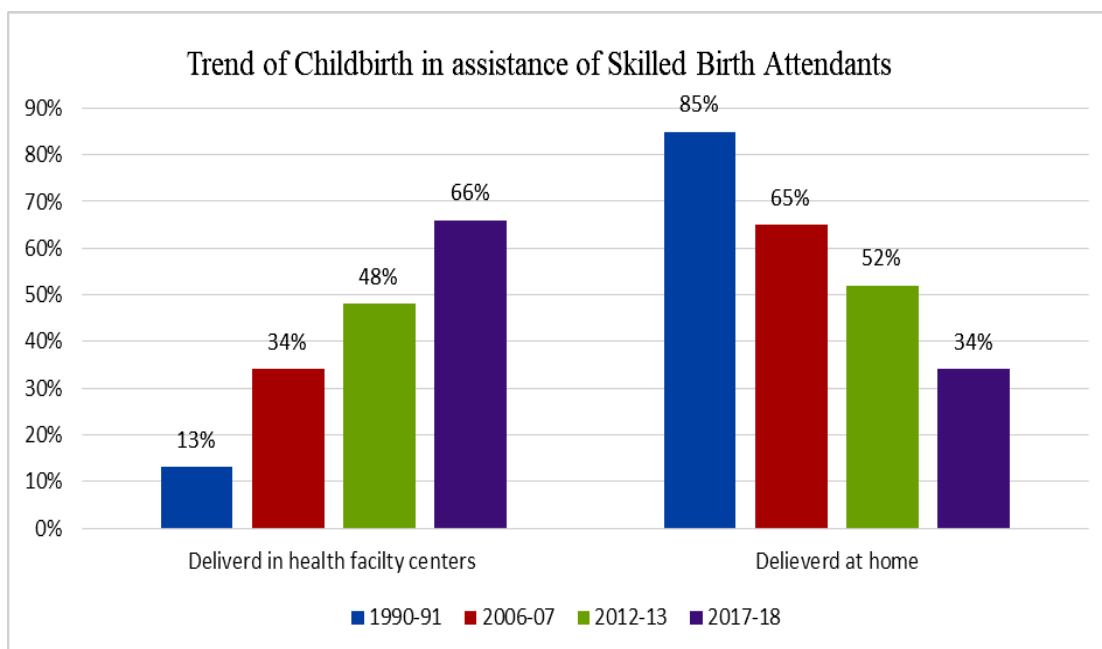
Source: UNICEF, PDHS-18

Figure 2.7: Trends in the use of ANC services by a skilled provider (SP) and the trend of at least four ANC visits (1990 – 2018)

Figure 2.7 demonstrates trends in the use of ANC services by a skilled provider (SP) and the trend of at least four ANC visits. As 26% from 1990-91 versus 86% in 2017-18, the percentage of women getting ANC by an SP has gradually increased. The rate of women getting ANC from a trained provider increased by 13 points between 2012-13 and 2017-18. The trend also showed that the number of women who had at least four ANC visits has steadily increased, 14% in 1990-91 but 51% in 2017-18.

2.4.2 Skilled Birth Attendant

Proper medical care during delivery lowers the chance of complications and infections, leading to death or severe sickness for both mother and the infant. Increasing the number of infants born in a safe, hygienic environment under the guidance of trained health professionals is essential to minimize health risks to women and children. According to PDHS-18, 66% of women in the last five years of the survey gave birth to their babies in the presence of a skilled birth attendant (SBA). Only 22% of women utilized government facilities, while 44% had confidence in private health facility centers.



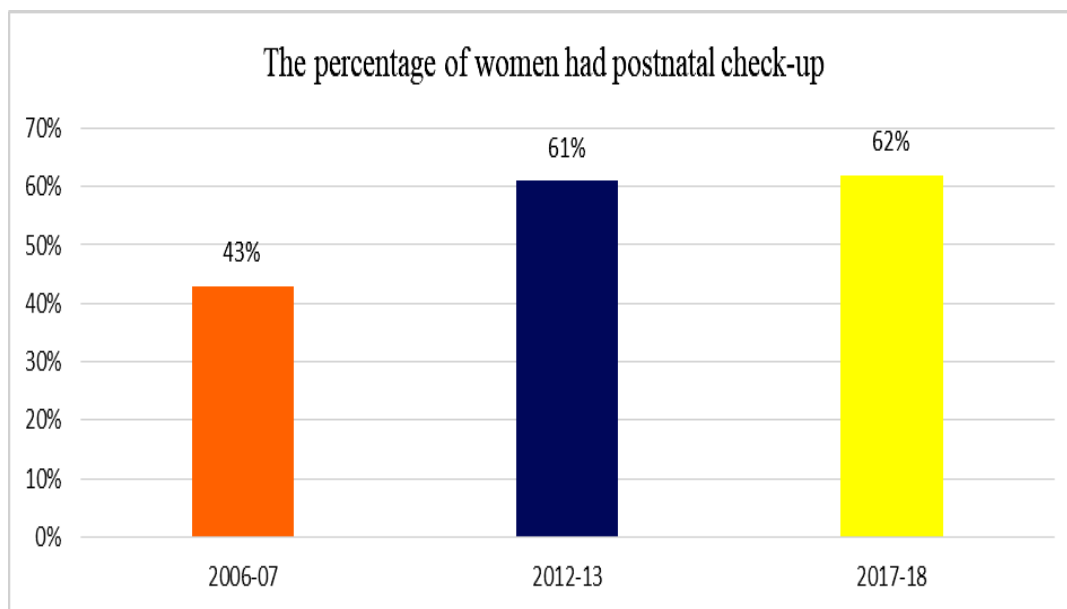
Source: UNICEF, PDHS-18

Figure 2.8: Trend of Childbirth in assistance of Skilled Birth Attendants (1990 – 2018)

Fig. 2.8 shows that the birth rate in the presence of skilled birth attendants has increased significantly over time; institutional deliveries grew from 13% in 1990-91 to 66% in 2017-18. The share has risen by 18% in the last five years, from 48% in 2012-13 to 66% in 2017-18.

2.4.3 Postnatal Care

The postnatal period is essential for women since it is during this time that they can suffer severe, life-threatening problems, particularly in the period immediately after the baby's birth. Evidence shows that the immediate 48 hours after delivery accounts for a high percentage of maternal and newborn deaths. Postnatal care visits are an ideal time to teach a new mother how to care for herself or her newborn child. According to PDHS-18, 62% of women had a postnatal check-up within two days of baby birth.



Source: UNICEF, PDHS-18

Figure 2.9: Trend of the percentage of women who had a postnatal check-up (1990 – 2018)

Fig. 2.9 shows the percentage of women who visited the hospital for a postnatal check-up within six weeks after the baby’s birth. The trend has increased significantly from 2006 to 2012, as it was 43% in 2006-07 and 61% in 2007. The trend shows that 18% increase from 2016 to 2012 but only a 1% increase from 2012 to 2018.

2.5 CHILD HEALTH CARE SERVICES

Child Health care is defined as the medical services that medical health professionals provide to children with disease or infection. Different health organizations fund these services. These medical professionals are specialized and experienced in treating pediatric patients. In our study, we select child immunization, diarrhea and fever/cough treatment as child healthcare services.

2.5.1 Child Immunization

Immunization is a safe, effective, and cost-effective intervention that is essential for reducing infant and child mortality. In 2016, the WHO World Immunization Week campaign brought global attention to the need to improve disparities in immunization coverage, urging countries to “close the immunization gap” and ensure that immunization was available to all (WHO, 2021)

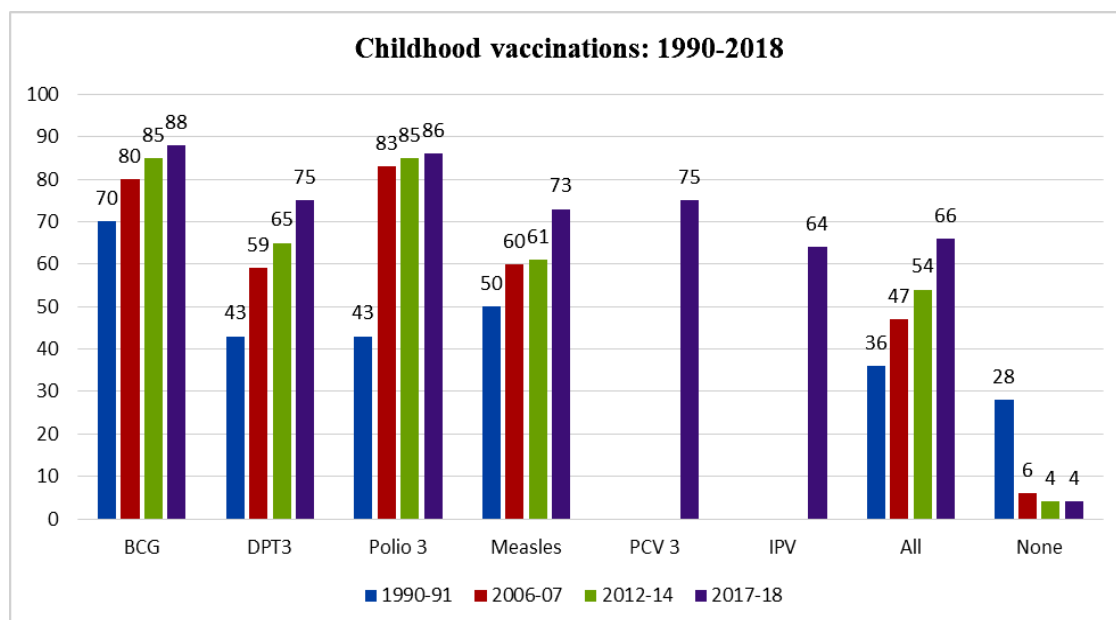
In 1978, the Pakistani government took essential steps to start the Expanded Programme on Immunization (EPI). EPI had the recommended antigens to protect children from tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, and measles. The monovalent hepatitis B (HepB) vaccine was available in 2003. It was later provided as a single tetravalent (DPT-HepB) injection. Pakistan started using the pentavalent vaccine in 2009 to protect people from diphtheria, whooping cough, tetanus (DPT), hepatitis B (HepB), and Haemophilus influenzae type b. (Hib). The pneumococcal conjugate vaccine (PCV), which protects against Streptococcus pneumonia, was made available in Pakistan in 2012. In 2015, Pakistan added one dose of the inactivated poliomyelitis vaccine (IPV). The current routine schedule is given in table 2.1.

Table 2.1
Schedule of Vaccination

Disease	Vaccination	Cause of infection	Doses	Child age for vaccination
Childhood TB	BCG	Bacteria	1	Soon after Birth
Poliomyelitis	OPV+IPV	Virus	4 + 1	OPV 0: soon after birth OPV1: 6 weeks OPV2: 10 weeks OPV 3 and IPV: 14 weeks
Diphtheria	DPT + Hep B + Hib	Bacteria	3	Penta 1: 6 weeks Penta 2: 10 weeks Penta 3: 14 weeks
Tetanus		Bacteria		
Pertussis		Bacteria		
Hepatitis B		Virus		
Hib, Pneumonia, and meningitis		Bacteria		
Measles	Measles	Virus	2	Measles1: 9 months Measles2: 15 months
Diarrhea due to rota virus	Rotavirus	Virus	2	Rota 1: 6 weeks Rota 2: 10 weeks

Source; WHO, 2021.

Over the past two decades, different campaigns have been introduced. Such campaigns aimed to provide door-to-door vaccination, especially in rural and tribal areas. Since its launch, immunization coverage has improved significantly in Pakistan.



Source: UNICEF, PDHS-18

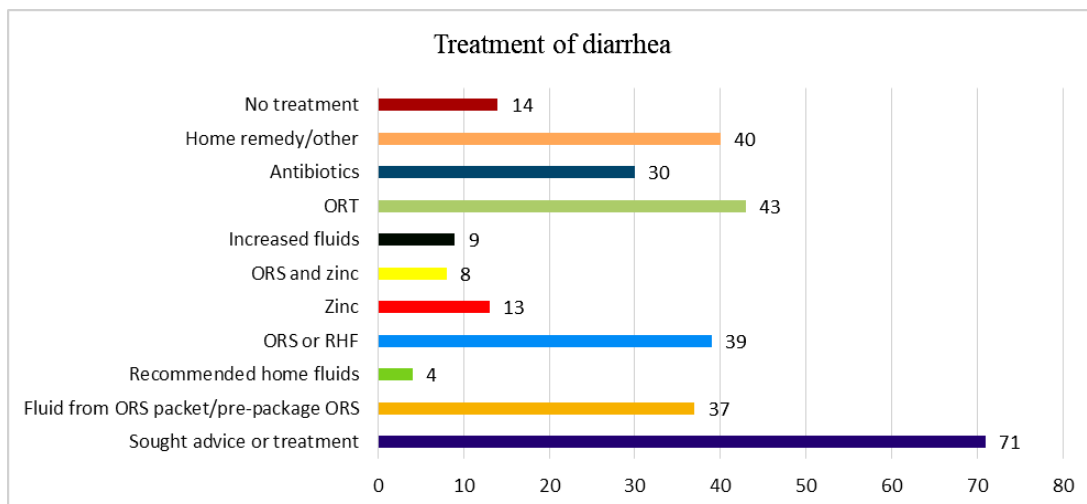
Figure 2.10: The percentage of childhood vaccination from 1992 to 2018

The percentage of children who received all vaccinations has grown, from 36% in 1990–91 to 66% in 2017–18 (Figure 2.10). The trend of immunization among children has sharply increased over the last five years, from 54% in 2012-13 to 66% in 2017-18. Noticeable improvement occurred in the administration of specific vaccines. 65% of children received all doses of DPT in 2012-13, while 75% received them in 2017–18. 85% of children received BCG in 2012-13, while 88% received it in 2017-18. 85% of children received all doses of polio in 2012–13, while 86% received them in 2017–18. And 61% of children received the measles vaccination in 2012–13 and 73% in 2017–18. 75% of children received PCV-3, and 64% received IPV in 2017-18.

2.5.2 Diarrhea Prevalence and Treatment

Diarrhea is still the primary cause of morbidity and mortality among children in underdeveloped countries. According to the World Health Organization (WHO), Pakistan ranks 23 (out of 194 monitored countries) in terms of the proportion of child (under five years of age) deaths attributable to diarrhea (WHO,2017). The MNCH program concentrates on preventing and treating diarrheal diseases in children under five. Pakistan was among the first in Asia to treat diarrhea with zinc, oral rehydration therapy and ORS with low osmolality. Treatment of diarrhea with zinc is not a complete replacement for ORT. But the use of zinc with ORT can reduce the intensity and duration of diarrhea. As suggested by WHO, this improved treatment contains less salt and glucose, resulting in lower osmolality (WHO, 2006d). Pakistan launched the

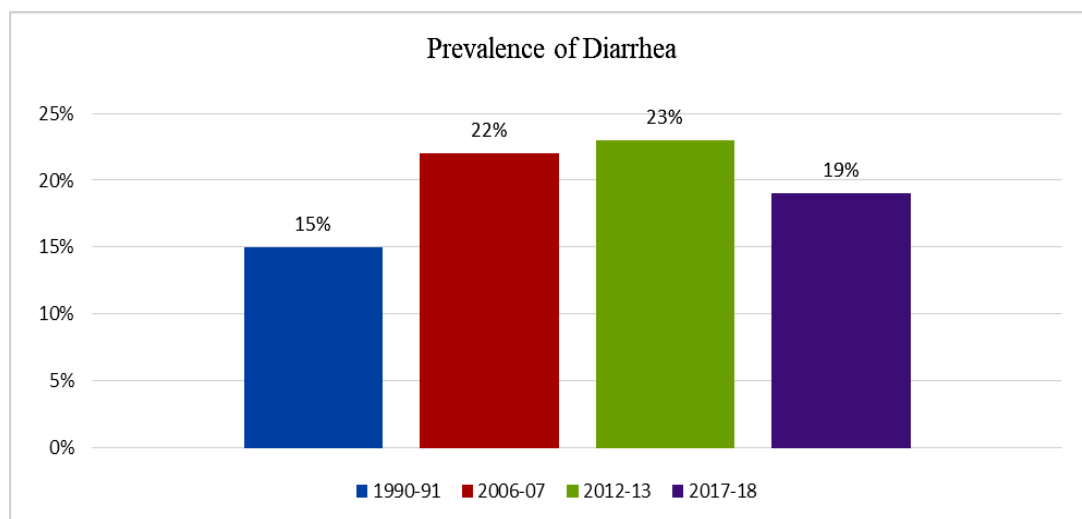
protocol in 2005, and this improved version of ORS therapy is now available in the market.



Source: UNICEF, PDHS-18

Figure 2.11: Diarrhea Treatment

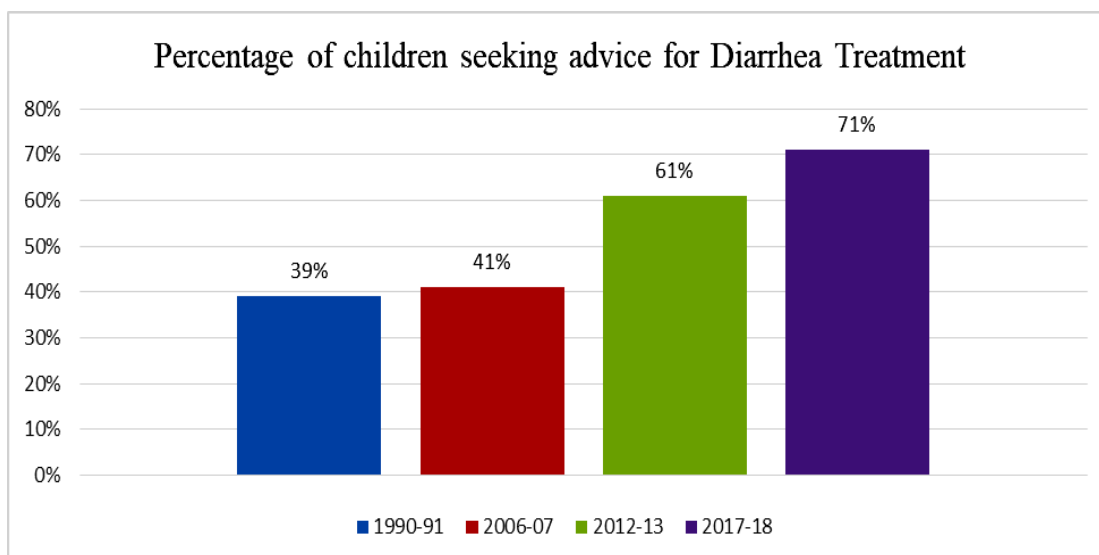
According to fig. 2.11, the graph shows that 71% of children, according to PDHS-18, seek diarrhea treatment. Results show that 37% of children received ORS treatment for diarrhea, while only 8% received zinc with ORS.



Source: UNICEF, PDHS-18

Figure 2.12: Trend in Prevalence of Diarrhea 1990-2018

Figure 2.12 shows the percentage of children who suffered from diarrhea before the last two weeks of the survey. Results showed a 4% improvement from 2012-13 to 2017-18 in the prevalence of diarrhea among children under five.



Source: UNICEF, PDHS-18

Figure 2.13: Trend of Percentage of children seeking advice for Diarrhea Treatment (1990-18)

The percentage of children who visited the doctor to seek diarrhea treatment has grown from 39% in 1990–91 to 71% in 2017–18 (Figure 2.13). This trend among children has sharply increased over the last five years, from 61% in 2012-13 to 71% in 2017-18.

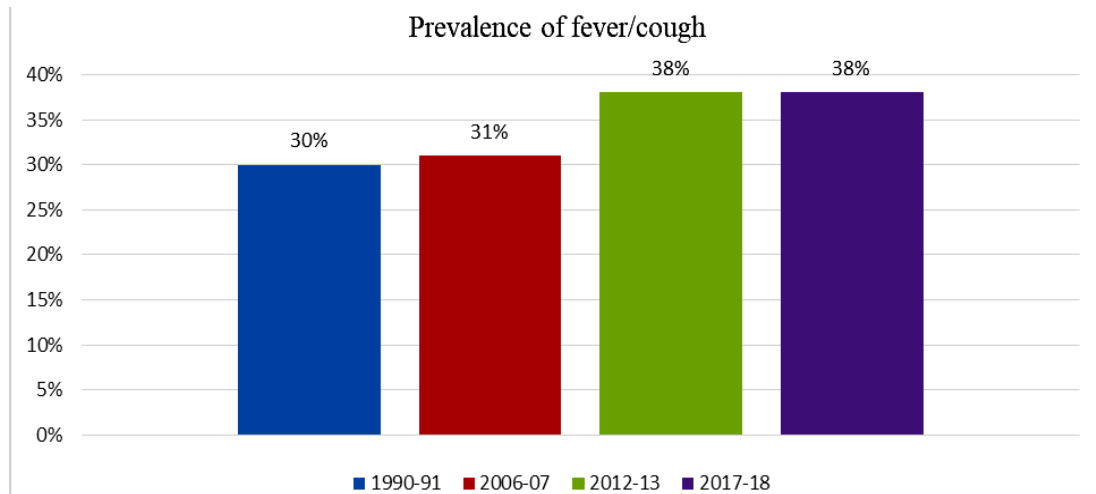
2.5.3 Fever/Cough Prevalence and Treatment

Child mortality is mainly concentrated in regions where morbidity and mortality rates remain generally high (Wagstaff and Claeson, 2019). Acute respiratory infections (ARI), antenatal care causes, and diarrhea have been recognized as the three most significant contributors to infant death. Environmental conditions contribute to a diversity of global health problems among children. Environmental hazards are related globally to acute respiratory infections, diarrheal illnesses, and fever in children under five (WHO 2009).

The last two centuries have seen a general improvement in children’s health, mainly due to nutrition, hygiene, and health policy. By the end of the 20th century, most health problems and deaths caused by diseases like malaria, fever, cholera, measles, tuberculosis, ARI, and nutritional deficiencies were gone from industrialized countries. Despite this, the bulk of these health issues, as well as the morbidity and mortality associated with them, are still prevalent in developing countries (Semba 2008).

Pakistan’s most common and most lethal acute respiratory tract infections viral hepatitis, malaria, diarrhea, dysentery, scabies, goiter, hepatitis,

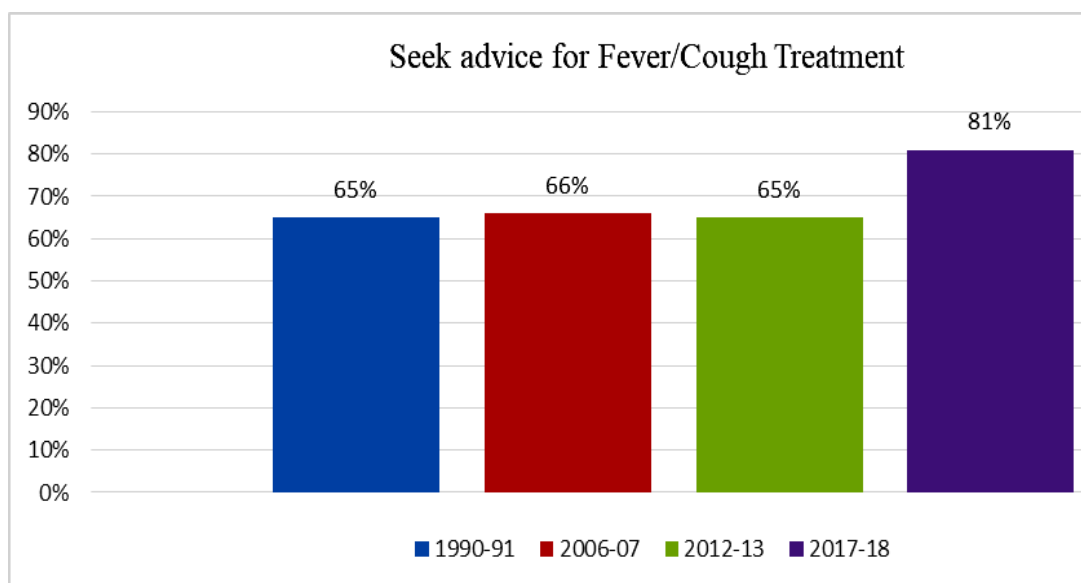
and tuberculosis. The most vulnerable victims of acute respiratory tract infection are children whose immune systems have been weakened by malnutrition. Therefore, we need to improve our children’s quality and quantity of diet. And it is also essential to provide necessary protection from these diseases with the help of immunization.



Source: UNICEF, PDHS-18

Figure 2.14: Trend in Prevalence of fever/cough (1990 – 2018)

Figure 2.14 shows the percentage of children who suffered from fever/cough before the last two weeks of the survey. Results showed no improvement from 2012-13 to 2017-18 for the prevalence of fever/cough among less than five years children. Even the prevalence of fever/cough is increasing among children in Pakistan.



Source: UNICEF, PDHS-18

Figure 2.15: Trend in Treatment of fever/cough (1990 – 2018)

The percentage of children who visited the doctor to seek fever/cough treatment is presented in figure 2.15. Surprisingly, this trend was the same from 1990 to 2015. But, this trend among children has sharply increased over the last five years, from 65% in 2012-13 to 81% in 2017-18.

Despite the launch of different health policies and programs, Pakistan's current health situation remains unsatisfactory. Pakistan's fertility rate and population growth are the highest in South Asia, following Afghanistan. Pakistan has the highest number of newborn and stillbirth deaths in South Asia.

CHAPTER 3

LITERATURE REVIEW

Literature has shown that different societies and groups have unequal access to and use of healthcare services, and many factors explain these disparities. Inequalities exist regarding the use of maternal and child healthcare services (MCHCS), especially in developing countries. Research in developing countries has shown that these kinds of facilities vary depending on the family's income and other socio-geographical factors, like where they live and whether they go to school or not. So, this chapter gives a brief history of the situations that often lead to health disparities, a brief history of the relationship between socio-political conflict and health care, and some selected determinants of MCHCS.

According to Halder and Kabir (2008), the level of a family's wealth and other socio-demographic factors are related to the immunization status of children. To carry out this analysis, the researchers used the data set titled "Bangladesh Demographic Health Survey 2004." They applied the "principal component analysis" (PCA) to check inequality among children under the same circumstances. According to their study, there was a statistically significant gap in vaccination coverage between the highest and lowest income quintiles. Adding education to the model reduced the wealth index's impact by half. Results also showed a clear correlation between higher levels of education and reaching a complete immunization status. No correlation was found between the mother's age or the child's gender and immunization status.

Rosa Dias (2009) measured the IO of health in the United Kingdom. He used data sets from the "UK National Child Development Study" (NCDS) for the study. The years 1965, 1969, 1974, 1981, 1991, 1999/2000, and 2004 were used for this analysis. He used the "Gini opportunity index" and the "pseudo-Gini coefficient" to measure health inequality. The results showed the presence of a significant IO in health. Education level has a direct effect on health in adulthood. According to the results, the impact of some inequitable circumstances can be fixed during childhood. It could also be essential to have complementary educational policies to reduce inequality.

Trannoy et al. (2010) investigated the impact of childhood circumstances, particularly those related to social and familial networks, on the health of older people. Using the French part of SHARE, they tested the idea that health differences are passed down from one generation to the next. Their study used stochastic dominance tests in first-order, multivariate regressions, and a counterfactual analysis to determine how childhood conditions affect

health inequality over time. Using the Gini coefficient, their results revealed that giving each child the parents with the best SES and health makes health more equal by an impressive 57 percent. The mother's social status has a significant impact on the human health of her children. In contrast, the social status of a father has no direct effect on a child's health. Instead, it indirectly affects the child's social standing as an adult.

Singh (2011) estimated the IO in health among Indian children. He used the proxies of immunization and nutrition as health indicators, and the 1993 and 2006 "National Health Family Survey" data sets to measure inequality. He used the "Human Opportunity Index" (HOI) methodology to check the disparity among children under the same circumstances. Their results showed that geographical background (urban and rural) is one of the most critical factors contributing to increasing IO among Indian children in both cases (immunization and nutrition). Afterwards, wealth status and the parent's educational background are responsible for IO. He suggested that the government should make policies for providing services like health and education centres in rural areas to reduce the high inequality among Indian children.

Ferreira et al. (2011) used the Tanzania Demographic and Health Survey and The Household Budget Survey datasets from 2003-2004 to figure out the lower bound of the share of IO in overall inequality in Turkey. They used the wealth index method to check inequality. In a study of ever-married women aged 30-49 in Turkey, inequality of opportunity accounted for at least 26% (31%) of total disparity in imputed consumption.

Assaad et al. (2012) measured the IO in health among Arab and Turkish children. They used the "Demographic Health Survey" of Arabia and Turkey to estimate child health inequalities. They used weight for height and height for weight as proxies for child health. They used the Thiel index and parametric and non-parametric approaches to find the share of IO in total inequality. Their study showed that overall inequality and IO have different levels and trends in other countries. Researchers have found that inequality of opportunities is a significant cause of inequality in child health outcomes. Still, its share of total inequality varies significantly between and within countries over time. According to their results, factors such as socio-economic status and geographic location play a significant role in the disparity in child health outcomes.

Jusot et al. (2013) examined the association between circumstances and efforts to measure health inequality. They used 2006 ESPS data. They adopted Roemer, Barry, and Swift's three alternative normative approaches to treating this relationship and assessed their empirical relevance utilizing survey data.

They used regression analysis and natural variance decomposition to relate circumstances and effort to health status inequity. The practical examination demonstrates that opportunity inequalities in health inequities do not change considerably (44.5–46.4%) based on individual effort and circumstances. Swift's conception increases legitimate inequality by 33% compared to Roemer's. This statistic is almost minimal in numbers, but because efforts count very little in their data set, selecting one view over another makes little difference. The proportion of efforts ranged from 6 to 11 percent. Regardless of perspective, their data showed that circumstance-related inequality is far more significant than effort-related inequality.

Ersado and Aran (2014) did a study to investigate the IO of Egyptian children regarding their access to necessities. They used data sets for the years 2000 and 2008 from the "Egypt Demographic and Health Survey" (DHS) and the "Egypt Household Income, Expenditure and Consumption Survey" (HIECS) for their investigation. The results for IO indicated that, despite a decrease, there is still a substantial issue regarding school enrolment and healthcare. In the cases of malnutrition, the availability of safe drinking water, electricity, or sanitation, the results of IO are insignificant. Thus, the analysis demonstrates that Egypt has substantially improved the provision and accessibility of programs for children and mothers in some situations, with a net pro-poverty effect.

Mukungwa (2015) analyzed the factors affecting child immunization among children aged 12–23 months in Zimbabwe. They utilized secondary data from the Zimbabwe Demographic and Health Survey, 2010–11. They used multivariate binary logistic regression for empirical analysis. The findings of their study indicated that mothers with higher education, living in urban areas, and children with first birth orders are more likely to vaccinate their children. Their study also revealed that maternal health services uptake, media exposure, and income significantly correlate with child immunization. The authors suggested that awareness programs should be further promoted to achieve full child immunization in society.

Dabalen et al. (2014) performed research to find out how African children get their basic needs. They used data sets from the "Africa Demographic and Health Survey" (ADHS) and the "Expenditure and Consumption Survey" (HIECS) for the years 2000 and 2008. Even though IO decreased, the results showed that it is still essential for school students and health care. The impact of IO is insignificant compared to the prevalence of malnutrition, the availability of clean drinking water, electricity, sanitation, etc. So, the study showed that Egypt had made much progress in giving children and mothers access to essential services and making sure they were available.

Krafft (2015) estimated the factors of IO in Jordanian children's health. He used the "Jordanian Demographic Health Survey" (JSHS) data set of 2012 to check inequality. According to the findings of the study, which focused on aspects such as parental wealth, the quantity and quality of food, and the surrounding health environment, the health environment, in particular the availability of piped water and sanitation, and parental wealth contribute significantly to inequality in the opportunities available to children's health.

Khan and Aslam (2017) examined the factors affecting child immunization in Pakistan. They used secondary data on children aged 12–60 months from PDHS, 2006–2007. For empirical analysis, they employed a binary logistic regression model. Their study showed that children of educated mothers were more likely to be immunized. Children of employed mothers were less likely to receive immunization than children of unemployed mothers. In Punjab, children were more vaccinated than in other regions of the country. The authors suggested that immunization programs and strategies focus on uneducated women and those from poor socio-economic and ethnic groups.

Iqbal et al. (2017) explored the correlates of maternal health services uptake in Pakistan. They used secondary data from "Pakistan Demographic Health Surveys" (PDHS), 2006-07 and 2012-13. They employed bivariate and multivariate logistic regression models for empirical analysis. According to their findings, maternal health uptake increased by 12% from 2006 to 2012. Women's education, household income, and mass media exposure significantly correlate with maternal health service uptake. Their results also indicated that women with their first birth at old age and those with few children have access to more maternal health services. Women from Sindh's urban areas are more likely to uptake maternal health services. They suggested that to reduce inequality; the government should make policies to increase educational facilities, especially for women, and awareness programs on the importance of education for all. In developed countries like Pakistan, there is a vast difference between health facilities for rich and poor people and urban and rural areas. The government needs to introduce health for all programs to reduce IO.

Adedokun et al. (2017) explored the determinants of incomplete immunization of children aged 12–23 months in Nigeria. They used secondary data from the Nigeria Demographic and Health Survey 2013. They applied multilevel logistic regression for empirical analysis. Their findings revealed that more than 75% of children were not completely vaccinated. More than 80% of children belonging to adolescent and uneducated mothers were not fully immunized. Mothers' uptake of maternal health services and urban residence was less associated with incomplete immunization. Children

belonging to mothers of poor socio-economic status and regions were also found more likely to have incomplete vaccination. A considerable distance to the health facility was also associated with non-immunization.

A study on South Africa's current economic scenario, focusing specifically on IO, was carried out by Dabalen et al. (2014). They used two methodologies in their study to check IO; HOI and the Gini coefficient. After the financial crisis that swept the world, South Africa's economy has not been able to recover at its previous speed. An impediment to potential growth has been formed due to factors like industrial concentration, rigidity in the labour market, skill shortages, and low savings rates. In addition, growth has harmed low-income people, which has contributed to the country's income Gini reaching approximately 0.70 in 2008 and consumption Gini reaching 0.63 in 2009, making South Africa one of the most unequal nations in the world. There was a significant gap between individuals concerning work opportunities and income earned. Factors such as ethnicity, region, gender, and household status were the most critical factors in determining IO regarding necessities, education, employment, and income. The research recommended further emphasizing social assistance and cultivating human capital, particularly among younger generations.

Fajardo-Gonzalez (2016) researched the degree of health inequalities among Colombia's adult population. He based his analysis on information from the "Colombian Living Standards and Social Mobility Survey," conducted in 2010. The Dissimilarity index and Gini index were used to calculate the IO. After that, the Shapley value decomposition was used to assess the contribution of early-life conditions to inequality of opportunity. According to their findings, to attain opportunity equality, between 8 and 10 percent of the circumstance-driven chances that healthy people uniquely experience need to be redistributed or compensated in some other way. The most prominent aspects of IO in health outcomes of adults appear to be differences in the socio-economic condition of the home the child was raised in during childhood and the educational attainment of the child's parents.

Hussien and Ayele (2016) used 2002 and 2006 Young Lives Survey data to study health inequalities in Ethiopia. The study measured health outcomes by standardized height-for-age and weight-for-height and dissected inequality using parametric and non-parametric techniques. According to their results, region, religion, clean water and sanitation facilities, and household wealth status contributed significantly to inequality,

Pal (2016) compared two data sets from health surveys of India at the district level (from 2002 to 2004 and from 2007 to 2008). He analyzed inequality using the Shapley value approach and explained how each

circumstance contributed to inequality. According to his research, the most significant factors contributing to the inequality of opportunities are the household's socio-economic status, the level of education attained by the parents, and regional differences.

Bricard et al. (2013) compared health inequities across Europe. They looked at Brian Barry's and John Roemer's two different normative ways of looking at the relationship between effort, as measured by lifestyle, and circumstances, as evaluated by the traits of parents and children. Their study used regression analysis and came up with several ways to measure how unequal opportunities are. They utilized data from the Survey of Health, Ageing and Retirement in Europe, which focuses on the life histories of Europeans aged 50 and older. In the Barry scenario and the Roemer scenario, the results showed that almost half of Europe's health differences are caused by differences in opportunities. In the Roemer scenario, this number is 57.5 percent. In most countries, differences in health opportunities were mainly caused by social background, which directly affected adult health. It meant that policies were needed to make up for poorer starting conditions. On the other hand, their results showed that lifestyles in Belgium, the Netherlands, Italy, Germany, Poland, and Denmark were strongly influenced by social and family factors. It showed the significant differences in health opportunities in these countries and the need for targeted prevention policies.

Sanoussi (2017) assessed the disparity in Togo's maternal and child healthcare opportunities. He used the information gathered from a demographic health survey conducted in 1998 and 2013. To quantify the disparity in maternal and child health opportunities, he utilized the human opportunity index in addition to the Shapley decomposition. He discovered that between 1998 and 2013, there was a decline in the IO for four of the six variables. However, inequalities grew in access to sufficient care (from 5.9 percent to 12.5 percent) and access to antenatal care provided by qualified professionals (from 5.9 percent to 12.5 percent) (27.7 percent to 28.6 percent). He advised ongoing efforts to guarantee that moms and children have equal access to primary medical care.

Jusot et al. (2017) figured out how unequal the chances are in Indonesia. He used data from the Indonesia Family Life Survey (IFLS) from 1993, 1997, 2003, and 2007. They made a continuous synthetic index of global health status based on many health indicators. They then used non-parametric and parametric methods to measure the inequality of opportunity in the health dimension. When compared to European countries, their results showed that Indonesians have a lot fewer healthcare options than people in European countries. Compared to what has been seen in more developed nations, the influence of family education on health is comparatively tiny and mostly

indirect (through descendants' social, economic, marital, and mobility status). While long-term differences in health associated with religion, language spoken, and the unique province of the location recommend that community belonging variables are more important for health equity in a developing country.

Saidi and Hamdaoui (2017) used the 2012 Multiple Indicator Cluster Survey to analyze healthcare access and health status disparities among Tunisian children. HOI was calculated for healthcare usage and nutrition parameters in the study. When analyzing health service consumption, indicators for prenatal care, blood testing, and postnatal care were all considered. For nutritional status, use weight for age, height for age, and weight for height. Gender, location, area, mother's education, and annual family income were considered. Using Shapley's decomposition method, the researchers discovered that the mother's level of education, wealth, and geographic location significantly impact her child's future development.

Adeyanju et al. (2017) evaluated socio-economic inequalities in Nigeria's maternal and child health care over 18 years. Their research focused on Nigeria. They used data from two rounds of the Nigerian Demographic and Health Survey (NDHS), conducted in 1990 and 2008, to quantify inequalities in maternal and child health care variables across socio-economic status using concentration curves and indices. After the calculation, they found that inequalities in child care decreased, while in the case of maternal care, inequality increased. The mother's education, geographical boundaries, and wealth status played a significant role in increasing inequality.

Gallardo et al. (2017) assessed the disparities in opportunity in Chile's healthcare system. He based his conclusions on the results of the self-rated health section of the 2010 Chilean National Health Survey. They could estimate the inequality using non-parametric methods in conjunction with second-order stochastic dominance criteria. After research, robust empirical evidence was obtained, which indicates that opportunities to achieve good health in Chile are determined by the mother's educational level, the socio-economic status of the household, the gender of the individual, as well as the zone and region in which they reside.

Li et al. (2017) assessed the disparities in maternal and child health outcomes and deaths in China between 2000 and 2013. They used a data set consisting of China's maternal and child health monitoring reports collected between 2000 and 2013. Horizontal and vertical monitoring of China's maternal and child health inequalities using between-group variance (BGV) and the Theil index (T). According to empirical evidence, the discrepancy between maternal and child health outcomes in China has decreased. However,

the improvements still do not match the Healthy China 2030 strategy's criteria, particularly with the increase in IBD levels and the decline in inequality.

Amara and Jemmali (2017) conducted research in Tunisia to investigate the patterns of unequal opportunity regarding health and nutrition outcomes for children under the age of five. Their study utilized the Shapley decomposition to estimate the relative contributions of various circumstances. They concluded that the level of parental education, parental wealth, and the location of the child's residence are the most critical factors in determining the degree to which opportunities for child health are unequally distributed.

Hu et al. (2017) looked at the level and causes of inequality in the number of children who were up-to-date and fully immunized (UTDFI) in Zhejiang province, east China. They used data from the 2014 Zhejiang provincial vaccination coverage survey, and the health outcome was the UTDFI status among children aged 24–35 months. For the analysis of inequality, the monthly household income was used to measure social and economic quality. The concentration index (CI) was used to measure how unequal things were, and the decomposition method was used to calculate how much demographic factors affected how unequal UTDFI coverage was. Their results show that children with a higher socio-economic status were much more likely to get immunized. The decomposition analysis showed that the mother's education level should be used to explain the difference in socio-economic status in UTDFI coverage. Also, things like birth order, ethnic group, mother's job, place of residence, immigration status, GDP per capita, and the share of health spending that goes to public health could explain why UTDFI coverage isn't the same everywhere.

Sanoussi (2018) studied children's health (as indicated by standard height) in Togo using data from the Demographic and Health Survey (DHS, 1998 and 2013). The Theil-T index is used to determine IO in children. According to his research, unequal access to opportunities exists and contributes to differences in children's health in Togo, as measured by the height-for-age index. In his study, he argued that to considerably decrease IO and enhance children's health, a greater understanding of the living conditions of children and the factors that negatively affect their health is necessary.

Pervaiz and Akram (2018) calculated the inequality of opportunity in Punjab (Pakistan) using a non-parametric method. They used household-level Multiple Indicator Cluster Survey 2014 data to estimate inequality in Punjab (Pakistan). In their study, the household head's income was an outcome variable. Residence region, father's wealth, and education level were considered circumstances. Their results showed that different circumstances account for up to 28% of the inequality in income. Among all the factors, a

father's education was one of the most significant contributors to inequality. The study showed how important and necessary it is for the government to have policies that make up for the unequal opportunities in Punjab (Pakistan). They recommended that all parts of society have the same access to educational opportunities as a critical public policy measure to reduce inequality of opportunity.

Carrieri and Jones (2018) utilized a decomposition-based strategy to estimate the inequality of opportunity regarding health. They used data from the England Health Survey, conducted between 2003 and 2012. Their methodology was completely non-parametric in terms of how it dealt with variations in conditions and offered decompositions of a rank-dependent relative (the Gini coefficient) and a rank-independent absolute inequality index (the variance). According to the facts they uncovered, circumstances were the primary factor determining inequality in cholesterol, glycated hemoglobin, and a combined ill-health index. On the other hand, the effort was significant in explaining the inequality in fibrinogen alone.

Aizawa (2019) examined the inequality of opportunity in child malnutrition in 10 emerging nations in Asia, where a significant proportion of children continue to be at risk of food insecurity. This study considered various elements of household and parental socio-economic position and divided children into distinct categories using a data-driven clustering technique. Using a non-linear decomposition, he decomposed the observed discrepancy into the components associated with the between-type disparity in malnutrition rates. The results revealed that considerable between-type inequalities exist in all ten nations. He discovered the most significant disparity in Pakistan and the minor disparity in the Maldives. In five of the ten nations, the difference in household wealth best explains the observed variance between types. All of the data indicates that protecting children from marginalized households should be a top priority to reduce disparities in child health.

Yaya and Ghose (2019) tried to figure out how unequal healthcare services are for mothers worldwide. They used the WHO's Global Health Observatory's 2012 and 2015 data sets, the dot chart, and a bar chart to compare how easy it was to get health care. 78.17 percent and 88.33 percent of people used the ANC and SBA, respectively. The use of ANC and SBA was very different on each continent, especially in Asia and Africa. The situation was the worst in Afghanistan, Somalia, and South Sudan, where more than three-quarters of women still didn't have access to ANC and SBA services between 2012 and 2015. The most significant difference in ANC use was in Africa (9.4% in Somalia and 99.9% in Libya), while the most significant difference in SBA use was in Asia (17.8 percent in Afghanistan vs 100 percent

in Bahrain). ANC (66.8% in Albania and 99.7% in Belarus) and SBA (94.4% in Denmark and 100% in Lithuania) were more similar in Europe than in any other region.

Owino (2019) figured out how different the chances for adolescent mothers' health in Kenya are. The study used data from the Kenya Demographic and Health Survey (KDHS) from 2003, 2008/09, and 2014. In this study, he used the human opportunity index (HOI) method to estimate inequality. The shapely decomposition method determined how much each situation contributed to the imbalances. He found valuable evidence about differences in opportunities in maternal health. Education and region had the leading roles in increasing inequality.

Ebaidalla (2019) used the Sudanese 2014 Multiple Indicator Cluster Survey to look at what causes health outcomes to be different for children under five. He examined the variation in inequality across and within regions, separating inequality into a portion attributable to inequality of opportunity and a piece attributable to other causes, such as random changes in health. His research indicates that disparities in child health are widespread, especially in poor and conflict-affected communities. The contribution of opportunity inequality to total inequality in child health outcomes is significant and varies by area. The results also demonstrated that the proportion of circumstances contributing to child health inequalities varies significantly by health indicator and geographic region. In particular, geographic location, parental education, and parental wealth are the primary contributors to disparities in child health outcomes.

Nizamani and Waheed (2020) analyzed the disparities in opportunities available to children in Pakistan at the provincial level. They utilized the 2004-2005 and 2014-2015 Pakistan Social and Living Standards Measurement Survey data sets. They used the human opportunity index to quantify access to health care and the Shapley value decomposition to determine the marginal effects of circumstances on inequality. The study results indicate that access to these essential services is unequal and limited across Pakistan. In Pakistan, the opportunities for all five education indicators have decreased, and Sindh is the province with the most significant educational inequality due to the low literacy rates of child-headed households. The region of Baluchistan has the weakest infrastructure indicators, and its education system is also in a precarious position. Despite progress, they found an overall improvement in health indicators, and Pakistan is far from achieving universal access to health facilities.

Bobo and Hayen (2020) analyzed the socio-economic disparities in basic immunization coverage among children in Ethiopia between the ages of

12 and 23 months. They utilized unique data sets from the Ethiopian demographic health survey conducted in 2011 and 2106. They checked for inequity by using concentration curves and indices, abbreviated as CCIs. Their findings indicated that Ethiopia had a relatively low rate of childhood immunization coverage. Vaccination was less likely to occur in homes with lower incomes than in households with higher incomes. To reduce socio-economic disparities in essential vaccine uptake in Ethiopia, addressing wealth disparities, improving education, and expanding the availability of maternal health services are all necessary steps.

Asif and Akbar (2020) looked at the effect of maternal education on differences in child health care and how different factors contributed to the differences they found. They used information from the Pakistan Demographic and Health Survey 2017-18 that was already available. They used concentration curves and indices to measure how unequal child health care is. This study showed that children whose mothers attended college are more likely to get health care. The significant contributors to child health care inequalities were improved sanitation (6% for diarrhea and 15% for fever/cough therapy), rural residency (4% and 23% for diarrhea and fever/cough treatment, respectively), wealth status (49% and 28% for diarrhea and fever/cough treatment, respectively), and maternal education (26% for diarrhea and 28% for fever/cough treatment). The finding showed that educated women are more likely to offer health care to their children. They suggested that government should take the initiative for women's education to reduce inequality.

Di Novi and Thakare (2020) figured out how people in Bangladesh have different chances of getting access to health services for mothers and babies. They used different data sets from the Bangladesh demographic health survey of 2014. They used the human opportunity method to measure the inequality of opportunity and the Shapley decomposition method to see how much each factor contributed to the disparity. Their results showed that low access to health care in the country was caused by the mother's education level, the family's wealth, and where the mother lived. Due to a lack of health infrastructure, health professionals, awareness, coverage, and opportunities were lower in rural areas.

Sanoussi et al. (2020) examined the patterns and amount of inequality in health and nutrition among children under five in three sub-Saharan African nations with low Human Development Index (HDI). They used data from the Multiple Indicator Cluster Survey of the Democratic Republic of Congo, Guinea Bissau, to figure out the human opportunity index (HOI) and the dissimilarity index (D-index). In addition, the Shapley value was used to assess the relative contribution of situations far beyond the control of children

under five, influencing their development outcomes during later life stages. The results show that some places are improving access to health and nutrition services so that all children have the same level of access, no matter their socio-economic status or where they live. But the differences in opportunities between the children of the best-off group and those of the worst-off group are still significant enough that the governments of these countries need to make policies that take these differences into account.

Tsawe and Susuman (2020) looked at the HOI in the use of and access to maternal and reproductive health care in Sierra Leone between 2008 and 2013. They did this using data from the Sierra Leone Demographic and Health Survey. In this study, the dependent variables were the number of prenatal care visits, the number of skilled prenatal care providers, the number of births that happened in a facility, the number of births that a skilled birth attendant helped, and the use of any method of birth control. In the study, the mother's age, her level of education, her marital status, her exposure to the media, her family's wealth, the number of living children, the number of people in her family, her region, and where she lived were all used as variables. The study found that the HOI's access to maternal and reproductive health care improved between 2008 and 2013. Overall, the authors found that inequality has decreased over time. Using Shapley's decomposition method, they found that household wealth, maternal education, and place of residence are the most critical factors that cause inequality.

Mujaddad and Anwar (2020) estimated the inequality of opportunity in access to antenatal care in the districts of Punjab, Pakistan, 2021. They checked for inequality by looking at the data from Punjab's Multiple Indicator Cluster Survey 2017-18. Their study used the Human Opportunity Index to measure the coverage rate, inequality, and access to opportunities for everyone. They used the Shapley Decomposition to determine how each circumstance contributed to inequality. Based on what they found, Punjab's southern and central districts are very different. They also found that household wealth, the order of births, the time between births, the education of the household head, the person's ethnicity, access to the media, and where they lived were the things that made it hard for people in different districts of Punjab to get ANC services.

Ma et al. (2021) used the notion of equality of opportunity to evaluate the urban-rural inequity in healthcare in China. Using the compensation principle as a guide, they set up a decomposition strategy for the fairness gap, and they use it to measure the difference in opportunities between people in urban areas and those who live in rural areas. Then, to figure out how fair it was, they used data from the China Health and Nutrition Survey (CHNS) from 1997 to 2006. Their research showed that changing how urban and rural

citizens are reimbursed may not be enough to ensure that people in both places have the same chances of using health care. In a society split between urban and rural areas and where the income gap between urban and rural areas is growing, a shift to a policy that helps the poor will be a better way to promote equal opportunities in healthcare.

Orso and Kovacic (2022) investigated the evolution of IO in the prevalence of chronic diseases over the life course and across different birth cohorts for adults aged 50 or older residing in 13 European nations. They used an ex-ante parametric strategy and the dissimilarity index for their standard inequality metric. In addition to a regularly used group of circumstances, they focused on the role of poor early-life factors, such as the experience of damage and the quality of parental relationships. They also applied the Shapley Value to measure the relative impact of each circumstance. According to their findings, IO in health is not consistent throughout a lifetime; it is often smaller at early ages and increases monotonically. In addition, it varies with various birth cohorts and thus is typically better among younger people than older age groups. Lastly, the impact of adverse early life situations ranges from 25 to 45 percent, equivalent to the proportion of socio-economic conditions but much larger than the relative impact of other demographic factors, particularly at younger ages.

As far as the literature review is concerned, very few previous studies relating to inequality of opportunity in maternal and child healthcare services were done in Pakistan, even though Pakistan is among the countries with the highest Maternal mortality rate (MMR) and Child mortality rate (CMR) in the world. Besides the highest MMR and CMR, the country also had a history of many conflicts over the years, eradicating equality among individuals. Therefore, these inequalities might be related to the community's social and health-related aspects. As an developing country, socioeconomic inequalities are expected. Still, there needs to be empirical evidence to show the extent of these inequalities in the use of maternal and child healthcare services in Pakistan. As a means of filling research gaps in the country, this thesis has an academic grounding to provide insights for understanding maternal and child health care use and to explore the inequalities that may be prevalent in minimizing maternal and child health care use in Pakistan. This thesis mainly tries to determine if the country has maternal and child healthcare use inequalities. Therefore, this thesis aims to unpack inequalities in Pakistan's maternal and child healthcare services.

CHAPTER 4

THEORETICAL FRAMEWORK AND METHODOLOGY

4.1 THEORETICAL FRAMEWORK

Over the past few decades, development economics has paid much attention to equal opportunities. This concept is based on equal rights for everyone in society and the absence of discrimination among them. Equal opportunity requires one generation's social status no longer depend on the previous generation's status. Equal opportunity is one of the pillars/foundations of "Justice Theory." Rawls presented two basic principles of justice theory. The first principle is that each person's liberty must be consistent with the other's freedom or liberty. The second principle is that everyone has at least the same basic opportunities (health, education, employment) regardless of their social status (Rawls, 1971).

According to Roemer, equality requires people's access to essential services independent of their backgrounds, such as religion or parents' socio-economic status. He stressed on the distinction between the disparity of opportunity and the disparity of outcome (Roemer, 1998, 2002). According to him, inequality in outcomes is primarily due to two sets of factors: individual effort and circumstances. Circumstances are those factors that are not in an individual's control, such as the gender of a person, their parents' education, income, the geographical area where they live, and religion.

In contrast, efforts are in the control of an individual and associated with his desertion. The inequality that arises due to effort is morally justifiable, whereas inequality due to circumstances is morally unjustifiable. This circumstance-related inequality is called the inequality of opportunity (Assaad et al., 2012; Pervaiz and Akram, 2018).

The idea of equal opportunity is also utilized by economists when assessing the equality of outcomes. World Bank Report on "Equity and Development" adopted a view of fairness based on equal opportunities. Roemer's definition is the one that is frequently used to describe this idea. He referred to the desired result as an "advantage" and separated the factors affecting the advantage into two categories (efforts and circumstances). Individual effort is subject to individual choice, whereas circumstances are forces beyond the individual's control. Whenever the distribution of the desired outcome is unaffected by circumstances, the equality of opportunity may prevail; otherwise, inequality of opportunity (World Bank, 2005).

The compensation and reward principles are the two fundamental tenets for achieving equal opportunity. The compensation principle states that inequalities caused by circumstances (outside of an individual's control) should be eliminated or compensated for by government policies. At the same time, inequality arises because efforts should be rewarded through the liberal reward principle (Fleurbaey and Schokkaert, 2009). It is important to note that the difference between effort and circumstances is sometimes called; the difference between legitimate and illegitimate sources of inequality, ethically acceptable and unethical sources of inequality, or even between fair and unfair sources of inequality (Roemer and Trannoy, 2015).

Commonly, there is disagreement on which sources constitute effort and circumstances. In literature, many studies based on IO in health and health care services agree with the scenario that factors related to a family's socioeconomic and geographical background are considered circumstances, as an individual is not responsible for his birth lottery. As well as, they are not responsible for their parent's occupation, educational level, lifestyle during their childhood, health habits, etc. On the other hand, the effort is hard to see and measure. However, in the health field, a person's lifestyle choices, such as smoking or not or any addictive drug, eating a balanced diet, drinking clean water, or investing in health, can be seen as examples of efforts made for health and healthcare (Jusot and Tubeuf, 2019; Ramos et al., 2016).

However, Roemer's framework leads to an unrealistic understanding of inequality of opportunity when considering child health outcomes. When considering young children, no circumstances are under a child's control. Thus, according to Roemer's framework, inequality in outcomes for young children, by definition, is inequality of opportunity. It seems essential in this case to talk about an "age of consent," a threshold point below which people cannot be considered responsible for their actions. Economists selected 15 years as the threshold point for age; below 15 years of age, an individual's parents are responsible for their lifestyle and health care habits; after this, the individual is fully responsible for his lifestyle. So, inequality below the age of 15 years will be considered an inequality of opportunity (Assaad et al., 2012; Krafft, 2015; Palmisano and Peragine, 2016; Sanoussi, 2017)

Our research aims to demonstrate how the circumstances affect Pakistan's maternal and child health care services. Maternal health care services include antenatal care, skilled birth attendants, and postnatal care. Immunization, diarrhea treatment, and fever/cough treatment are all included in child health care services. Researchers investigate the same indicators of MCHCS in Sub-Saharan Africa (Brunori et al., 2019), in Egypt (Ersado and Aran, 2014), Togo (Sanoussi, 2017), Nigeria (Adeyanju, 2017), Bangladesh

(Di Novi and Thakare, 2020), and Togo (Sanoussi, 2017). The researcher applied the same proxies for child health services (immunization) and maternal health services (antenatal care, skilled birth attendant, and postnatal care) as we did in our study. However, in the literature, IO of diarrhea and fever/cough treatment is only rarely mentioned, particularly in the context of Pakistani populations. Our research will check the effect of circumstances on antenatal care, skilled birth attendant, postnatal care, immunization, diarrhoea treatment, and fever/cough treatment as proxies for MHCS in Pakistan on the data set of PDHS 2-13 and 2018. The theoretical framework of maternal and child health care services is below.

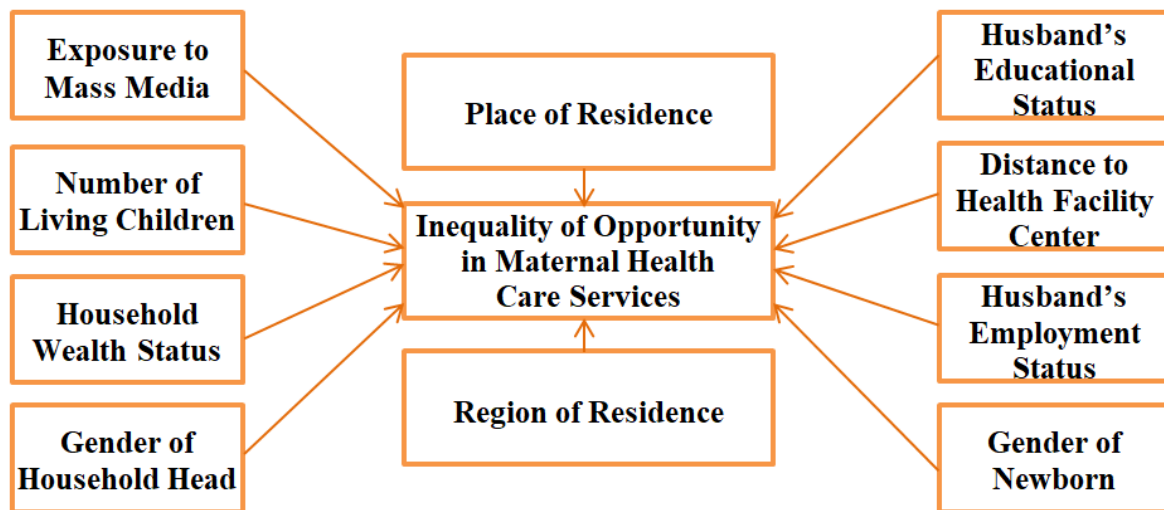


Figure 4.1: Framework of Inequality of Opportunity in Maternal Health Care Services

Figure 4.1 shows the theoretical framework of inequality of opportunity in maternal health care services. We selected antenatal care, skilled birth attendant and postnatal care as indicators of maternal health care services. In our study, we chose the place and region of residence, the husband’s education and employment status, the distance to health facility centres, the gender of the newborn and household head, exposure to mass media, the number of living children, and the household wealth status as circumstances that affect access to maternal healthcare services. Due to the participation of the “effort” factor, we do not consider women’s education and employment level in our study. Studies have shown that wealth status, region of residence, employment status of the husband, and exposure to mass media (newspapers, television, and radio) highly predict the use of MHCS (Navaneetham and Dharmalingam, 2002; Sanoussi et al., 2017; Amara et al., 2017; Tsawe et al., 2020)

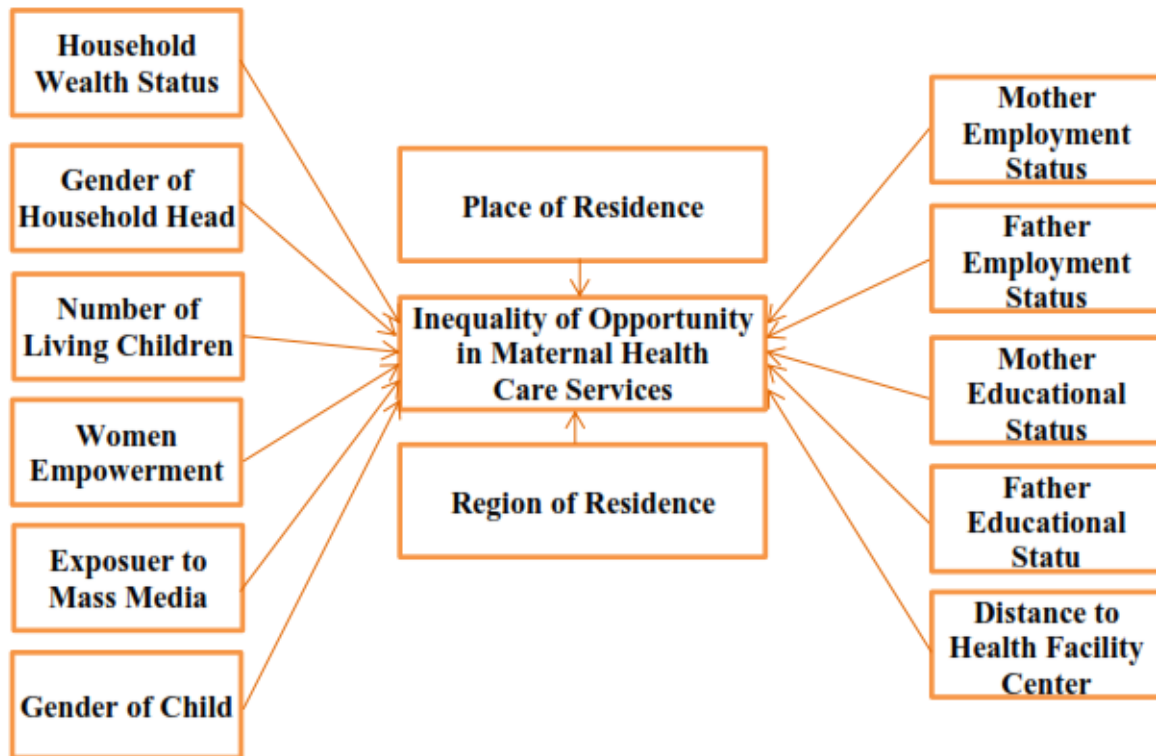


Figure 4.2: Framework of Inequality of Opportunity in Child Health Care Services

Figure 4.2 explains the theoretical framework of child health care services. In our study, child immunization, diarrhea treatment, and fever/cough treatment are the selected healthcare services for children. Circumstances are those variables over which an individual has no control. For our study, we choose parent's employment and wealth status, their place and region of residence, their distance to health care services, number of living children in a house, exposure to mass media, gender of the child and household head, and women empowerment (women's decision power) as circumstance variables. Our study will check these circumstances' effects on access to child healthcare services. Previous studies have shown that household wealth status, mother's education, place and region of residence are the most critical circumstances influencing the inequality of opportunity in child healthcare services (Hoyos and Narayan, 2011; Barros et al., 2012; Saidi, Hamdaoui, 2017; Singh, 2011).

4.2 BRIEF SPECIFICATIONS OF VARIABLES

4.2.1 Maternal and Child Healthcare Services

The following outcome variables were considered healthcare services for mothers and children. All selected all healthcare services as categorical variables. We coded 1 if the service met; otherwise, 0.

4.2.1.1 Antenatal Care

This variable is measured from the question, “How numerous times did the respondent receive antenatal care during childbirth”? PDHS (2018). According to the WHO, women must visit a doctor at least four times during the antenatal period. So, if a woman had at least four or more antenatal visits, we code her response as 1; otherwise, in the case of fewer than four visits, we will code her answer as 0.

4.2.1.2 Skilled Birth Attendants

Births taking place in a hospital or medical institute in the presence of a skilled person are considered one of the most effective measures to reduce maternal mortality and increase the chances for children to survive and enjoy a healthy life. The following question determines this variable: “Whether respondents gave birth under the supervision of a skilled person (public or private hospital) or at home” (PDHS, 2018). childbirth in the presence of a skilled person coded as 1 otherwise 0.

4.2.1.3 Postnatal Care

Most new born fatalities occur during delivery or postnatal (WHO, 2012). The following question determines this variable: “Would the respondent attend the hospital for postnatal care within six weeks?” (PDHS, 2018). If a new born receives a postnatal check-up during the first six weeks of birth, the variable is set to 1; otherwise, it is set to 0.

4.2.1.4 Child Immunization

In medical research, child immunization is the most successful method for reducing infectious illnesses and mortality. This variable is determined by asking, “Has the kid got all the vaccinations?” (PDHS, 2018). If the child received all 12 vaccines: three doses of DPT, one dose of measles, one dose of BCG, four doses of polio, and three doses of HBV, he would be fully immunized. We will generate a dummy variable with the help of this information: if the child is fully immunized, then cod as 1; otherwise, 0.

4.2.1.5 Diarrhea Treatment

Treatment of diarrhea lowers the risk of morbidity and mortality in children. The following question determines this variable: “Did the respondent receive advice or treatment for her kid in the case of diarrhea?” PDHS (2018). This indicator was constructed as a dummy variable with a value of 1 for diarrhea treatment and otherwise 0.

4.2.1.6 Fever/Cough Treatment

Fever and cough are also severe reasons for mortality in children. This variable is determined by the following question: “Did the respondent get advice/treatment for children in the situation of a fever/cough from any source?” PDHS (2018). If the child gets treatment, we code it as 1; otherwise, 0.

4.2.2 Circumstances

Circumstances are those that are not in the individual’s control. Most of the research calls circumstances the situations that a person gets in inheritance, So, circumstances are those things over which a person has no control. In our study, we consider the region of residence (Reg), place of residence (Res), mother’s educational status (M Edu. S), father’s educational status (F Edu. S), mother’s employment status (M Emp. S), father’s employment status (F Emp. S), gender of the child (GC), gender of new born (GNb), number of living children (NLC), household wealth status (HWS), gender of household head (GHH), exposure to mass media (EMM), distance to health facility centres (DH), women empowerment (EM) as circumstances for MCHCS. We subdivide these circumstances into several subgroups, from the most favourable group to the least favourable.

4.2.2.1 Region of Residence

For identification, each respondent was asked about their region of origin (PDHS, 2018). It is divided into eight categories. If the respondent resides in Punjab, then code 1, Sindh as 2, Khyber Pakhtunkhwa as 3, Baluchistan as 4, Gilgit Baltistan as 5, Islamabad (ICT) 6, Azad Jammu and Kashmir as 7, and FATA as 8.

4.2.2.2 Place of Residence

Each responder was questioned about their residence (PDHS, 2018). This binary variable indicates whether the household's community is urban or rural. Respondents who live in rural regions are labelled as 0; otherwise, 1.

4.2.2.3 Husband's / Father's Education

This variable is determined by the following question: "What is the greatest class the respondent's husband has completed?" PDHS (2018). This variable is divided into two categories if the husband has no education and primary school, considered "less than secondary", and coded as 0. If the husband has completed secondary or higher education, considered "at least secondary," then the code is 1.

4.2.2.4 Husband's/ Father's Employment Status

This variable is determined by the following question: "What is the husband's occupation?" (PDHS, 2018). It is a categorical variable if the husband has an occupation; we considered him employed and coded him as 1; otherwise, 0 for unemployed.

4.2.2.5 Gender of New Born/ Gender of Child

This question is based on the answer to the question, "What was the last (new born) child's gender?" PDHS (2018). Gender seems to significantly influence access to essential services in underdeveloped nations (Hoyos and Narayan, 2011). It is an essential indicator in analysing the inequality in access to medical services for children in Pakistan. This variable is categorized into two categories; male and female. We coded male 0 and female 1 in our study.

4.2.2.6 Gender of Household Head

In undeveloped countries, the head of the family is accountable for providing and accessing essential services. This variable is calculated using the question, "Who is the head of the family?" (PDHS, 2018). The variable will help express the disparities that arise due to the sex of the family head in terms of buying power and the decision-making process for the respondent's access to healthcare services. Our study coded 0 for male and 1 for female household heads.

4.2.2.7 Number of Living Children

Due to a greater demand for care, this variable may impact a mother's capacity to pay the expenses of healthcare services. Indeed, the pattern of total medical expenditure by age is J-shaped: expenses for newborns are high and drop with age until the age of 15, then grow relatively minor until the age of 45, and then climb at an increasing pace later in life (Gabriele et al., 2006). This variable is assessed by asking the respondent, "How many children are in your household?" PDHS (2018). In our study, we coded 0 if there was no child at home, 1 for only one child, 2 for two children, 3 for three children, 4 for four children, and 5 for five or more children.

4.2.2.8 Mother's Employment Status

A mother's employment status can be interpreted as a reflection of her relative purchasing power in the home, affecting her ability to obtain healthcare services. The question determines this variable: "Has the mother performed any jobs in the last 12 months?" (PDHS, 2018), and was defined as employed or unemployed. We coded one if she is currently employed in our study; otherwise, 0.

4.2.2.9 Household Wealth Status

The Household Wealth Index was created to analyze wealth status. Each household has been assigned a wealth score, calculated using Principal Component Analysis. It considers the household's possession of identified financial resources, such as TVs, fridges, motorcycles, vehicles, tractors, and bikes; sanitation facilities available to household members; and materials used in home construction. Households have been classified into five quintiles based on their wealth index score: poorest, poorest, middle, rich, and richest. (PDHS, 2018). We categorize it into two categories, i.e., Poor (poorest and poor) and non-poor (middle, rich and richest). We coded poor as 0; otherwise, 1.

4.2.2.10 Exposure to Mass Media

The following question determines this variable: "Does a respondent read the newspaper, magazine, radio, or TV every day, at least once per week, rarely, or even not?" PDHS (2018). Answers were recorded as yes or no. If the answer was yes in our study, we coded it as 1; otherwise, 0.

4.2.2.11 Distance Health Facility Centre

This variable is determined by the following question: “When the respondent is unwell and needs healthcare advice and treatment, does she suffer a distance problem from the nearest hospital?” (PDHS, 2018). The answers were recorded as “big problem (if distance $\geq 5\text{km}$)” and “not big distance (distance 0km to 4km).” In our study, we renamed the big problem as “long distance” and coded it as 1 and 0; in the case of a not-big problem (not long distance).

4.2.2.12 Mother’s Educational Status

In the study based on opportunity perspectives, this variable has been widely used, with the mother’s education acting as a proxy for circumstance in many publications. This variable is determined by responding to the “What is the greatest level of education?” (PDHS, 2018). This variable is divided into two categories. If the mother has no education and only primary school, it is considered “less than secondary” and coded as 0. Suppose the mother has completed secondary or higher education, considered “at least secondary,” and coded as 1.

4.2.2.13 Women’s Empowerment

This variable is derived from the question, “Who usually makes decisions about making major household purchases: you, your husband, you and your husband jointly, or someone else?” or “Who usually makes decisions about health care for women: women herself, her husband, she and her husband jointly, or someone else?” (PDHS, 2018). If a woman takes the decision alone or jointly with her husband, she is considered empowered and coded as 1; otherwise, 0 if she is not empowered.

4.3 METHODOLOGY

The literature suggests two approaches to measure IO: an ex-ante approach and an ex-post approach. The ex-ante approach measures the IO between the groups with the same circumstances regardless of their efforts. On the other hand, the ex-post approach measures the IO within the groups with the same level of effort. Both methods (ex-ante and ex-post) can be measured using parametric or non-parametric techniques. As explained earlier, there are two principles to achieve EO; the compensation principle and the reward

principle. We adopted the ex-post approach in the compensation principle; in this case, we reduce IO between individuals with the same level of effort but under different circumstances. In contrast, we adopted an ex-ante approach for the reward principle between groups with identical circumstances. (Bourguignon et al., 2007; Checchi and Peragine, 2010; Ferreira and Gignoux, 2011; Kranich, 1996; Lefranc et al., 2008; Roemer, 1993, 1998; Van De Gaer, 1995).

Several indices are used to estimate IO in income, consumption, health, education, etc.: the Pearson-Cramer index, The Concentration indices, the Overlap index, Reardon's index, the scalar index, etc. In these studies, individual traits are divided into circumstances and efforts, and they use parametric or non-parametric techniques to check the role of these IO (Checchi and Peragine, 2010; Singh, 2011; Asadullah and Yalonetzky, 2012; Bourguignon et al., 2007; Ferreira and Gignoux, 2008; Pervaiz and Akram, 2018; Zere and McIntyre; 2003). As in the case of children, the number of circumstances is quite large, and it is challenging to consider a large number of circumstances to measure IO. For this purpose, World Bank developed the human opportunity index to measure IO among children in 2006. HOI is the ex-ante parametric approach to measure IO among children. This index was first applied by Barros et al. in 2009 in Latin America and the Caribbean to measure the IO among children to access essential goods and services. The advantage of HOI is that; it combines equity and coverage rates into a single measure. It measures (1) how close a nation is to give universal access to goods and services and (2) how equitable access to such goods and services is for all children in the nation (Assaad et al., 2012; De Barros et al., 2009; Jusot and Tubeuf, 2019; Sanoussi, 2017)

4.3.1 Human Opportunity Index

The Human Opportunity Index (HOI) is one of the tools to measure the IO. The average coverage rate and the degree of opportunity distribution measure it. In other words, it measures the coverage rate of opportunities and how they are equally distributed among the groups, discounted by unequal circumstances. The range of HOI is 0 to 100; 0 means no opportunity, while 100 means equal opportunity (De Barros et al., 2009). The steps to calculate HOI are given below:

First, we will calculate the conditional probabilities by establishing the binary function between accessibility to healthcare outcome variables and circumstances. We will do this by using binary logistic regression.

$$\ln \left(\frac{P(I_i = 1 | x_1, x_2, x_3, \dots, x_n)}{1 - P(I_i = 1 | x_1, x_2, x_3, \dots, x_n)} \right) = \sum_{k=1}^n \beta_k(x_k)$$

where $I_i = 1$ if women and children have access to healthcare services and $I_i = 0$ if they don't have access to healthcare services and $x_1, x_2, x_3, \dots, x_n$ being the vector variable indicating their circumstances.

The regression produced an estimated coefficient β_x , which was used to calculate the probability p_i of maternal and child healthcare opportunities among women and children by using the formula given below

$$p_i = \frac{1}{1 + e(\beta_0 + \sum_{k=1}^m \beta_x)}$$

p_i = predicted probability of each circumstance

$e = 2.718$, approximately

After predicting the probability of each circumstance, we will calculate the likelihood of access to healthcare services, that is called coverage rate and the D-index by using the following equations:

$$C = \sum_{i=1}^n w_i p_i$$

$w_i = \frac{1}{n}$ "n" means the sampling weights

C = Average coverage rate

$$D - index = \frac{1}{2C} \sum_{i=1}^n w_i |p_i - C|$$

p_i = Coverage rate of circumstance of each group

The D-Index calculates the difference between the groups' accessing essential services from the same population. The same population means they have the same circumstances and average coverage rate for the same services. It tells us how much dissimilarity exists between these groups or the unequal distribution of opportunity. It measures how many reallocations or the percentage of opportunities are required to achieve equality of opportunity among the groups. The range of the D-Index is from 0 to 1, or we can calculate it in percentage: 0 means perfect equality, and by increasing the value of the D-index, inequality will also increase.

In the fourth and last step, we will calculate HOI, which means how many opportunities exist in a population based on the equal opportunity principle. For more clarification, we can say that HOI considers two things. (1) how much a country needs to work to achieve the goal of equal opportunity. (2) the percentage of opportunity that every child has to access goods and services

$$HOI = C(1 - D)$$

D = Dissimilarity index (D – Index)

C = Average coverage rate

(1 – D) will describe the proportion of available opportunities that are equally distributed. So, HOI can also be interpreted as the average coverage rate of services, discounted by 1 minus the dissimilarity index. When services are fairly distributed, the value of D will be zero, meaning HOI will equal the average coverage rate. On the other hand, if no one in society can access the services, the value of D will be 1. That means HOI will be zero, which means people in this society cannot access essential services, and a high level of inequality exists in this society (World Bank, 2006; Vélez et al., 2010.; Vega et al., 2011.; Sanoussi, 2017).

4.3.2 Variation of the Human Opportunity Index

HOI variation is the sum of two effects: (1) the distribution effect and (2) the scale effect.

- The distribution effect tells us how much changes in unequal distribution opportunities.
- The Scale Effect tells us how much variation in coverage rate there is for a whole society without changes in inequality (Ferreira et al., 2011).

$$\text{Variation of HOI} \quad HOI^{final} - HOI^{initial} = \Delta\bar{p} + \Delta D$$

$$\text{Scale Effect} \quad \Delta\bar{p} = \bar{p}^{final}(1 - D^{initial}) - \bar{p}^{initial}(1 - D^{initial})$$

$$\text{Distribution Effect} \quad \Delta D = \bar{p}^{final}(1 - D^{final}) - \bar{p}^{final}(1 - D^{initial})$$

4.3.3 Decomposition of the Dissimilarity Index by the Shapley Value

After estimating the inequality of opportunity proxied by the HOI, we assess the marginal contribution of each circumstance variable to inequality by using the Shapley decomposition procedure proposed by Shorrocks (2013). He introduced a single paradigm, based on the concept of Shapley value in cooperative games, to calculate the marginal contribution of each circumstance factors to the IOP (Amara and Jemmali, 2017; Sanoussi, 2017).

According to de Barros et al. (2009), the dissimilarity index is contingent on the set of circumstances, and its value increases as more circumstances are added. For instance, if there are two distinct circumstance variables, C1 and C2, D-index (C1, C2) is greater than D-index (C1), and vice versa for HOI. According to the Shapley decomposition method, each circumstance variable is eliminated sequentially from the set of circumstance variables to determine the marginal effect of the eliminated variable on the dissimilarity index (Saidi and Hamdaoui, 2017). The newly added or changed values of the dissimilarity index show how much an individual circumstance affects the overall significance of the inequality index.

The formula for Shapley Value is

$$D_{C_i} = \sum_{S \subseteq N/C_i} \frac{|s|!(n - |s| - 1)!}{n} [D(S \cup \{C_i\}) - D(S)]$$

where:

N= total number of circumstances selected for study

n= Selected circumstances

S= Subset of circumstances

D(S)= D-index of a subset

D (S ∪ {C_i}) = D-index of Subset of circumstances and circumstances variable

We can identify the marginal contribution of each circumstance p_j to the dissimilarity index

$$\theta_{C_j} = \frac{D_{C_j}}{D(N)}, \text{ where } \sum_{i \in N} D_{C_i} = 1$$

4.4 DATA SOURCE

The data is taken from the Pakistan Demographic and Health Survey 2012–13 and 2017–18, conducted by the National Institute of Population Studies. This survey describes marriage, fertility preferences, usage of family planning methods, maternal healthcare, awareness of HIV/AIDS, women’s empowerment, and household socio-economic characteristics. The objective of this survey is to observe the population and health situation in Pakistan and record the country’s performance in meeting the Millennium Development Goals.

According to the first dataset, PDHS 2012-13, the total sample size was based on 13,944 households, of which 6,944 were in urban areas, and 7,000 were in rural areas. In this dataset, 13,558 ever-married women aged 15–49 and 3,134 ever-married men aged 15–49 were interviewed successfully. The PDHS 2017-18 survey sample size was based on 16,240 households, of which 7,980 were in urban areas, and 8,260 were in rural areas. According to this dataset, 15,068 ever-married women aged 15–49 and 3,691 ever-married males aged 15–49 were interviewed successfully (PDHS 2012–13; 2017–18).

CHAPTER 5

RESULTS AND DISCUSSIONS

This chapter is divided into two sections. The first section provides the results related to maternal health care services. The second section shows the results of child health care services. These sections are further divided into four sub-sections. Descriptive analysis in the first sub-section; results of HOI in the second; variation of HOI with the help of the distribution effect and scale effect in the third; and the results of marginal contribution of circumstances by the Shapley value of maternal and child health care services (MCHCS) are provided in the fourth subsection.

5.1 MATERNAL HEALTH CARE SERVICES

We used antenatal care (ANC), skilled birth attendant (SBA), and Postnatal care (PC) as essential services of maternal health. We briefly describe these services in the following sections.

5.1.1 Descriptive Analysis

Descriptive analyses of ANC, SBA, and PC are presented in Tables 5.1, 5.2, and 5.3, respectively.

5.1.1.1 Descriptive Analysis of Antenatal Care

According to the World Health Organization (WHO), women must visit a doctor at least four times during the antenatal period. AC is a pre-birth period, and during the survey, the question asked of all ever-married women was, “How numerous times do they visit the doctor during childbirth?” Answers were recorded quantitatively, ranging from 0 to 14. For our study, we made two categories of their answers by following the requirement of WHO; less than four and at least four. The descriptive analysis of this health care opportunity is given below.

Table 5.1
Descriptive Analysis of Antenatal Care

Sr.	Circumstances		2012-13			2017-18		
			Less than 4 Visits	At least 4 Visits	Total	Less than 4 Visits	At least 4 Visits	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
1	Region of residence	Punjab	1140 (15.9%)	706 (9.9%)	1846 (25.8%)	759 (9.6%)	844 (10.7%)	1603 (20.3%)
		Sindh	946 (13.2%)	585 (8.2%)	1531 (21.4%)	719 (9.1%)	694 (8.8%)	1413 (17.9%)
		Khyber Pakhtunkhwa (KPK)	1068 (14.9%)	428 (6.0%)	1496 (20.9%)	679 (8.6%)	664 (8.4%)	1343 (17.0%)
		Baluchistan	955 13.3%	180 2.5%	1135 15.9%	742 (9.4%)	230 (2.9%)	972 (12.3%)
		Gilgit Baltistan (GB)	451 6.3%	250 3.5%	701 9.8%	331 (4.2%)	254 (3.2%)	585 (7.4%)
		Islamabad Capital Territory (ICT)	136 1.9%	310 4.3%	446 6.2%	144 (1.8%)	370 (4.7%)	514 (6.5%)
		Azad Jammu Kashmir (AJK)	-	-	-	392 (5.0%)	422 (5.4%)	814 (10.3%)
		Federally Administered Tribal Areas (FATA)	-	-	-	465 (5.9%)	178 (2.3%)	643 (8.2%)
2	Place of Residence	Urban	1671 23.4%	1448 20.2%	3119 43.6%	1465 (18.6%)	2062 (26.1%)	3527 (44.7%)
		Rural	3025 42.3%	1011 14.1%	4036 56.5%	2766 (35.1%)	1594 (20.2%)	4360 (55.3%)
3	Husband's Educational Status	Less than Secondary	2526 (35.3%)	671 (9.4%)	3197 (44.7%)	2227 (28.2%)	997 (12.6%)	3224 (40.9%)
		At least Secondary	2170 (30.3%)	1788 (25.0%)	3958 (55.3%)	2004 (25.4%)	2659 (33.7%)	4663 (59.1%)

Sr.	Circumstances		2012-13			2017-18		
			Less than 4 Visits	At least 4 Visits	Total	Less than 4 Visits	At least 4 Visits	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
4	Husband Employment Status	Unemployed	143 (2.0%)	53 (0.7%)	196 (2.7%)	194 (2.5%)	129 (1.6%)	323 (4.1%)
		Employed	4553 (63.6%)	2406 (33.6%)	6959 (97.3%)	4037 (51.2%)	3527 (44.7%)	7564 (95.9%)
5	Gender of new-born	Male	2380 (33.3%)	1291 (18.0%)	3671 (51.3%)	2202 (27.9%)	1891 (24.0%)	4093 (51.9%)
		Female	2316 (32.4%)	1168 (16.3%)	3484 (48.7%)	2029 (25.7%)	1765 (22.4%)	3794 (48.1%)
6	Gender of household head	Male	4364 (61.0%)	2268 (31.7%)	6632 (92.7%)	3840 (48.7%)	3287 (41.7%)	7127 (90.4%)
		Female	332 (4.6%)	191 (2.7%)	523 (7.3%)	391 (5.0%)	369 (4.7%)	760 (9.6%)
7	Household's Wealth Status	Poor	2500 (34.9%)	513 (7.2%)	3013 (42.1%)	2610 (33.1%)	944 (12.0%)	3554 (45.1%)
		Non-Poor	2196 (30.7%)	1946 (27.2%)	4142 (57.9%)	1621 (20.6%)	2712 (34.4%)	4333 (54.9%)
8	Number of living children	0	46 (0.6%)	20 (0.3%)	66 (0.9%)	42 (0.5%)	31 (0.4%)	73 (0.9%)
		1	734 (10.3%)	644 (9.0%)	1378 (19.3%)	652 (8.3%)	889 (11.3%)	1541 (19.5%)
		2	864 (12.1%)	605 (8.5%)	1469 (20.5%)	845 (10.7%)	908 (11.5%)	1753 (22.2%)
		3	816 (11.4%)	423 (5.9%)	1239 (17.3%)	736 (9.3%)	722 (9.2%)	1458 (18.5%)
		4	699 (9.8%)	316 (4.4%)	1015 (14.2%)	659 (8.4%)	511 (6.5%)	1170 (14.8%)
		≥ 5	1536 (21.5%)	451 (6.3%)	1988 (27.7%)	1297 (16.6%)	595 (7.6%)	1892 (24.2%)

Sr.	Circumstances		2012-13			2017-18		
			Less than 4 Visits	At least 4 Visits	Total	Less than 4 Visits	At least 4 Visits	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
9	Distance to Health Facility Centre	Not long distance	2300 32.1%	1718 24.0%	4018 56.2%	1651 20.9%	2247 (28.5%)	3898 (49.4%)
		Long Distance	2396 33.5%	741 10.4%	3137 43.8%	2580 (32.7%)	1409 (17.9%)	3989 (50.6%)
10	Exposure to Mass Media	No	2003 28.0%	480 6.7%	2483 34.7%	1963 (24.9%)	909 (11.5%)	2872 (36.4%)
		Yes	2693 37.6%	1979 27.7%	4672 65.3%	2268 (28.8%)	2747 (34.8%)	5015 (63.6%)
Total			4696 ^a (65.6%)	2459 ^b (34.4%)	7155 100.0%	4231 ^c (53.6%)	3656 ^d (46.4%)	7887 (100.0%)

^a Percentage of those women who had less than four antenatal visits in 2013 = 65.9% (4696/7155)

^b Percentage of those women who had taken at least four antenatal visits in 2013 = 34.4 % (2459/7155)

^c Percentage of those women who had less than four antenatal visits in 2018 = 53.6% (4231/7887)

^d Percentage of those women who had taken at least four antenatal visits in 2018 = 46.4% (3656/7887)

(Autor's calculations)

Table 5.1 shows the descriptive analysis of antenatal care (ANC) in 2013 and 2018. Our first household characteristic is the region of residence. In 2013, according to the PDHS-13 survey, Pakistan was divided into six regions, namely, Punjab, Sindh, Khyber Pakhtunkhwa (KPK), Baluchistan, Gilgit Baltistan (GB), and Islamabad (ICT). In 2018, according to PDHS-18, the whole country was divided into eight regions, namely, Punjab, Sindh, Khyber Pakhtunkhwa (KPK), Baluchistan, Gilgit Baltistan (GB), Islamabad (ICT), Azad Jammu and Kashmir (AJK), and the Federally Administered Tribal Area (FATA). According to the table, in 2013, from Punjab, 9.9%, Sindh 8.2%, KPK 6%, Baluchistan 2.5%, GB 3.5%, and ICT 4.3% of women had at least four antenatal visits. While in 2018, from Punjab 10.7%, Sindh 8.8%, KPK 8.4%, Baluchistan 2.9%, GB 3.2%, ICT 4.7%, AJK 5.4%, and FATA 2.3% of women had at least four ANC visits.

The area of residence is categorized into two categories; urban and rural. In 2013, 20.2% of women were from urban areas, while 14.1% of women from rural areas had at least four ANC visits. However, in 2008, 26.1% of women were from urban areas, while 20.2% of women from rural areas had at least four ANC visits.

Husband's educational and employment status are further categorized into two categories. Educational categories are; less than secondary and at least secondary, while employment categories are; unemployment and employment. According to the results, those women whose husbands had less than secondary education had 9.4% in 2013, while 12.6% in 2018 had at least four ANC visits. Those women whose husbands are unemployed had 0.7% in 2013, while 1.6% in 2018 had at least four ANC visits.

If a new-born's gender is male, then 18% of women in 2013 while 24% of women in 2018 had at least four ANC visits. By comparing 2013 and 2018, women from those houses whose household head were male were more likely to avail the opportunity of ANC than those whose household head was female. Similarly, women belong poor families are less likely to visit the doctor for ANC than those from non-poor families. Additionally, women with fewer children are more likely to seek medical attention for ANC than women with a large number of children.

Our following circumstance is the distance to the health facility centre, which is categorized into two categories, i.e., not long-distance and long-distance. If health facility centres are not far away, then 24% of women in 2013 and 28.5% of women in 2018 had at least four ANC visits. Our last circumstantial factor is exposure to mass media. Results show that 34.8% of women in 2018 and 27.7% in 2013 had at least four ANVs who had exposure to mass media.

Overall, one-third of women (34.4%) had at least four ANC visits in 2013, while in 2018, less than half of the women (46.4%) had at least four ANC visits.

5.1.1.2 Descriptive Analysis of Skilled Birth Attendant

Births taking place in the presence of a skilled person, such as a doctor or a nurse, are considered one of the most effective measures to reduce maternal and child mortality. For this purpose, the question was asked of all ever-married women, “Whether they gave birth under the supervision of a skilled person or not.” The answer was recorded as “yes” or “no.” A descriptive analysis of this health care opportunity is given below.

Table 5.2
Descriptive Analysis of Skilled Birth Attendant

Sr. No.	Circumstances		2012-13			2017-18		
			Not Skilled Birth Attendant	Skilled Birth Attendant	Total	Not Skilled Birth Attendant	Skilled Birth Attendant	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
1	Region of residence	Punjab	1461 (13.0%)	1536 (13.7%)	2997 (26.6%)	811 (6.7%)	1742 (14.4%)	2553 (21.1%)
		Sindh	945 (8.4%)	1481 (13.2%)	2426 (21.6%)	572 (4.7%)	1602 (13.3%)	2174 (18.0%)
		Khyber Pakhtunkhwa (KPK)	1210 (10.8%)	1008 (9.0%)	2218 (19.7%)	688 (5.7%)	1347 (11.1%)	2035 (16.8%)
		Baluchistan	1450 (12.9%)	413 (3.7%)	1863 (16.6%)	942 (7.8%)	521 (4.3%)	1463 (12.1%)
		Gilgit Baltistan (GB)	521 (4.6%)	559 (5.0%)	1080 (9.6%)	254 (2.1%)	617 (5.1%)	871 (7.2%)
		Islamabad Capital Territory (ICT)	112 (1.0%)	554 (4.9%)	666 (5.9%)	154 (1.3%)	612 (5.1%)	766 (6.3%)
		Azad Jammu Kashmir (AJK)	-	-	-	406 (3.4%)	824 (6.8%)	1230 (10.2%)
		Federally Administered Tribal Areas (FATA)	-	-	-	451 (3.7%)	545 (4.5%)	996 (8.2%)
2	Place of Residence	Urban	1716 (15.3%)	3002 (26.7%)	4718 (41.9%)	1255 (10.4%)	4040 (33.4%)	5295 (43.8%)
		Rural	3943 (35.5%)	2549 (22.7%)	6532 (58.1%)	3023 (25.0%)	3770 (31.2%)	6793 (56.2%)
3	Husband's Educational Status	Less than Secondary	3427 (30.5%)	1843 (16.4%)	5270 (46.8%)	2436 (20.2%)	2655 (22.0%)	5091 (42.1%)
		At least Secondary	2272 (20.2%)	3708 (33.0%)	5980 (53.2%)	1842 (15.2%)	5155 (42.6%)	6997 (57.9%)
4	Husband Employment Status	Unemployed	165 (1.5%)	127 (1.1%)	292 (2.6%)	179 (1.5%)	287 (2.4%)	466 (3.9%)
		Employed	5534 (49.2%)	5424 (48.2%)	10958 (97.4%)	4099 (33.9%)	7523 (62.2%)	11622 (96.1%)

Sr. No.	Circumstances		2012-13			2017-18		
			Not Skilled Birth Attendant	Skilled Birth Attendant	Total	Not Skilled Birth Attendant	Skilled Birth Attendant	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
5	Gender of new-born	Male	2885 (25.6%)	2843 (25.3%)	5728 (50.9%)	2116 (17.5%)	4063 (33.6%)	6179 (51.1%)
		Female	2814 (25.0%)	2708 (24.1%)	5522 (49.1%)	2162 (17.9%)	3747 (31.0%)	5909 (48.9%)
6	Gender of household head	Male	5323 (47.3%)	5145 (45.7%)	10468 (93.0%)	3897 (32.2%)	7033 (58.2%)	10930 (90.4%)
		Female	376 (3.3%)	406 (3.6%)	782 (7.0%)	381 (3.2%)	777 (6.4%)	1158 (9.6%)
7	Household's Wealth Status	Poor	3461 (30.8%)	1490 (13.2%)	4951 (44.0%)	2968 (24.6%)	2615 (21.6%)	5583 (46.2%)
		Non-Poor	2238 (19.9%)	4061 (36.1%)	6299 (56.0%)	1310 (10.8%)	5195 (43.0%)	6505 (53.8%)
8	Number of Living Children	0	35 (0.3%)	41 (0.4%)	76 (0.7%)	20 (0.2%)	69 (0.6%)	89 (0.7%)
		1	510 (4.5%)	981 (8.7%)	1491 (13.3%)	382 (3.2%)	1267 (10.5%)	1649 (13.6%)
		2	964 (8.6%)	1551 (13.8%)	2515 (22.4%)	799 (6.6%)	2181 (18.0%)	2980 (24.7%)
		3	1088 (9.7%)	1116 (9.9%)	2204 (19.6%)	774 (6.4%)	1662 (13.7%)	2436 (20.2%)
		4	967 (8.6%)	738 (6.6%)	1705 (15.2%)	750 (6.2%)	1154 (9.5%)	1904 (15.8%)
		5 +	2135 (19.1%)	1124 (10.1%)	3259 (29.2%)	1553 (12.8%)	1477 (12.3%)	3030 (25.1%)

Sr. No.	Circumstances		2012-13			2017-18		
			Not Skilled Birth Attendant	Skilled Birth Attendant	Total	Not Skilled Birth Attendant	Skilled Birth Attendant	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
9	Distance to Health Facility Centres	Not long distance	2462 (21.9%)	3697 (32.8%)	6159 (54.7%)	1434 (11.9%)	4477 (37.0%)	5911 (48.9%)
		Long Distance	3237 (28.8%)	1854 (16.5%)	5091 (45.3%)	2844 (23.5%)	3333 (27.6%)	6177 (51.1%)
10	Exposure to Mass Media	No	2724 (24.2%)	1346 (12.0%)	4070 (36.2%)	2139 (17.7%)	2437 (20.2%)	4576 (37.9%)
		Yes	2975 (26.5%)	4205 (37.4%)	7180 (63.8%)	2139 (17.7%)	5373 (44.4%)	7512 (62.1%)
Total			5699 (50.7%)^a	5551 (49.3%)^b	11250 (100.0%)	4278 (35.4%)^c	7810 (64.6%)^d	12088 (100.0%)

^a Percentage of those women who didn't deliver their baby in the presence of SBA in 2013 = 50.7% (5699/11250).

^b Percentage of those women who delivered their baby in the presence of SBA in 2013 = 49.3% (5551/11250).

^c Percentage of those women who don't deliver their baby in the presence of SBA in 2018 = 35.4% (4278/12088).

^d Percentage of those women who delivered their baby in the presence of SBA in 2018 = 64.6% (7810/12088).

(Autor's calculations)

Descriptive analysis for the household characteristics of a skilled birth attendant (SBA) is shown in Table 5.2. The first circumstantial characteristic is the area of residence. In 2013, approximately 13.7%, 13.2%, 9%, 3.7%, 5%, and 4.9% of women from Punjab, Sindh, KPK, Baluchistan, GB, and ICT, respectively, gave birth in the presence of SBA. However, in 2018, 14.4%, 13.3%, 11.1%, 4.3%, 5.1%, 5.1%, 6.8%, and 4.5% of women from Punjab, Sindh, KPK, Baluchistan, GB, ICT, AJK, and FATA, respectively, gave birth their child in the presence of SBA in 2018.

The following circumstantial variable is the place of residence. In 2018, 31.4% of women living in urban areas gave birth to their children in the presence of SBA, while in 2013, this percentage was 26.7%. In 2013 and 2018, women whose husbands were educated and employed were more likely to give birth to their children in the presence of SBA than those whose husbands were uneducated and unemployed. In the case of a male child, 33.6% of women in 2013 and 25.3% of women in 2018 gave birth in the presence of SBA. For the case of the female child, 31% gave birth in 2013, while 24.1% of women in 2018 gave birth to their child in the presence of SBA.

Women whose household heads are male are more likely to give birth to their children in the presence of SBA. By comparing 2013 and 2018, poor women were less likely to avail themselves of the opportunity of SBA for their childbirth (13.2% vs 21.6%) than non-poor women (36.1% vs 43%). Descriptive analysis showed that women with more children mostly neglect to give birth to their children in the presence of SBA. Women who live close to health facility centres (32.8% in 2013 vs 37% in 2018) are more likely to give birth to their child in the presence of SBA than those who live far from health facility centres (16.5% in 2013 vs 27.6% in 2018). Similarly, women with access to mass media are more likely to birth their child in the presence of SBA than those without access to it.

Overall, almost half of the women (49.3 percent) had birthed their child in the presence of SBA in 2013, while in 2018, almost three-quarters of the women (64.6 percent) had birthed their child in the presence of SBA.

5.1.1.3 Descriptive Analysis of Postnatal Care

The postnatal care (PC) period is within the first six weeks after childbirth. According to the WHO, most maternal and child mortality occurred during the PC period. During the surveys in 2013 and 2018, every married woman asked, “Would they visit a doctor for PC within six weeks after childbirth?” The response was recorded as “yes” or “no.” A descriptive analysis of PC is presented in Table 4.3.

Table 5.3
Descriptive Analysis of Postnatal Care

Sr. No.	Circumstances	2012-13			2017-18			
		NO	YES	Total	NO	YES	Total	
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
1	Region of residence	Punjab	740 (10.4%)	1080 (15.1%)	1820 (25.5%)	1063 (13.6%)	534 (6.8%)	1597 (20.3%)
		Sindh	702 (9.9%)	826 (11.7%)	1528 (21.5%)	852 (10.8%)	558 (7.1%)	1410 (18.0%)
		Khyber Pakhtunkhwa (KPK)	942 (13.2%)	551 (7.7%)	1493 (20.9%)	1098 (14.0%)	243 (3.1%)	1341 (17.1%)
		Baluchistan	917 (12.9%)	214 (3.0%)	1131 (15.9%)	812 (10.3%)	142 (1.8%)	954 (12.2%)
		Gilgit Baltistan (GB)	584 (8.2%)	115 (1.6%)	699 (9.8%)	479 (6.1%)	105 (1.3%)	584 (7.4%)
		Islamabad Capital Territory (ICT)	166 (2.3%)	278 (3.9%)	444 (6.2%)	311 (4.0%)	201 (2.6%)	512 (6.5%)
		Azad Jammu Kashmir (AJK)	-	-	-	532 (6.8%)	282 (3.6%)	814 (10.4%)
		Federally Administered Tribal Areas	-	-	-	(609) (7.8%)	34 (0.4%)	643 (8.0%)
2	Place of Residence	Urban	1638 (23.0%)	1457 (20.5%)	3095 (43.5%)	2445 (31.1%)	1069 (13.6%)	3514 (44.7%)
		Rural	2413 (33.9%)	1607 (22.6%)	4020 (56.5%)	3311 (42.2%)	1030 (13.1%)	4341 (55.3%)
3	Husband's Educational Status	Less than Secondary	2057 (28.9%)	1123 (15.8%)	3180 (44.7%)	2467 (31.4%)	743 (9.5%)	3210 (40.9%)
		At least Secondary	1994 (28.0%)	1941 (27.3%)	3935 (55.3%)	3289 (41.9%)	1356 (17.3%)	4645 (59.1%)
4	Husband Employment Status	Unemployed	137 (1.9%)	58 (0.8%)	195 (2.7%)	242 (3.1%)	79 (1.0%)	321 (4.1%)
		Employed	3914 (55.0%)	3006 (42.2%)	6920 (97.3%)	5514 (70.2%)	2020 (25.7%)	7534 (95.9%)

Sr. No.	Circumstances		2012-13			2017-18		
			NO	YES	Total	NO	YES	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
5	Gender of New-Born	Male	2072 (29.1%)	1583 (22.2%)	3655 (51.4%)	2939 (37.4%)	1135 (14.4%)	4074 (51.9%)
		Female	1979 (27.8%)	1481 (20.8%)	3460 (48.6%)	2817 (35.9%)	964 (12.3%)	3781 (48.1%)
6	Gender of household head	Male	3760 (52.8%)	2834 (39.8%)	6594 (92.7%)	5217 (66.4%)	1880 (23.9%)	7097 (90.4%)
		Female	291 (4.1%)	230 (3.2%)	521 (7.3%)	539 (6.9%)	219 (2.8%)	758 (9.6%)
7	Household's Wealth Status	Poor	2071 (29.1%)	934 (13.1%)	3005 (42.2%)	2793 (35.6%)	744 (9.5%)	3537 (45.0%)
		Non-Poor	1980 (27.8%)	2130 (29.9%)	4110 (57.7%)	2963 (37.7%)	1355 (17.3%)	4318 (55.0%)
8	Number of Living children	0	40 (0.6%)	24 (0.3%)	64 (0.9%)	53 (0.7%)	20 (0.3%)	73 (0.9%)
		1	663 (9.3%)	700 (9.8%)	1363 (19.1%)	1019 (13.0%)	512 (6.5%)	1531 (19.5%)
		2	739 (10.4%)	722 (10.1%)	1461 (20.5%)	1223 (15.6%)	523 (6.7%)	1746 (22.2%)
		3	733 (10.3%)	501 (7.0%)	1234 (17.3%)	1098 (14.0%)	356 (4.5%)	1454 (18.5%)
		4	580 (8.2%)	432 (6.1%)	1012 (14.3%)	866 (11.1%)	302 (3.8%)	1168 (14.9%)
		5+	1296 (18.3%)	685 (9.6%)	1981 (27.9%)	1497 (19.1%)	386 (4.9%)	1883 (24%)

Sr. No.	Circumstances		2012-13			2017-18		
			NO	YES	Total	NO	YES	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
9	Distance to Health Facility Centre	Not long distance	1967 (27.6%)	2026 (28.5%)	3993 (56.1%)	2654 (33.8%)	1233 (15.7%)	3887 (49.5%)
		Long Distance	2084 (29.3%)	1038 (14.6%)	3122 (43.9%)	3102 (39.5%)	866 (11.0%)	3968 (50.5%)
10	Exposure to Mass Media	No	1622 (22.8%)	850 (11.9%)	2472 (34.7%)	2256 (28.7%)	602 (7.7%)	2858 (36.4%)
		Yes	2429 (34.1%)	2214 (31.1%)	4643 (65.3%)	3500 (44.6%)	1497 (19.1%)	4997 (63.6%)
Total			4051 (56.9%) ^a	3064 (43.1%) ^b	7115 (100.0%)	5756 (73.3%) ^c	2099 (26.7%) ^d	7855 (100.0%)

^a Percentage of those women who had no postnatal visits in 2013 = 56.9% (4051/70115).

^b Percentage of those women who had postnatal visits in 2013 = 43.1% (3064/70115).

^c Percentage of those women who had no postnatal visits in 2018 = 73.3% (5756/7855).

^d Percentage of those women who had postnatal visits in 2018 = 26.7% (2099/7855).

(Autor's calculations)

Table 5.3 presents the household characteristics of postnatal care. The region of residence is the first circumstantial variable. Women residing in Punjab (15.1% vs. 6.8%), Sindh (11.7% vs. 7.1%), KPK (7.7% vs. 3.1%), Baluchistan (3% vs. 1.8%), GB (1.6% vs. 1.3%), and ICT (3.9% vs. 2.6%) AJK region (3.6%) and FATA region (0.4%) had visited for postnatal care in 2013 as compared to 2018. In 2013, 22.2% of women from urban areas and 20.5% from rural areas visited the hospital for PC. However, in 2018, 13.6% were from urban areas, while 13.1% of women from rural areas visited hospitals for PC.

Among women whose husbands have less than secondary education, 15.8% in 2013 and 9.5% in 2018 had postnatal visits. In the case of at least secondary education, 27.3% of women in 2013 and 17.3% of women in 2018 had a postnatal visit. Among women whose husbands are unemployed, 0.8% in 2013 and 1% in 2018 had postnatal visits. Of those women whose husbands are working or employed, 42.2% in 2013 and 25.7% in 2018 had a postnatal visit. The gender of the child played a significant role in postnatal visits. In the case of male children, 22.2% of children in 2013 and 14.4% of women in 2018 had postnatal visits. In the case of female children, 20.8% in 2013 and 12.3% of women in 2018 had a postnatal visit.

In the case of male household heads, 39.8% in 2013 and 23.9% of women in 2018 had a postnatal visit. If the head is female, then 3.2% of women in 2013 and 9.6% in 2018 had a postnatal visit. Among women who belong to the poorest families, 13.1% in 2013 and 9.5% of women in 2018 had postnatal visits. In the case of wealthy/non-poor families, 29.9% in 2013 and 17.3% of women in 2018 had a postnatal visit. Similarly, women with fewer children were more likely to consult doctors for PC in 2013 and 2018.

Among women who live near health care centres, 28.5% had postnatal visits in 2013, while 15.7% had them in 2018. If health facility centres are far from home, then 4.6% of women in 2013 and 11% in 2018 had postnatal visits. In the case of exposure to mass media, 31.1% of women in 2013 and 19.1% in 2018 had visited hospitals for postnatal care. And if they don't have any exposure to mass media, then, in this case, 11.9% in 2013 while 7.7% of women had a postnatal visit.

Overall, almost half of the women (43.1 percent) had postnatal visits in 2013, while in 2018, almost one-third of the women (26.7 percent) had postnatal visits.

5.1.2 Human Opportunity Index of MHCS

Table 5.4
Distribution of the Coverage, Dissimilarity Index, and HOI of MHCS

Health Care Access Indicators	Average Coverage Rate or Prevalence%		Inequality of Opportunity D%		(1-D) %		Human Opportunity Index %	
	2012-13	2017-18	2012-13	2017-18	2012-13	2017-18	2012-13	2017-18
Antenatal Care Visits	34.4%	46.4%	25.4%	21.0%	74.6%	79.0%	25.7%	36.6%
Skilled Birth Attendant	49.4%	64.6%	20.1%	13.8%	80.0%	86.2%	39.5%	55.7%
Postnatal Care (PC)	43.0%	26.7%	16.4%	15.8%	83.6%	84.2%	36.0%	22.5%

(Autor's calculations)

The average coverage rate, the inequality of opportunity, and the human opportunity values for the use of various interventions in maternal and child healthcare services among women and children in Pakistan are shown in Table 5.4. Before explaining the results, let's recall the coverage rate, dissimilarity index and human opportunity index. The coverage rate is the access to services or opportunities. The dissimilarity or inequality index (D-index) evaluates the extent of IO based on several circumstances. And HOI is a measure of "equality of opportunity-sensitive coverage rate". This indicates that HOI for a particular basic need rises with overall coverage and falls with inequality in coverage brought on by circumstances beyond the individual's control. According to the table, the coverage rates show that access to two out of three maternal health care services has increased. Access to ANC increased from 34.4% to 46.4%, and SBA (births assisted by a skilled birth attendant) increased from 49.4% to 64.4% during the five years of the survey. In contrast, PC access decreased (43% to 26%) during this period. It means during the five years of the survey, the uptake of ANC services increased by 12%, skilled birth attendants by 15.2%, and the other hand, services uptake of postnatal care decreased by 16.3%.

The dissimilarity index (D-index) dropped across all selected maternal health care service (MHCS) indicators. For instance, the dissimilarity index among women who attended four or more ANVs decreased from 25.4% to 21%. Inequality also decreased from 20.1% to 13.8% among women who reported giving birth to their baby in the presence of any professional (SBA) during their previous pregnancy in the five years preceding the survey. Moreover, in PC's case, the inequality (D-Index) decreased from 16.4% to 15.8% during this time; however, access to PC decreased by 16.3%. So according to the results, inequality of opportunity reduced by 4.4% in care of

antenatal care services, 6.3% for birth in the presence of a skilled birth attendant and 0.6% for Postnatal care.

The coverage scale affects HOI: if the coverage rate increases (decreases) by any percentage, HOI rises by the same percentage. So, due to fluctuations in coverage rate and D-index, the HOI increases for two out of two maternal health care services. So, the opportunities to get services of ANC increased from 25.7% to 36.6%, and in the case of SBA, it increased from 39.5% to 55.7% during the five years of the survey. In contrast to these two services, HOI dropped in the case of PC care due to the coverage rate, as access to PC services decreased by 16.3% during this time.

The highest HOI was found among women who delivered their babies in the presence of SBA, and the lowest was found in the case of PC. The low HOI is indicative of the low attention of women towards the medical checkup after their childbirth, within 40 days after pregnancy, known as PC. A graphic presentation of the change in HOI is given in Figure 5.1.

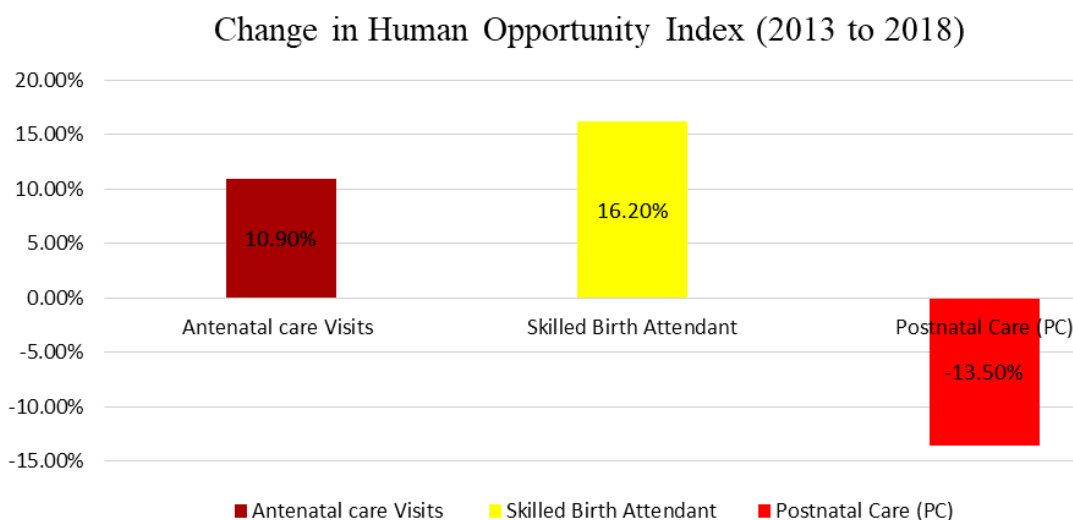


Figure 5.1: Graphical presentation of the change in the Human Opportunity Index of MHCS

Figure 5.1 shows the change in HOI from 2013 to 2018. Changes in the human opportunity index are caused by how many people have access to opportunities (coverage rate) and how evenly those opportunities are spread out (D-Index). Results show an increased coverage rate for antenatal care services and skilled birth attendants. Still, for postnatal care, this rate decreased by 16.3%. In all cases, the inequality of opportunity decreases. As we know, HOI is the coverage rate discounted by inequality of opportunity. Hence, inequality plays the role of a penalty on the coverage rate. We also know that, based on how HOI works, the coverage rate directly affects HOI.

In contrast, the D-Index, which measures inequality of opportunity, has an indirect impact. So by comparing the results of 2013 and 2018, results show that access to antenatal care services increased by 10.9%, and women’s access to the hospital for the birth of their child in the presence of skilled birth attendants increased by 16.2%. In the case of postnatal care, women’s access decreased by 13.5% during the five years of the survey.

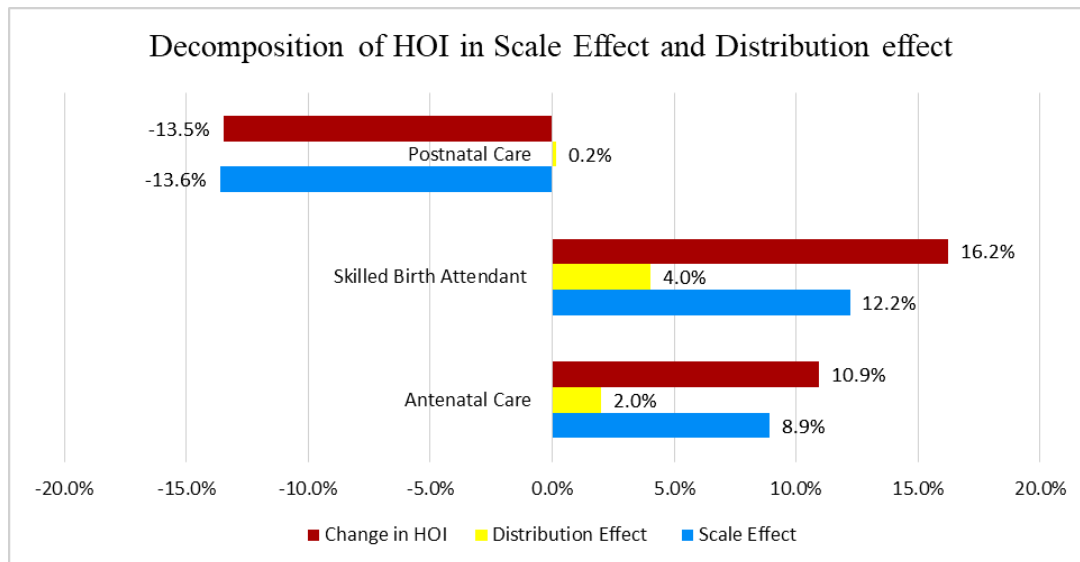


Figure 5.2: Decomposition of the HOI in Scale and Distribution Effects of MHCS

Another exciting thing about this index is that changes in HOI can be broken down into two parts: 1) a scale effect, which is a change in the coverage rate in the population, and 2) a distribution effect, which is a change in the between-group inequality in coverage between groups, keeping the coverage rate in the population the same. Figure 5.2 presents the decomposition of HOI into scale and distribution effects. As shown earlier, the HOI increased for two of three MHCS (ANC and SBA). The scale effect (the increases in coverage of services) has been the primary source of the variation in HOI. In the case of ANC, HOI increased by 10.9% between 2013 and 2018. Around 8.9% of the increase can be attributed to the scale effect (services becoming more widely available and being utilized). While about 2% is attributed to the distribution effect (services becoming more equitable and available across circumstance groups). Opportunities/access to SBA services for childbirth increased by 16.2% during 5 five years of the survey. This improvement is due to a 4% improvement in the distribution effect and a 12.2% improvement in the scale effect. While in the third case, HOI decreased by 13.5% for PC due to a 13.6% decrease in scale effect and a 0.2% decrease in distribution effect.

5.1.3 Shapley Decomposition of MHCS

By using the Shapley decomposition approach, we estimate the marginal contribution of each circumstance variable to inequality in maternal healthcare access after measuring the amount of opportunity equality as proxied by the HOI. Shorrocks proposed the original application of Shapley value in 1999. But, Ferreira et al. (2011) provide formal proof of Shapley value to check the marginal contribution of each circumstance to IO. According to the results, Shapley's value reveals that the household wealth status, region of residence, place of residence (urban or rural), and the husband's educational level are the most significant contributors to IO in MHCS.

Table 5.5
Shapley Value Decomposition of D-Index-Percentage
Contributions of Circumstances of MHCS

Circumstances	Antenatal Care		Skilled Birth Attendant		Postnatal Care	
	2012-13	2017-18	2012-13	2017-18	2012-13	2017-18
Region of Residence	15.1	12.7	18.5	14.5	47.9	56.7
Place of Residence	12.0	10.6	11.2	11.3	3.2	4.6
Husband's Educational Status	15.8	14.8	14.5	11.7	8.4	4.0
Husband's Employment Status	0.3	0.3	0.17	0.1	0.8	0.2
Household Wealth Status	23.4	30.3	22.3	30.5	15.1	9.6
Gender of The Household Head	0.2	0.3	0.21	0.3	0.1	0.5
Number of Living Children	10.1	9.1	10.9	10.6	6.0	6.4
Gender of NewBorn	0.6	0.1	0.2	0.9	0.2	1.6
Exposure To Mass Media	12.9	10.8	11.7	8.2	6.8	6.9
Distance To the Health Facility Centre	9.6	11.0	10.4	11.9	11.5	9.5

(Autor's calculations)

5.1.3.1 Marginal Contribution of Circumstance in Antenatal Care

It is evident from Table 5.5 that the family's economic background accounts for the highest contribution to the inequality in ANC. It contributed 5.9% (23.4% in 2013 and 30.3% in 2018) to the increase in inequality during the five years. The husband's education is the second most important contributor, which played an essential role in the increase in IO in 2013 and 2014. According to the results, it contributed 15.8% in 2013 and 14.8% in 2018. Its contribution to IO decreased by 1% during the five years of the survey. The region of residence is the third most crucial household

characteristic, which plays an essential role in IO. It contributed 15.1% in 2013 and 12.7% in 2018. Its contribution decreased by 2.4% during the survey.

Distance to health facility centres also increased inequality by 1.4% (9.6% in 2013 and 11% in 2014). Place of residence, number of children, and exposure to mass media also played an essential role in IO in 2013 (12%, 10.1%, and 12.9%, respectively) and 2018 (10.6%, 9.1%, and 10.8%, respectively). Inequality decreased by 1.4% in the region of residence, with 1% due to a large number of children in the house and 2.1% due to exposure to mass media.

The husband's employment status, the gender of the newborn, and the gender of the household played a very minimal role in the inequality during the five years of the survey.

5.1.3.2 Marginal Contribution of Circumstance in Skilled Birth Attendant

Household wealth status, region of residence, and husband's education played an important role in inequality in the case of safe delivery in the presence of skilled birth attendants from 2013 to 2018. Household wealth status contributed 22.3% in 2013 and 30.5% in 2018. Overall, 8.2% of inequality increased due to this factor from 2013 to 2018. The second most significant factor is the region of residence. Its contribution was 18.5% in 2013 and 14.5% in 2018. Inequality decreased by 4% during the five years of the survey. The third important factor is the husband's education; its contribution was 14.7% in 2013 and 11.7% in 2018. A total of 3% of inequality decreased due to this.

Place of residence, Number of children, Exposure to mass media, and distance to health facility centres also played a significant role in inequality in 2013 and 2018. They played almost the same role in inequality in 2013 and 2018. The contribution of the place of residence, number of children, exposure to mass media, and distance to health facility centres was 11.2%, 10.9%, 11.7, and 10.4 respectively, in 2013, while 11.3%, 10.6%, 8.2%, and 11.9% respectively in 2018.

As with AC, the husband's employment status, the gender of the newborn, and the gender of the household also played a very minimal role in the inequality in the case of SBA.

5.1.3.3 Marginal Contribution of Circumstance in Postnatal Care

In the case of PC, the region of residence played the most significant role in inequality in 2013 and 2018. Almost half of the inequality occurs due to this factor, as it contributed 47.9% in 2013, while its contribution increased by 8.8% during the five years of the survey and reached 56.7% in 2018.

After that, distance to health facility centres, exposure to mass media, a husband's education, and the number of children played an important role in inequality. But their role was only 11.5%, 6.8%, 8.4%, and 6% in 2013 and 9.5%, 6.9%, 4.6%, and 6.4% in 2018, respectively.

The husband's employment status, the gender of the household head, and the gender of the newborn played a very minimal role in postnatal care, as their role was also minimal in inequality in the case of AC and SBA.

5.2 CHILD HEALTH CARE SERVICES

This section will discuss the results related to child health care services (CHCS). Immunization, fever/cough treatment, and diarrhea treatment are the determinants of CHCS we used in our study. In our study, we analyzed two data sets of the Pakistan Demographic Health Survey (PDHS) from 2013 and 2018 to check the Inequality of Opportunity (IO) for children in Pakistan. In our study, we considered 13 circumstances that affect child health directly. Circumstances are factors that are beyond the control of anyone. So, as for children, all those factors that do not control any child are included in the circumstances. For this reason, the age limit is set from birth to 15 years. Parent's socio-economic background, such as their education, employment, wealth, geographical background, religion, etc., are included in circumstances until this age.

In our study, we consider region and place of residence, parents' education and employment status, gender of the child, decision maker in a family (gender of household head), number of children a family has, their wealth situation, distance of their parent's home from health facility centres, and whether they have exposure to mass media such as accessibility of newspaper, radio, or television, and most importantly, whether their mother is empowering to take decisions or not are all taken as circumstances. In our study, we took the data of less than five years of children and checked the IO for children from 2013 to 2018. We also checked the marginal role of each circumstance on child health. The results of the descriptive analysis, the Human Opportunity Index (HOI), the decomposition of HOI with the help of

scale effect and distribution effect, and the marginal contribution of each circumstance with the help of Shapley value are given below.

5.2.1 Descriptive Analysis

The descriptive analysis of CHCS (Immunization, fever/cough treatment, and diarrhea treatment) is presented in Tables 5.6, 5.7, and 5.8.

5.2.1.1 Descriptive Analysis of Child Immunization

We have used child immunization (CI) as one of the proxies of CHCS. If a child aged 12 to 60 months receives all 12 doses, namely, three doses of DPT, one dose of measles, one dose of BCG, four doses of polio, and three doses of HBV, we only consider those children fully immunized if they receive all of the above 12 doses. Otherwise, we consider the children not fully vaccinated in the case of missed immunization. A descriptive analysis of CI is given below in Table 5.6.

Table 5.6
Descriptive Analysis of Child Immunization

Sr. No.	Circumstances	2012-13			2017-18			
		Not Fully Immunized	Fully Immunized	Total	Not Fully Immunized	Fully Immunized	Total	
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
1	Region of Residence	Punjab	1635 (16.4%)	1005 (10.1%)	2640 (26.5%)	640 (9.6%)	774 (11.6%)	1414 (21.1%)
		Sindh	1716 (17.2%)	444 (4.5%)	2160 (21.7%)	729 (10.9%)	466 (7.0%)	1195 (17.8%)
		Khyber Pakhtunkhwa (KPK)	1448 (14.5%)	549 (5.5%)	1997 (20.0%)	652 (9.7%)	489 (7.3%)	1141 (17%)
		Baluchistan	1352 (13.6%)	217 (2.2%)	1569 (15.7%)	589 (8.8%)	139 (2.1%)	728 (10.9%)
		Gilgit Baltistan (GB)	835 (8.4%)	154 (1.5%)	989 (9.9%)	278 (4.2%)	200 (3.0%)	478 (7.1%)
		Islamabad Capital Territory (ICT)	376 (3.8%)	237 (2.4%)	613 (6.1%)	242 (3.6%)	210 (3.1%)	452 (6.7%)
		Azad Jammu Kashmir (AJK)	0	0	0	288 (4.3%)	400 (6.0%)	688 (10.3%)
		Federally Administered Tribal Areas (FATA)	0	0	0	482 (7.2%)	119 (1.8%)	601 (9.0%)
2	Place of Residence	Urban	2629 (26.4%)	553 (5.5%)	3182 (31.9%)	1593 (23.8%)	1385 (20.7%)	2978 (44.5%)
		Rural	4733 (47.5%)	2053 (20.6%)	6786 (68.1%)	2307 (34.4%)	1412 (21.1%)	3719 (55.5%)
3	Mother's Educational Status	Less than Secondary	5552 (55.7%)	1511 (15.2%)	7063 (70.9%)	2799 (41.8%)	1447 (21.6%)	4246 (63.4%)
		At least Secondary	1810 (18.2%)	1095 (11.0%)	2905 (29.1%)	1101 (16.4%)	1350 (20.2%)	2451 (36.6%)

Sr. No.	Circumstances		2012-13			2017-18		
			Not Fully Immunized	Fully Immunized	Total	Not Fully Immunized	Fully Immunized	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
4	Father's Educational Status	Less than Secondary	3680 (36.9%)	888 (8.9%)	4568 (45.8%)	1845 (27.5%)	889 (13.3%)	2734 (40.8%)
		At least Secondary	3682 (36.9%)	1718 (17.2%)	5400 (54.2%)	2055 (30.7%)	1908 (28.5%)	3963 (59.2%)
5	Mother's Employment Status	Unemployed	5914 (59.3%)	2208 (22.2%)	8122 (81.5%)	3541 (52.9%)	2472 (36.9%)	6013 (89.8%)
		Employed	1448 (14.5%)	398 (4.0%)	1846 (18.5%)	359 (5.4%)	325 (4.9%)	684 (10.2%)
6	Father's Employment Status	Unemployed	205 (2.1%)	50 (0.5%)	255 (2.6%)	181 (2.7%)	101 (1.5%)	282 (4.2%)
		Employed	7157 (71.8%)	2556 (25.6%)	9713 (97.4%)	3719 (55.5%)	2696 (40.3%)	6415 (95.8%)
7	Gender of Child	Male	3734 (37.5%)	1348 (13.5%)	5082 (51.0%)	1908 (28.5%)	1465 (21.9%)	3373 (50.4%)
		Female	3628 (36.4%)	1258 (12.6%)	4886 (49.0%)	1992 (29.7%)	1332 (19.9%)	3324 (49.6%)
8	Gender of Household Head	Male	6900 (69.2%)	2390 (24.0%)	9290 (93.2%)	3576 (53.4%)	2485 (37.1%)	6061 (90.5%)
		Female	462 (4.6%)	216 (2.2%)	678 (6.8%)	324 (4.8%)	312 (4.7%)	636 (9.5%)
9	Household Wealth Status	Poorest	3626 (36.4%)	653 (6.6%)	4279 (42.9%)	2060 (30.8%)	915 (13.7%)	2975 (44.4%)
		Richest	3736 (37.5%)	1953 (19.6%)	5689 (57.1%)	1840 (27.5%)	1882 (28.1%)	3722 (55.6%)

Sr. No.	Circumstances		2012-13			2017-18		
			Not Fully Immunized	Fully Immunized	Total	Not Fully Immunized	Fully Immunized	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
10	Number of Living Children	1	923 (9.3%)	368 (3.7%)	1291 (13.0%)	729 (10.9%)	516 (7.7%)	1245 (18.6%)
		2	1589 (15.9%)	687 (6.9%)	2276 (22.8%)	926 (13.8%)	818 (12.2%)	1744 (26.0%)
		3	1435 (14.4%)	535 (5.4%)	1970 (19.8%)	695 (10.4%)	582 (8.7%)	1277 (19.1%)
		4	1121 (11.2%)	421 (4.2%)	1542 (15.5%)	548 (8.2%)	401 (6.0%)	949 (14.2%)
		≥ 5	2294 (23%)	595 (5.9%)	2889 (28.9%)	1002 (14.9%)	480 (7.2%)	1482 (22.1%)
11	Distance To Health Facility Centres	No Problem	3684 (37.0%)	1833 (18.4%)	5517 (55.3%)	1681 (25.1%)	1606 (24.0%)	3287 (49.1%)
		Big Problem	3678 (36.9%)	773 (7.8%)	4451 (44.7%)	2219 (33.1%)	1191 (17.8%)	3410 (50.9%)
12	Exposure To Mass Media	No	2879 (28.9%)	653 (6.6%)	3532 (35.4%)	1664 (24.8%)	841 (12.6%)	2505 (37.4%)
		Yes	4483 (45.0%)	1953 (19.6%)	6436 (64.6%)	2236 (33.4%)	1956 (29.2%)	4192 (62.6%)
13	Mother Empowerment	Not Empower	4920 (49.4%)	1379 (13.8%)	6299 (63.2%)	2731 (40.8%)	1694 (25.3%)	4425 (66.1%)
		Empower	2442 (24.5%)	1227 (12.3%)	3669 (36.8%)	1169 (17.5%)	1103 (16.5%)	2272 (33.9%)
Total			7362 (73.9%) ^a	2606 (26.1%) ^b	9968 (100.0%)	3900 (58.2%) ^c	2797 (41.8%) ^d	6697 (100.0%)

^a Percentage of those children who were not fully vaccinated in 2013 = 73.9% (7362/9968).

^b Percentage of those fully vaccinated children in 2013 = 26.1% (2606/9968).

^c Percentage of those children who were not fully vaccinated in 2018 = 58.2% (3900/6697).

^d Percentage of those children who were fully vaccinated in 2018 = 41.8% (2797/6697).

(Autor's calculations)

Our first circumstantial factor is the region of residence. In PDHS-13, we have data for 6 regions (Punjab, Sindh, KPK, Baluchistan, GB, ICT), while in 2018, we have data for 8 regions (Punjab, Sindh, KPK, Baluchistan, GB, ICT, AJK, FATA). From Punjab: 10.1% in 2013, while in 2018, 11.6% of children were fully immunized. In Sindh, 4.5% of children in 2013 were fully immunized, while 7% were fully immunized in 2018. According to KPK, 5.5% in 2013, while in 2018, 7.3% of children were fully immunized. In Baluchistan, 2.2% was in 2013; in 2018, 2.1% of children were fully immunized. In GB, 1.5% of children were fully immunized in 2013, while in 2018, 3% of children were fully immunized. From ICT, 2.4% of children in 2013, while in 2018, 3.1% of children were fully immunized. In 2013, we didn't have data for AJK and FATA. In 2018, 6% of children were fully immunized in AJK, and 1.8% were fully immunized in FATA.

The place of residence is the following circumstantial variable; it is further categorized as a rural or urban area. In urban areas, 5.5% were in 2013, while in 2018, 20.7% of children were fully immunized. Education is an essential circumstance variable, especially the mother's education. We categorize education into less than secondary and at least secondary education. In 2013, 15.2% of children, while in 2018, 21.6% of children were fully immunized in the case of less than secondary-educated mothers. In the second case of at least educated mothers, 11% in 2013 and 20.2% of children in 2018 were fully immunized. The pattern was the same for the father's educational level as if the father was more educated. The child had more chances to get all immunization doses than less educated fathers in both surveys.

A parent's employment status is further categorized into two categories; unemployed or employed; of the unemployed mothers, then 22.2% in 2013, while 36.9% of children in 2018 were fully immunized. In the scenario of employed mothers, 4% in 2013 and 4.9% of children in 2018 were fully vaccinated. If a father is unemployed, then 0.5% in 2013 and 1.5% in 2018 were fully immunized. For the male child, 13.5% of children in 2013, while 21.9% of children in 2018 were fully immunized. In the case of females, 12.6% of children in 2013 and 19.9% of children in 2018 were fully immunized.

If the household head is male, then 24% of children in 2013 and 37.1% in 2018 were fully immunized. In the category of female household heads, 2.2% in 2013 and 4.7% of children in 2018 were fully immunized. Among children from the poorest families, 6.6% out of 42.9% in 2013 and 13.7% in 2018 were fully immunized. In the wealthiest family's case, 19.6% of children in 2013, while 28.1% of children in 2018, were fully immunized. In the case of the number of living children in a house, results showed that those families

with fewer children in a house were more likely to vaccinate their children than big families.

If the houses were located near health facility centres, 18.4% of children in 2013 and 24% in 2018 were fully immunized. If parents had exposure to mass media, then 19.6% of children in 2013, while 29.2% in 2018, were fully immunized. Women's empowerment means women have decision-power. If a woman is empowered, 12.3% of children in 2013 were fully immunized, while 16.5% in 2018 were fully immunized.

Overall, less than one-third of children (26.1%) in 2013 and almost half (41.8%) in 2018 were fully immunized.

5.2.1.2 Descriptive Analysis of Fever/Cough Treatment

Fever and cough are common illnesses among children in developing countries, and medical treatment received during these conditions is considered a measure of child health care. In our research, we checked the role of various circumstances that affect the children getting treatment if they suffer from fever or cough. A descriptive analysis of fever or cough treatment is presented in Table 5.7.

Table 5.7
Descriptive analysis of Fever/Cough Treatment

Sr. No.	Circumstances	2012-13			2017-18			
		NO	YES	Total	NO	YES	Total	
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
1	Region of residence	Punjab	258 (5.8%)	1041 (23.3%)	1299 (29.1%)	252 (5.5%)	790 (17.2%)	1042 (22.6%)
		Sindh	247 (5.5%)	757 (17.0%)	1004 (22.5%)	152 (3.3%)	575 (12.5%)	727 (15.8%)
		Khyber Pakhtunkhwa (KPK)	350 (7.8%)	664 (14.9%)	1014 (22.7%)	224 (4.9%)	563 (12.2%)	787 (17.1%)
		Baluchistan	181 (4.1%)	275 (6.2%)	456 (10.2%)	263 (5.7%)	259 (5.6%)	522 (11.3%)
		Gilgit Baltistan (GB)	87 (1.9%)	283 (6.3%)	370 (8.3%)	106 (2.3%)	229 (5.0%)	335 (7.3%)
		Islamabad Capital Territory (ICT)	77 (1.7%)	245 (5.5%)	322 (7.2%)	87 (1.9%)	220 (4.8%)	307 (6.7%)
		Azad Jammu Kashmir (AJK)	-	-	-	146 (3.2%)	418 (9.1%)	564 (12.3%)
		Federally Administered Tribal Areas (FATA)	-	-	-	125 (2.7%)	194 (4.2%)	319 (6.9%)
2	Place of Residence	Urban	469 (10.5%)	1428 (32.0%)	1897 (42.5%)	507 (11.0%)	1583 (34.4%)	2090 (45.4%)
		Rural	731 (16.4%)	1837 (41.1%)	2568 (57.5%)	848 (18.4%)	1665 (36.2%)	2513 (54.6%)
3	Mother's Education	Less than Secondary	855 (19.1%)	2198 (49.2%)	3053 (68.4%)	948 (20.6%)	1931 (42.0%)	2879 (62.5%)
		At least Secondary	345 (7.7%)	1067 (23.9%)	1412 (31.6%)	407 (8.8%)	1317 (28.6%)	1724 (37.5%)
4	Father's Education	Less than Secondary	591 (13.2%)	1401 (31.4%)	1992 (44.6%)	615 (13.4%)	1238 (26.9%)	1853 (40.3%)
		At least Secondary	609 (13.6%)	1864 (41.7%)	2473 (55.4%)	740 (16.1%)	2010 (43.7%)	2750 (59.7%)

Sr. No.	Circumstances		2012-13			2017-18		
			NO	YES	Total	NO	YES	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
5	Mother employment status	Unemployed	940 (21.1%)	2650 (59.4%)	3590 (80.4%)	1191 (25.9%)	2810 (61.0%)	4001 (86.9%)
		Employed	260 (5.8%)	615 (13.8%)	875 (19.6%)	164 (3.6%)	438 (9.5%)	602 (13.1%)
6	Father Employment status	Unemployed	38 (0.9%)	77 (1.7%)	115 (2.6%)	65 (1.4%)	96 (2.1%)	161 (3.5%)
		Employed	1162 (26.0%)	3188 (71.4%)	4350 (97.4%)	1290 (28.0%)	3152 (68.5%)	4442 (96.5%)
7	Gender of child	Male	618 (13.8%)	1744 (39.1%)	2362 (52.9%)	663 (14.4%)	1726 (37.5%)	2389 (51.9%)
		Female	582 (13.0%)	1521 (34.1%)	2103 (47.1%)	692 (15.0%)	1522 (33.1%)	2214 (48.1%)
8	Gender of household head	Male	1099 (24.6%)	3029 (67.8%)	4128 (92.5%)	1221 (26.5%)	2910 (63.2%)	4131 (89.7%)
		Female	101 (2.3%)	236 (5.3%)	337 (7.5%)	134 (2.9%)	338 (7.3%)	472 (10.3%)
9	Household Wealth Status	Poor	567 (12.7%)	1265 (28.3%)	1832 (41.0%)	766 (16.6%)	1281 (27.8%)	2047 (44.5%)
		Non-Poor	633 (14.2%)	2000 (44.8%)	2633 (59.0%)	589 (12.8%)	1967 (42.7%)	2556 (55.5%)
10	Number of Living children	1	154 (3.4%)	535 (12.0%)	689 (15.4%)	178 (3.9%)	546 (11.9%)	724 (15.7%)
		2	273 (6.1%)	786 (17.6%)	1059 (23.7%)	293 (6.4%)	850 (18.5%)	1143 (24.8%)
		3	233 (5.2%)	623 (14.0%)	856 (19.2%)	279 (6.1%)	615 (13.4%)	894 (19.4%)
		4	150 (3.4%)	522 (11.7%)	672 (15.1%)	217 (4.7%)	519 (11.3%)	736 (16.0%)
		5 +	390 (8.7%)	799 (17.9%)	1189 (26.6)	388 (8.4%)	718 (15.6%)	1106 (24.0%)

Sr. No.	Circumstances		2012-13			2017-18		
			NO	YES	Total	NO	YES	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
11	Distance to Health Facility Centre	Long Distance	592 (13.3%)	1953 (43.7%)	2545 (57.0%)	514 (11.2%)	1687 (36.7%)	2201 (47.8%)
		Long Distance	608 (13.6%)	1312 (29.4%)	1920 (43.0%)	841 (18.3%)	1561 (33.9%)	2402 (52.2%)
12	Exposure to Mass Media	No	475 (10.6%)	1121 (25.1%)	1596 (35.7%)	585 (12.7%)	1114 (24.2%)	1699 (36.9%)
		Yes	725 (16.2%)	2144 (48.0%)	2869 (64.3%)	770 (16.7%)	2134 (46.4%)	2904 (63.1%)
13	Mother Empowerment	Not Empower	785 (17.6%)	2006 (44.9%)	2791 (62.5%)	949 (20.6%)	2071 (45.0%)	3020 (65.6%)
		Empower	415 (9.3%)	1259 (28.2%)	1674 (37.5%)	406 (8.8%)	1177 (25.6%)	1583 (34.4%)
Total			1200 (26.9%)^a	3265 (73.1%)^b	4465 (100.0%)	1355 (29.4%)^c	3248 (70.6%)^d	4603 (100.0%)

^a Percentage of those children who had no fever/cough treatment in 2013 = 26.9% (1200/4465).

^b Percentage of those children who had fever/cough treatment in 2018 = 29.4% (1355/4603).

^a Percentage of those children who had no fever/cough treatment in 2013 = 73.1% (3265/4465).

^b Percentage of those children who had fever/cough treatment in 2018 = 70.6% (3248/4603).

(Autor's calculations)

Table 5.7 shows the descriptive analysis of fever/cough treatment of children in 2013 and 2018. Our first household characteristic is the region of residence. The analysis shows that in Punjab, 23.3% in 2013, while in 2018, 17.2% of children had fever/cough treatment. In Sindh, 17% in 2013, while in 2018, 12.5% of children had fever/cough treatment. In KPK, 14.9% of children in 2013, while in 2018, 12.2% had fever/cough treatment. In Baluchistan, 6.2% in 2013, while in 2018, 5.6% had fever/cough treatment. In GB, 6.3% of children in 2013, while in 2018, 5% had fever/cough treatment. In ICT, 5.5% was in 2013, while in 2018, 4.8% of children had fever/cough treatment. In 2018, 9.1% of children in AJK and 4.2% from FATA had fever/cough treatment in FATA. Place of residence is the following circumstance variable; it is further categorized as a rural or urban area. In urban areas, 32% out of 42.5% in 2013; in 2018, 34.4% out of 45.4% of children had fever/cough treatment. In rural areas, 41.1% out of 57.5% of children in 2013, while 36.2% out of 54.6% of children in 2018 had fever/cough treatment.

Parent education is categorized into less than secondary and at least secondary education. 49.2% out of 68.4% in 2013; in 2018, 42% out of 62.5% of children had fever/cough treatment. in the category of less than secondary educated mothers, while if mothers have at least secondary education, 23.9% in 2013 and 28.6% of children had fever/cough treatment. Employment status is further categorized into two categories; unemployed or employed. If mothers are unemployed, 59.4% in 2013 while 61% of children in 2018 had fever/cough treatment. In the scenario of employed mothers then, 13.8% out of 19.6% in 2013, while 9.5% out of 13.1% of children in 2018 had fever/cough treatment. If the father is unemployed, then 1.7% of children in 2013 while 2.1% of children in 2018 had fever/cough treatment. In the case of employed fathers, 71.4% out of 97.4% of children in 2013, while in 2018, 58.5% out of 96.5% of children had fever/cough treatment.

The gender of the child may be male or female. If children are male, 39.1% out of 52.9% of children in 2013, while 37.5% out of 51.9% of children in 2018 had fever/cough treatment. In the case of females, 34.1% out of 47.1% of children in 2013, while 33.1% out of 48.1% had fever/cough treatment. If the household head is male, then 67.8% of children in 2013 and 63.2% in 2018 had fever/cough treatment. If females are household heads, then 5.3% in 2013 while 7.3% of children in 2018 had fever/cough treatment. Wealth status is categorized into two categories poorest and richest. Among children belonging to poor families, 28.3% of children in 2013 while 27.8% in 2018 had fever/cough treatment. In a non-poor family case, 44.8% in 2013 while 42.7% of children in 2018 had fever/cough treatment. For the number of children, children belonging to a smaller number of family members were more likely to have fever/caught treatment compared to large families. If the health facility

near home, 43.7% out of 57% of children in 2013 while 36.7% out of 47.8% of children in 2018 had fever/cough treatment. If it's not near home, then 29.4% out of 43% of children in 2013, while 33.9% out of 52.2% of children in 2018 had fever/cough treatment.

If parents have exposure to mass media, then 48% of children in 2013 while 46.4% in 2018 had fever/cough treatment. If they don't have exposure to mass media, then 25.1% in 2013 while 24.2% of children in 2018 had fever/cough treatment. Women empowered means women to have decision power or not. If a woman is empowered, then 28.2% out of 37.5% of children in 2013, while 25.6% out of 34.4% had fever/cough treatment. If a woman is not empowered, 44.9% out of 62.5% of children in 2013, while 45% out of 65.6% of children in 2018 had fever/cough treatment.

Overall, two to three children in 2013 (73.1%) and 2018 (70.6%) had fever/cough treatment.

5.2.1.3 Descriptive Analysis of Diarrhea Treatment

Diarrhea remains a prominent source of morbidity and mortality among children in underdeveloped countries. Despite decades of intensive efforts and special initiatives, it remains a significant cause of mortality and morbidity among Pakistani children. In our research, we checked how various types of circumstances affect the treatment of diarrhea. A descriptive analysis of diarrhea treatment is given below:

Table 5.8
Descriptive Analysis of Diarrhea Treatment

Sr. No.	Circumstances	2012-13			2017-18			
		NO	YES	Total	NO	YES	Total	
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
1	Region of residence	Punjab	116 (5.3%)	492 (22.6%)	608 (27.9%)	165 (8.2%)	306 (15.3%)	471 (23.5%)
		Sindh	131 (6.0%)	370 (17.0%)	501 (23.0%)	82 (4.1%)	196 (9.8%)	278 (13.9%)
		Khyber Pakhtunkhwa (KPK)	235 (10.8%)	313 (14.4%)	548 (25.1%)	162 (8.1%)	230 (11.5%)	392 (19.5%)
		Baluchistan	78 (3.6%)	126 (5.8%)	204 (9.4%)	114 (5.7%)	130 (6.5%)	244 (12.2%)
		Gilgit Baltistan (GB)	49 (2.2%)	130 (6.0%)	179 (8.2%)	38 (1.9%)	74 (3.7%)	112 (5.6%)
		Islamabad Capital Territory (ICT)	29 (1.3%)	112 (5.1%)	141 (6.5%)	50 (2.5%)	90 (4.5%)	140 (7.0%)
		Azad Jammu Kashmir (AJK)	0	0	0	64 (3.2%)	109 (5.4%)	173 (8.6%)
		Federally Administered Tribal Areas (FATA)	0	0	0	101 (5.0%)	95 (4.7%)	196 (9.8%)
2	Place of Residence	Urban	386 (17.7%)	846 (38.8%)	1232 (56.5%)	310 (15.5%)	573 (28.6%)	883 (44.0%)
		Rural	252 (11.6%)	697 (32.0%)	949 (43.5%)	466 (23.2%)	657 (32.8%)	1123 (56.0%)
3	Mother's Educational Status	Less than Secondary	468 (21.5%)	1097 (50.3%)	1565 (71.8%)	542 (27.0%)	765 (38.1%)	1307 (65.2%)
		At least Secondary	170 (7.8%)	446 (20.4%)	616 (28.2%)	234 (11.7%)	465 (23.2%)	699 (34.8%)
4	Father's Educational Status	Less than Secondary	336 (15.4%)	702 (32.2%)	1038 (47.6%)	340 (16.9%)	527 (26.3%)	867 (43.2%)
		At least Secondary	302 (13.8%)	841 (38.6%)	1143 (52.4%)	436 (21.7%)	703 (35.0%)	1139 (56.8%)

Sr. No.	Circumstances		2012-13			2017-18		
			NO	YES	Total	NO	YES	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
5	Mother employment status	Unemployed	515 (23.6%)	1202 (55.1%)	1717 (78.7%)	709 (35.3%)	1094 (54.5%)	1803 (89.9%)
		Employed	123 (5.6%)	341 (15.6%)	464 (21.3%)	67 (3.3%)	136 (6.8%)	203 (10.1%)
6	Father Employment status	Unemployed	24 (1.1%)	34 (1.6%)	58 (2.7%)	41 (2.0%)	40 (2.0%)	81 (4.0%)
		Employed	614 (28.2%)	1509 (69.2%)	2123 (97.3%)	735 (36.6%)	1190 (59.3%)	1925 (96.0%)
7	Gender of child	Male	319 (14.6%)	839 (38.5%)	1158 (53.1%)	380 (18.9%)	677 (33.7%)	1057 (52.7%)
		Female	319 (14.6%)	704 (32.3%)	1023 (46.9%)	396 (19.7%)	553 (27.6%)	949 (47.3%)
8	Gender of household head	Male	582 (26.7%)	1426 (65.4%)	2008 (92.1%)	694 (34.6%)	1112 (55.4%)	1806 (90.0%)
		Female	56 (2.6%)	117 (5.4%)	173 (7.9%)	82 (4.1%)	118 (5.9%)	200 (10.0%)
9	Household's Wealth Status	Poorest	313 14.4%	677 31.0%	990 45.4%	413 (20.6%)	505 (25.2%)	918 (45.8%)
		Non-poor	325 (14.9%)	866 (39.7%)	1191 (54.6%)	363 (18.1%)	725 (36.1%)	1088 (54.2%)
10	Number of living children	1	93 (4.3%)	267 (12.2%)	360 (16.5%)	112 (5.6%)	238 (11.9%)	350 (17.4%)
		2	141 (6.5%)	363 (16.6%)	504 (23.1%)	177 (8.8%)	327 (16.3%)	504 (25.1%)
		3	113 (5.2%)	297 (13.6%)	410 (18.8%)	163 (8.1%)	231 (11.5%)	394 (19.6%)
		4	85 (3.9%)	247 (11.3%)	332 (15.2%)	121 (6.0%)	180 (9.0%)	301 (15.0%)
		≥ 5	206 (9.5%)	369 (16.9)	575 (26.4%)	203 (10.1%)	254 (12.7%)	457 (22.8%)

Sr. No.	Circumstances		2012-13			2017-18		
			NO	YES	Total	NO	YES	Total
			Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
11	Distance to Health Facility Centres	Not long distance	264 (12.1%)	860 (39.4%)	1124 (51.5%)	315 (15.7%)	633 (31.6%)	948 (47.3%)
		Long distance	374 (17.1%)	683 (31.3%)	1057 (48.5%)	461 (23.0%)	597 (29.8%)	1058 (52.7%)
12	Exposure to Mass Media	No	313 (14.4%)	677 (31.0%)	990 (45.4%)	335 (16.7%)	442 (22.0%)	777 (38.7%)
		Yes	325 (14.9%)	866 (39.7%)	1191 (54.6%)	441 (22.0%)	788 (39.3%)	1229 (61.3%)
13	Mother Empowerment	Not Empower	447 (20.5%)	963 (44.2%)	1410 (64.6%)	561 (28.0%)	815 (40.6%)	1376 (68.6%)
		Empower	191 (8.8%)	580 (26.6%)	771 (35.4%)	215 (10.7%)	415 (20.7%)	630 (31.4%)
Total			638 (29.3%) ^a	1543 (70.7%) ^b	2181 (100.0%)	776 (38.7%) ^c	1230 (61.3%)	2006 (100.0%) ^d

^a Percentage of children who didn't receive diarrhea treatment in 2013 = 29.3% (638/2181).

^b Percentage of children who received diarrhoea treatment in 2013 = 70.7% (1543/2181).

^c Percentage of children who received diarrhea treatment in 2018 = 61.3% (1230/2006).

^d Percentage of children who didn't receive diarrhea treatment in 2018 = 38.7% (776/2006).

(Autor's calculations)

Table 5.8 shows data on the treatment of recent episodes of diarrhea among children under age 5, as reported by their mothers. In Pakistan, 70.7 percent of children in 2013 and 61.3 percent of children with diarrhea were taken to a medically trained health provider for treatment. A detailed description is given below.

According to PDHS-13, we have data from 6 regions (Punjab, Sindh, KPK, Baluchistan, GB, ICT), while in 2018, we have data from 8 provinces (Punjab, Sindh, KPK, Baluchistan, GB, ICT, AJK, FATA). In Punjab, 22.6% in 2013, while in 2018, 15.3% of children had diarrhea treatment. In Sindh, 17% in 2013, while in 2018, 9.8% of children had diarrhea treatment. In KPK, 14.4% of children in 2013, while in 2018, 11.5% had diarrhea treatment. In Baluchistan, 5.8% in 2013, while in 2018, 6.5% of children had diarrhea treatment. In GB, 6% in 2013, while in 2018, 3.7% of children had diarrhea treatment. In ICT, 5.1% had diarrhea treatment in 2013, while in 2018, 4.5% of children had diarrhea treatment. In 2018, 5.4% of children in AJK and 4.7% from FATA had diarrhea treatment. Place of residence is the following circumstance variable; it is further categorized as a rural or urban area. In urban areas, 38.8% out of 56.5% in 2013, while in 2018, 28.6% out of 44% of children had diarrhea treatment. In rural areas, 32% out of 43.5% of children in 2013, while 32.8% out of 56% of children in 2018 had diarrhea treatment.

Categories of parents' education are; less than secondary and at least secondary education. 50.3% in 2013, while in 2018, 38.1% of children had diarrhea treatment. 32.2% in 2013, while 26.3% of children in 2108 had diarrhea treatment if their fathers had less than secondary education. Employment status is further categorized into two categories; unemployed or employed. If mothers are unemployed, 55.1% in 2013 while 54.5% in 2018 had diarrhea treatment. In the scenario of employed mothers, 15.6% in 2013 while 6.8% of children in 2018 had diarrhea treatment. If the father is unemployed, then 1.6% of children in 2013 while 2% of children in 2018 had diarrhea treatment. In the case of employed fathers, 69.2% of children in 2013, while in 2018, 59.3% had diarrhea treatment of the male child, 38.5% in 2013, while 33.7% of children in 2018 had diarrhea treatment. In the case of females, 32.3% in 2013, while 59.3% of children had diarrhea treatment. If the household head is male, 65.4% of children in 2013 while 55.4% in 2018 had diarrhea treatment. If females are household heads, then 5.4% in 2013 while 5.9% of children in 2018 had diarrhea treatment. Wealth status is categorized into two categories poor and non-poor. Among children from poor families, 31% in 2013, while 25.2% of children in 2018 had diarrhea treatment. In the richest family's case, 39.7% in 2013, while 36.1% of children in 2018 had diarrhea treatment. Descriptive analysis showed that children belonging to a large number of members in a family had less prevalence of getting diarrhea

treatment compared to a large number of families. Distance to the nearest health facility may be long or not too long. If the health facility is near home, 39.4% in 2013, while 31.6% of children in 2018 had diarrhea treatment.

If parents have exposure to mass media, then 39.7% of children in 2013 while 39.3% of children in 2018 had diarrhea treatment. If they don't have exposure to mass media, then 31% of children in 2013 while 22% of children in 2018 had diarrhea treatment. Women empowered means women have decision power or not. If a woman is empowered, 26.6% out of 35.4% of children in 2013, while 20.7% out of 31.4% had diarrhea treatment. If a woman is not empowered, 44.2% out of 64.6% of children in 2013, while 40.6% out of 68.6% of children in 2018 had diarrhea treatment.

Overall, the percentage of children getting diarrhea treatment dropped in 2018 (61.3%) compared to 2013 (70.7%).

5.2.2 Human Opportunity Index

Table 5.9
Distribution of the Coverage, Dissimilarity Index, and HOI of CHCS

Health Care Access Indicators	Average Coverage Rate or Prevalence%		Inequality of Opportunity D%		(1-D) %		Human Opportunity Index %	
	2012-13	2017-18	2012-13	2017-18	2012-13	2017-18	2012-13	2017-18
Immunization	26.1%	41.8%	20.7%	13.9%	79.4%	86.1%	20.8%	36.0%
Diarrhea Treatment	70.8%	61.3%	5.0%	6.2%	95.0%	93.8%	67.2%	57.5%
Fever/Cough Treatment	73.1%	70.6%	3.6%	5.5%	96.4%	94.5%	70.5%	66.7%

Autor's calculations

Apart from the prevalence of full immunization, diarrhea treatment and fever/cough treatment, examining the inequality of opportunity and human opportunity indices for all child healthcare services is essential. The data on the inequality of opportunity and human opportunity indices are presented in Table 5.9. According to the results, the prevalence of child health care services only increases in immunization while it decreases access to treatment for diarrhea or fever/cough. For immunization, we considered those children who had all 12 vaccinations (Three doses of DPT, one dose of measles, one dose of BCG, four doses of polio and three doses of HBV). Prevalence for immunization increased in 2018 from 26.1% (2013) to 41.8% (2018) overall increase in the prevalence of immunization was 15.7% in points during the

five years of the survey. The prevalence of getting treatment for diarrhea and fever/cough decreased in these five years of the survey. The prevalence of getting therapy for diarrhea decreased from 70.8% (2013) to 61.3% (2018). Overall it fell by 9.4% in points in these five years. The prevalence of getting treatment for fever/cough has reduced from 73.1% (2013) to 70.6% (2018). Overall it fell by 2.6% in points during these years.

The decrease in coverage for treatment of diarrhea and fever/cough has increased the inequality of opportunity for these health care services among children. A 9.4% decrease in coverage rate to access treatment for diarrheas get resulted in to increase in IO (D-Index), as it was 5% in 2013 and grew from 5% to 6.2% in 2018 overall increase of 1.2% IO (D-Index) due to a decrease in coverage rate (C). IO (D-Index) also increased access to treatment for fever/cough; it increased by 1.9% during the five years of the survey, from 3.6% in 2013 to 5.5% in 2018. IO (D-Index) decreased in the case of immunization due to an increase in the coverage rate of 15.7%. A decrease in IO is a good sign. IO in access to full immunization decreased by 6.8% during the five years of the survey, decreasing from 20.7% in 2013 to 13.9% in 2018.

Coverage rate and IO (D-Index) have a combined effect on Human Opportunity Index (HOI). As the Human Opportunity Index (HOI) measures the average availability of essential services, discounted by how inequitably these services are distributed among the population. So, the average availability of child health care services only increased in one health care service, i.e., immunization. HOI increased in immunization because of the combined effect of coverage rate and IO (D-Index). An increase in coverage rate and decrease in IO (D-Index) are good signs, as coverage/prevalence rate increased by 15.7% and IO (D-Index) decreased by 6.8% in the case of immunization, results to rise in HOI by 15.2% in points during five years of the survey as it was 20.8% in 2013 to 36% in 2018. HOI decreased in case of diarrhea treatment and fever/cough treatment due to a decrease in coverage/prevalence rate and as a result of this increase in IO (D-Index). The prevalence rate of access to treatment for diarrhea decreased by 9.4%, and it's IO (D-Index) increased by 1.2%. Hence, this HOI decreased from 67.2% (2013) to 57.5% (2018), which means 9.7% of children had no availability for treatment for diarrhea. This availability also decreased in the case of fever/cough treatment as it decreased by 3.8% during the five years of the survey from 70.5% in 2013 to 66.7% in 2013 due to a coverage/prevalence rate of 2.6% and IO (D-Index) 1.9%.

The highest HOI was found in the case of immunization, and the lowest was in the case of diarrhea and fever/cough treatment. The low HOI indicates less access to these services by children. A graphical presentation of HOI for 2013 and 2018 is given below.

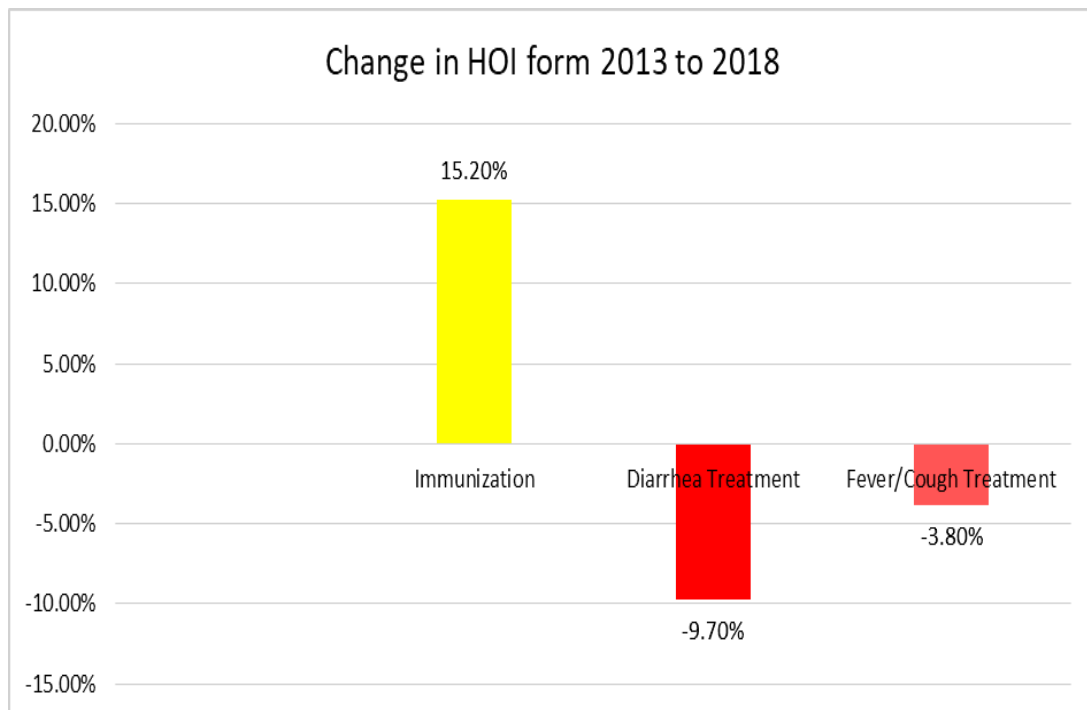


Figure 5.3: Graphical Presentation of the Human Opportunity Index of CHCS

Figure 5.3 shows the change in access to healthcare opportunities from 2013 to 2018. Results show that people's access to healthcare services for children increases only for case immunization while it decreases in other health treatments (diarrhea, fever/cough). People's access to immunized children increased by 15.2%, while for the case of diarrhea treatment and fever/cough treatment, it decreased by 9.7% and 3.8%, respectively, during the five years of the survey.

5.3 DECOMPOSITION OF THE HOI IN SCALE AND DISTRIBUTION EFFECT OF CHCS

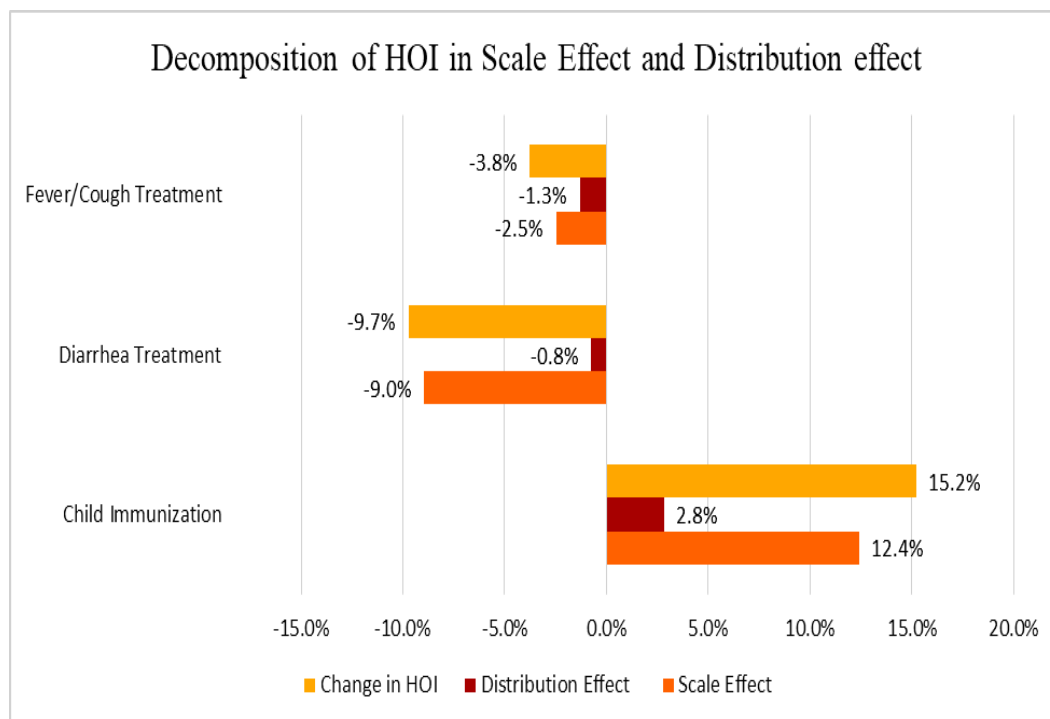


Figure 5.4: Decomposition of the HOI in scale and distribution effect of CHCS

Figure 5.4 shows the variations in the access rate, which estimates the number of opportunities existing in a society that is allocated based on the principle of equal opportunity for each opportunity indicator and the scale and distribution effects. Access to diarrhea and fever or cough treatment given by qualified staff declined between 2013 and 2018. The reduced access rate to diarrhea and fever/cough treatment is explained by the combined effect of a decrease in the average coverage rate and inequality of opportunities. In the case of diarrhea treatment, the scale effect explains 9% of the decline in the access rate, and the distribution effect explains a 0.8% decrease in opportunities, and both have a combined impact on HOI as a 9.7% decrease in access rate among these children. Similarly, getting treatment for fever/cough, the scale effect decreased by 2.5%, while the distribution effect decreased by 1.3%, and the combined effect of reducing HOI decreased by 3.8%. For immunization, the increase in access rates (HOI) is explained by an increase in the average coverage rate and a decrease in opportunity inequality. For immunization, the scale effect explains a 12.4% increase in access. In comparison, the distribution effect explains a 2.8% increase in opportunities which has a combined impact on HOI as it increased by 15.2% during the five years of the survey.

5.3.1 Shapley Decomposition

Table 5.10
Shapley Value Decomposition of D-Index-Percentage
Contributions of Circumstances in Inequality in CHCS

Circumstances	Immunization		Diarrhea Treatment		Fever/Cough Treatment	
	2012-13	2017-18	2012-13	2017-18	2012-13	2017-18
Region of Residence	22.3%	27.5%	47.2%	19.9%	43.7%	26.1%
Place of Residence	3.9%	3.9%	0.9%	5.3%	3.1%	9.9%
Mother's Educational Status	9.5%	15.2%	1.2%	6.1%	2.6%	7.0%
Father's Educational Status	8.3%	10.4%	6.6%	1.7%	5.6%	4.0%
Mother Employment Status	1.8%	1.2%	2.0%	2.6%	2.9%	0.9%
Father Employment Status	0.3%	0.4%	1.3%	2.5%	0.8%	1.7%
Household Wealth Status	19.7%	15.4%	3.0%	18.1%	8.7%	21.4%
Gender of the Household Head	0.8%	1.4%	0.8%	1.0%	1.1%	0.2%
Number of Children	4.0%	3.7%	6.3%	10.4%	9.3%	4.2%
Gender of Child	0.3%	1.6%	3.1%	7.9%	1.3%	2.9%
Exposure to Mass Media	7.0%	6.6%	1.1%	5.6%	3.6%	5.5%
Distance to the Health Facility Center	14.0%	8.2%	19.4%	13.3%	14.1%	12.7%
Women Empowerment	8.2%	4.5%	7.2%	5.6%	3.2%	3.5%

Autor's calculations

The Shapley Value decomposition for child healthcare utilization outcomes is explained in Table 5.10. Results reveal that region of residence is the most important determinant of access to healthcare services, as measured by the variation in whether a child receives a complete set of immunizations, diarrhea, and fever/cough treatment. Wealth status is another major factor in determining access to and utilization of child healthcare services.

5.3.1.1 Marginal Contribution of Circumstance in Child Immunization

The first and most important circumstance variable contributing to inequality is the region of residence in 2013 and 2018. Its contribution in 2013 was 22.3%, while in 2018, its contribution increased by 5.2% during the five years of the survey. The second most important circumstance variable is household wealth status. In 2013 its contribution was 19.7%, while in 2018, its contribution decreased by 4.4% and was estimated at 15.4%. In 2013, the third circumstance variable was the distance to the nearest health facility, while in 2018, women's education was the third most important variable. In 2013 the role of distance to the nearest health facility decreased by 5.7%, as it was 14.8% in 2013 and 8.2% in 2018. Women's education is also the most important variable contributing to inequality. Its role increased by 5.7% during the 5 years of the survey as it was 9.5% in 2013, while in 2018, its contribution was 15.2%. Place of residence has the same contribution in 2013 and 2018, as it was 3.9% in both years. The role of father education also increases from 8.3% (2013) to 10.4% (2018). Mother employment status role decrease by 0.5% (1.8% in 2013 while 1.2% in 2018) while father employment status increase in inequality only by 0.1% as it increases 0.3% (2013) to 0.4% (2018). The role of the gender of the household head and gender of the child increased during the five years of the survey as it is 0.8% and 0.3% in 2013 and 1.4% and 1.6% in 2018, similarly. Role of number of children, exposure to mass media and women empowerment decreased by 0.3% (0.4% (2013) to 3.7% (2018)), 0.5% (0.7% (2013) to 6.6% (2018)) and 3.7% (8.2% (2013) to 4.5% (2018)) during five years of survey.

5.3.1.2 Marginal Contribution of Circumstance in Diarrhea Treatment

Region of residence is a significant variable for diarrhea treatment during the five years of the survey. In 2013 it contributed 47.2%, while in 2018, it contributed 19.9% in inequality. The contribution of the region of residence decreased by 27.4% during the five years of the survey. The second most important variable contributing to inequality is the distance to the health facility in 2013 while household wealth status in 2018. The contribution of distance to the nearest health facility was 19.4% in 2013 and 13.3% in 2018. Its contribution decreased by 6.1% from 2013 to 2018. Household wealth status contributed 3% in 2013, while its contribution increased by 15.1% during the five years of the survey and an estimated 18.1% in 2018. Women empowerment was the third most significant variable in 2013. It contributed 7.2% in 2013 and 5.6% in 2018, and its contribution decreased by 1.6% during the five years of the survey. Those circumstance variables contributing to inequality increased during the five years of the survey are the place of residence, mother's education, father and mother's employment status, gender of household head, number of children, gender of child and exposure to mass

media. The contribution of the place of residence increased from 0.9% to 5.3%, the contribution of the mother's education increased from 1.2% to 6.1%, and the mother, employment status contribution, increased from 2% to 2.6%. Father employment status contribution increased from 1.3% to 2.5%, gender of household head contribution increased from 0.8% to 1%, the number of children increased from 6.3% to 10.4%, gender of child contribution also increased from 3.1% to 7.9%. The role of exposure to mass media increased from 1.1% to 5.6% from 2013 to 2018. In points their contribution increase inequality 4.4%, 5%, 0.7%, 1.2%, 0.2%, 4.1%, 4.8% and 4.5% respectively. The contribution of father education decreased by 4.9% during the five years of the survey, as it was 6.6% in 2013 and 1.7% in 2018.

5.3.1.3 Marginal Contribution of Circumstance in Fever/Cough Treatment

The most significant variable that contributes to inequality is the region of residence. It contributed 43.7% in 2013 and 26.1% in 2018, and the contribution of the region of residence decreased during five years of the survey 17.6%. The second most important circumstance variable is the distance to the nearest health facility in 2013 while household wealth status in 2018. The contribution of distance to health facility centers decreased by 1.4% during the five years of the survey, as it was 14.1% in 2013 and 12.7% in 2018. Household wealth status is the second most important circumstance variable in 2018 that's contribution increases in inequality by 12.7% during five years of the survey as its contribution increased from 8.7% (2013) to 21.4% (2018). The number of children was the next most significant circumstance variable in 2013. Its contribution decreased 5.1% from 9.3% to 4.2% from 2013 to 2018. Those circumstances variables that contributed to the increase in inequality are the place of residence, mother's education, father's employment status, gender of the child, exposure to mass media and women empowerment. The contribution of the place of residence increased from 6.8%, that is, 3.1% (2013), to 9.9% (2018). Mother education role increased inequality 4.4% that is 2.6% (2013) to 7% (2018). Father employment status increased by 0.9%, that is, 0.8% to 1.7%, from 2013 to 2018. The contribution of the gender of the child also increased from 1.6%, that is, 1.3% (2013) to 2.9% (2018). The contribution of exposure to mass media was 3.6% in 2013 and 5.5% in 2018, and the total increase in inequality due to mass media was 1.9%. The role of women empowerment also increased from 3.2% to 3.5% from 2013 to 2018, which is 0.3% during the five years of the survey. Those circumstances variables that contributed to the decrease in inequality during the five years of the survey are the father's education, the mother's employment status and the gender of the household head. The contribution of father education decreased by 1.6% during the five-year survey, from 5.5% (2013) to 4% (2018). Mother's employment status decreased by 2% from 2.9% to 0.9%

from 2013 to 2018. The contribution of the gender of household heads decreased by 0.8% from 1.1% to 0.2% from 2013 to 2018.

5.4 DISCUSSION ON RESULTS OF MATERNAL AND CHILD HEALTHCARE SERVICES IN PAKISTAN

The study's main idea is that healthcare services for mothers and children should be provided based on the egalitarian principle. It means that access to and utilization of these services shouldn't depend on a person's family or community background, which is out of their control. It's possible to achieve this goal by acknowledging the inherent biases in distributing these services to mothers and children. The study also lists possible reasons for these differences, such as the place and region of residence, parent's educational and employment level, household wealth status, gender of children and household head, distance to health facility centers, exposure to mass media and women empowerment. The research provides literature on the risks these younger mothers and children face due to disparities.

Despite public awareness of the potential consequences of these risks, the Human Opportunity Index (HOI) results indicate that slightly more than half of women and children do not have equal access to and utilization of health chances. It suggests that women and children do not have equal access to and use of these services because of predetermining circumstances which are not in their control. Therefore, the government must alleviate these health disparities, influencing the nation's microeconomic and macroeconomic sectors.

5.4.1 Key Findings of the Study

The findings demonstrate a drop in inequality of opportunity for all chosen maternal health services (ANC, SBA, PC), but for child health care services, it only decreases in the case of immunization, while for diarrhea and fever/cough treatment, inequality increases between 2013 and 2018. In general, the utilization of MHCS has increased over time, as seen by the greater coverage rates in 2018 compared to 2013. For the use of CHCS, coverage of immunization only increased while it decreased for the case of diarrhea and fever/cough treatment from 2018 to 2013. Variations in the coverage rate also caused a change in the D-index and the HOI. Using the HOI, the data revealed that fever/cough treatment in CHS is widely available and more equitable than the other services examined. However, the results indicate that opportunity reduces throughout the survey's five years. However, the HOI for antenatal care, skilled birth attendant, postnatal care, immunization, and diarrhea treatment was low, indicating that much more

needs to be done to enhance the country's use of these healthcare services. In terms of changes in HOI throughout time, we discovered that, in general, the impact of all (excluding postnatal care) of the examined circumstance variables increased between 2013 and 2018. The scale and distribution impacts influenced the utilization of maternity and child healthcare services such as ANC, SBA, and immunization. The scale effect and distribution effect seem to negatively affect postnatal care, diarrhea, and fever/cough treatment. These findings are consistent with previous research (Adeyanju et al., 2017; Halder and Kabir, 2008; Mujaddad and Anwar, 2020; Owino, 2019; Sanoussi, 2017).

After the results of the Shapley decomposition, household wealth status, mother's education, place and region of residence are the most critical circumstances influencing the IO in using MCHCS in Pakistan from 2013 to 2018. Our findings also support previous studies using HOI and Shapley decomposition to check inequality. These studies also found that geographical location and parent's economic and educational situation significantly influence the IO (Adedokun et al., 2017; Adeyanju et al., 2017; Asif and Akbar, 2020; Barros et al., 2012; Bobo and Hayen, 2020; Brunori et al., 2019; Di Novi and Thakare, 2020; Halder and Kabir, 2008; Mujaddad and Anwar, 2020, 2022; Nizamani and Waheed, 2020; Owino, 2019; Pal, 2016; Singh, 2011). Our findings show that more than 62% of Pakistani live in rural areas. Because of this, place of residence is one of the main reasons for inequality. Overall, except for the above-mentioned circumstance variable, all of the chosen variables had a unique effect on the unequal use of maternal and child health care services.

5.5 LIMITATIONS OF THE STUDY

We utilized the Pakistan Demographic and Health Surveys' cross-sectional data. As a result, this data is subject to the limitations associated with cross-sectional surveys, such as the inability to demonstrate causality across variables. Furthermore, the data may be prone to memory bias, as respondents must report on past occurrences (typically up to 5 years before the survey), particularly regarding the utilization of maternal and child health care services. In addition, the selected set of circumstances used to calculate the HOI for a particular opportunity is essential to the measure. So, the limitation is that the HOI is only estimated for a specific list of circumstances. If any variable from the list changes, then the results of inequality and the HOI also change. Nonetheless, the results of HOI depend on the number of circumstances used to compute it. It does not necessarily increase as additional circumstances add to the set of circumstances chosen for study.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 CONCLUDING REMARKS

The main goal of this study is to find out why some people in Pakistan have different opportunities than others to access essential healthcare services for mothers and children. Our research also aim to determine why people need equal access to these services so that the country can make thorough and practical reforms.

The HOI method, which the World Bank created, was used to do the analysis. HOI investigates both the availability and disparity of opportunities. It measures the availability of opportunities minus the degree to which they were given to different groups of people in different ways. We also use the Shapley value method to break down the inequality of opportunity by circumstances. This analysis is helpful for policymakers because it shows how different critical factors are by figuring out how much each contributes to unequal opportunities. The analysis is done for two survey periods, 2012–13 and 2017-18. Comparing the two times shows how unequal access to opportunities at MCHCS has changed over time.

Comparisons of IO from different datasets also show that most of the changes in the HOI are due to changes in coverage, not just changes in inequality. So, we need policies that ensure everyone gets the same opportunities and has better access to health care services.

Our findings show that geographical areas, household wealth status, and the mother's education are the key determinants of the country's low healthcare access opportunities. Coverage and opportunities need to be more adequate in postnatal care, diarrhea, and fever/cough treatment compared to antenatal care, skilled birth attendants, and child immunization due to the lack of health infrastructure, health professionals, and awareness. Women and children from low-income families should have access to essential maternal and child healthcare services, especially those living in rural areas where poverty is more common (Cummings et al., 2019). Essential services for mother and child health care are more likely to be used by people with more education and wealth. If poor mothers got better jobs and went to school, it would help reduce the differences between people. Therefore, to reduce inequality, policies should improve awareness and the availability of facilities.

6.2 POLICY RECOMMENDATIONS

We have empirically investigated the inequality of opportunity for maternal and child healthcare services in Pakistan by using Pakistan Demographic and Health Survey 2012-13 and 2017-18. This study used antenatal care, skilled birth attendant and postnatal care as maternal healthcare services' proxies. While child immunization, diarrhea treatment, and fever/cough treatment are used as proxies of child healthcare services. Results of our empirical analysis show that IO increased in the case of antenatal care, skilled birth attendant, and child immunization. At the same time, it decreases in the case of postnatal care, diarrhea treatment and fever/cough treatment during five years of the survey. While checking the marginal contribution of circumstances using Shapley Value, geographical boundaries, household wealth status, mother education, exposure to mass media, and women empowerment significantly affect the IO in MCHCS.

1. Providing educational facilities to women can improve Pakistan's maternal and child health. Government should make policies to educate the women in Pakistan. As most of the population lives in rural areas, the government must increase awareness of educational programs' importance and open separate schools for women in these areas.
2. There is a need to improve the standard of living of households because the wealth status of households contributes significantly to inequality.
3. Through media campaigns, awareness must be raised. Men and women should be informed about the importance of maternal and child health via television, which is an essential medium. The availability of health centres and services should be broadcast on television to the general public. The law restricts television coverage of maternal and infant health. It requires reconsideration.
4. The unequal set of circumstances between sectors needs to be widely known and discussed with government officials as a critical reference point for revising targeting design. It will help remove barriers to access for women and children in the most challenging situations and improve equality of opportunity.

6.3 AREAS FOR FURTHER RESEARCH

There is a need to conduct further research on the health outcomes resulting from these disparities in opportunity for access and utilization of maternal and child healthcare services to understand the magnitude of the problem.

REFERENCES

1. Adedokun, S.T., Uthman, O.A., Adekanmbi, V.T. and Wiysonge, C.S. (2017). Incomplete childhood immunization in Nigeria: a multilevel analysis of individual and contextual factors. *BMC public health*, 17(1), 1-10.
2. Adeyanju, O., Tubeuf, S. and Ensor, T. (2017). Socio-economic inequalities in access to maternal and child healthcare in Nigeria: changes over time and decomposition analysis. *Health policy and planning*, 32(8), 1111-1118.
3. Aizawa, T. (2019). Ex-ante inequality of opportunity in child malnutrition: New evidence from ten developing countries in Asia. *Economics & Human Biology*, 35, 144-161.
4. Amara, M. and Jemmali, H. (2017). *HJ. 'On the Decomposition and Dynamics of Inequality of Opportunities: A Special Focus on Early Childhood Health and Nutrition in Tunisia*. Paper presented at the Econ Res Forum Work Pap.
5. Anand, S. (2002). The concern for equity in health. *Journal of Epidemiology and Community Health*, 56(7), 485.
6. Asadullah, M.N. and Yalonetzky, G. (2012). Inequality of educational opportunity in India: Changes over time and across states. *World Development*, 40(6), 1151-1163.
7. Asif, A. and Akbar, M. (2020). Inequalities in child health care in Pakistan: measurement and decomposition analysis of maternal educational impact. *Public Health*, 183, 94-101.
8. Assaad, R., Krafft, C., Hassine, N.B. and Salehi-Isfahani, D. (2012). Inequality of opportunity in child health in the Arab World and Turkey. *Middle East Development Journal*, 4(2), 1250006.
9. Barros, A.J., Ronsmans, C., Axelson, H., Loaiza, E., Bertoldi, A.D., França, G.V., Bryce, J., Boerma, J.T. and Victora, C.G. (2012). Equity in maternal, newborn, and child health interventions in Countdown to 2015: a retrospective review of survey data from 54 countries. *The lancet*, 379(9822), 1225-1233.
10. Bobo, F.T. and Hayen, A. (2020). Decomposition of socioeconomic inequalities in child vaccination in Ethiopia: results from the 2011 and 2016 demographic and health surveys. *BMJ open*, 10(10), e039617.

11. Bourguignon, F., Ferreira, F.H. and Menéndez, M. (2007). Inequality of opportunity in Brazil. *Review of income and Wealth*, 53(4), 585-618.
12. Boyle, M.H., Racine, Y., Georgiades, K., Snelling, D., Hong, S., Omariba, W., Hurley, P. and Rao-Melacini, P. (2006). The influence of economic development level, household wealth and maternal education on child health in the developing world. *Social science & medicine*, 63(8), 2242-2254.
13. Bricard, D., Jusot, F., Trannoy, A. and Tubeuf, S. (2013). *Inequality of opportunities in health and the principle of natural reward: Evidence from European countries*. In Health and inequality (Vol. 21, pp. 335-370). Emerald Group Publishing Limited.
14. Brunori, P., Palmisano, F. and Peragine, V. (2019). Inequality of opportunity in sub-Saharan Africa. *Applied Economics*, 51(60), 6428-6458.
15. Carrieri, V. and Jones, A.M. (2018). Inequality of opportunity in health: A decomposition-based approach. *Health Economics*, 27(12), 1981-1995.
16. Checchi, D. and Peragine, V. (2010). Inequality of opportunity in Italy. *The Journal of Economic Inequality*, 8(4), 429-450.
17. Dabalen, A., Narayan, A., Saavedra-Chanduvi, J. and Suarez, A.H. (2014). *Do African children have an equal chance?: A human opportunity report for sub-Saharan Africa*: World Bank Publications.
18. De Barros, R.P., Ferreira, F., Vega, J. and Chanduvi, J. (2009). *Measuring inequality of opportunities in Latin America and the Caribbean*. World bank publications.
19. Di Novi, C. and Thakare, H. (2020). *Inequality of opportunity in accessing maternal and newborn healthcare services: Evidence from the Bangladesh Demographic and Health Survey*: Università di Pavia, Department of Economics and Management.
20. Donni, P.L., Peragine, V. and Pignataro, G. (2014). Ex-ante and ex-post measurement of equality of opportunity in health: a normative decomposition. *Health Economics*, 23(2), 182-198.
21. Ebaidalla, E.M. (2019). *Inequality of opportunity in child health in Sudan: Across-region study (No. 2019/86)*. WIDER Working Paper.

22. El-Kogali, S.E.T., Krafft, C., Abdelkhalek, T., Benkassmi, M., Chavez, M., Bassett, L. and Ejjanoui, F. (2016). Inequality of opportunity in early childhood development in Morocco over time. *World Bank Policy Research Working Paper* (7670).
23. Ersado, L. and Aran, M.A. (2014). Inequality of opportunity among Egyptian children. *World Bank Policy Research Working Paper* (7026).
24. Fajardo-Gonzalez, J. (2016). Inequality of opportunity in adult health in Colombia. *The Journal of Economic Inequality*, 14(4), 395-416.
25. Ferreira, F.H., Gignoux, J. and Aran, M. (2011). Measuring inequality of opportunity with imperfect data: the case of Turkey. *The Journal of Economic Inequality*, 9(4), 651-680.
26. Ferreira, F.H., Molinas Vega, J.R., Paes de Barros, R. and Saavedra Chanduvi, J. (2008). *Measuring inequality of opportunities in Latin America and the Caribbean*. The World Bank.
27. Filippi, V., Ronsmans, C., Campbell, O.M., Graham, W.J., Mills, A., Borghi, J., Koblinsky, M. and Osrin, D. (2006). Maternal health in poor countries: the broader context and a call for action. *The Lancet*, 368(9546), 1535-1541.
28. Fleurbaey, M. and Schokkaert, E. (2009). Unfair inequalities in health and health care. *Journal of health economics*, 28(1), 73-90.
29. Gabriele, S., Cislighi, C. and Costantini, F. (2006). *Demographic Factors and Health Expenditure Profiles by Age: The Case of Italy*. ENEPRI Research Reports No. 18, 18 May 2006.
30. Gallardo, K., Varas, L. and Gallardo, M. (2017). Inequality of opportunity in health: evidence from Chile. *Revista de saude publica*, 51.
31. Halder, A.K. and Kabir, M. (2008). Inequalities in infant immunization coverage in Bangladesh. *Health Services Insights*, 1, HSI. S927.
32. Hall, J.J. and Taylor, R. (2003). Health for all beyond 2000: the demise of the Alma-Ata Declaration and primary health care in developing countries. *The Medical Journal of Australia*, 178(1), 17-20.
33. Hamilton, J.L. and John, S.P. (2013). Evaluation of fever in infants and young children. *American family physician*, 87(4), 254-260.

34. Hu, Y., Wang, Y., Chen, Y. and Li, Q. (2017). Determinants of inequality in the up-to-date fully immunization coverage among children aged 24–35 months: Evidence from Zhejiang province, East China. *Human vaccines & immunotherapeutics*, 13(8), 1902-1907.
35. Hussien, A. and Ayele, G. (2016). *Inequality of opportunity in child health in Ethiopia*. MPRA_paper_86592
36. Iqbal, S., Maqsood, S., Zakar, R., Zakar, M.Z. and Fischer, F. (2017). Continuum of care in maternal, newborn and child health in Pakistan: analysis of trends and determinants from 2006 to 2012. *BMC health services research*, 17(1), 1-15.
37. Jusot, F. and Tubeuf, S. (2019). Inequality of Opportunities in Health and Health Care. In *Oxford Research Encyclopedia of Economics & Finance* (pp. 52): Oxford University Press.
38. Jusot, F., Mage-Bertomeu, S. and Menendez, M. (2017). Inequality of opportunity in health in Indonesia. 1-35. <https://hal.science/hal-01507738/>
39. Jusot, F., Tubeuf, S. and Trannoy, A. (2013). Circumstances and efforts: how important is their correlation for the measurement of inequality of opportunity in health? *Health Economics*, 22(12), 1470-1495.
40. Kawachi, I., Subramanian, S. and Almeida-Filho, N. (2002). A glossary for health inequalities. *Journal of Epidemiology & Community Health*, 56(9), 647-652.
41. Kennedy, A., Basket, M. and Sheedy, K. (2011). Vaccine attitudes, concerns, and information sources reported by parents of young children: results from the 2009 Health Styles survey. *Pediatrics*, 127(Supplement_1), S92-S99.
42. Khan, R.E.A. and Aslam, I. (2017). Child immunization in Pakistan: Socio-institutional and regional aspects. *Asian Journal of Economic Modelling*, 5(1), 49-56.
43. Krafft, C. (2015). *The determinants of child health disparities in Jordan*. Paper presented at the Economic Research Forum.
44. Kranich, L. (1996). Equitable opportunities: an axiomatic approach. *Journal of Economic Theory*, 71(1), 131-147.
45. Lefranc, A., Pistoiesi, N. and Trannoy, A. (2008). Inequality of opportunities vs. inequality of outcomes: Are Western societies all alike?. *Review of income and wealth*, 54(4), 513-546.

46. Li, Y., Zhang, Y., Fang, S., Liu, S., Liu, X., Li, M., Liang, H. and Fu, H. (2017). Analysis of inequality in maternal and child health outcomes and mortality from 2000 to 2013 in China. *International journal for equity in health*, 16(1), pp.1-11.
47. Ma, C., Song, Z. and Zong, Q. (2021). Urban-rural inequality of opportunity in health care: evidence from China. *International Journal of Environmental Research and Public Health*, 18(15), 7792.
48. Marmot, M. (2007). Achieving health equity: from root causes to fair outcomes. *The Lancet*, 370(9593), 1153-1163.
49. May, J. and Timæus, I.M. (2014). Inequities in under-five child nutritional status in South Africa: What progress has been made?. *Development Southern Africa*, 31(6), 761-774.
50. Mujaddad, H.G. and Anwar, M. (2020). Inequality of Opportunity in Access to Antenatal Care in Districts of Punjab, Pakistan. *Ilkogretim Online*, 19(4), 5235-5250.
51. Mujaddad, H.G. and Anwar, M. (2022). Spatial Analysis of Socioeconomic Inequality of Opportunity in Access to Skilled Birth Attendant in Punjab, Pakistan. *Journal of Economic Impact*, 4(1), 88-98.
52. Mukungwa, T. (2015). Factors associated with full immunization coverage amongst children aged 12-23 months in Zimbabwe. *African Population Studies*, 29(2), 1761-1774.
53. Nizamani, S. and Waheed, M.S. (2020). *Do Pakistani Kids Have An Equal Chance? A Study of Inequality of Human Opportunities for Kids in Pakistan*. MPRA_paper_98809.
54. Omer, S.B., Salmon, D.A., Orenstein, W.A., Dehart, M.P. and Halsey, N. (2009). Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *New England Journal of Medicine*, 360(19), 1981-1988.
55. Orso, C.E. and Kovacic, M. (2022). *Trends in Inequality of Opportunity in health over the life cycle: the role of early-life conditions*. Retrieved from
56. Owino, E.O. (2019). *Inequality of Opportunity in Maternal Health Among Adolescent in Kenya*. University of Nairobi,
57. Pal, R. (2016). Decomposing inequality of opportunity in immunization by circumstances: evidence from India. *The European Journal of Development Research*, 28(3), 431-446.

58. Cummings S., Seferiadis A.A., Maas J., Bunders J.F.G., Zweekhorst M.B.M. (2019). Knowledge, Social Capital, and Grassroots Development: Insights from Rural Bangladesh. *The Journal of Development Studies*, 55, 161-176.
59. Palmisano, F. and Peragine, V. (2016). Inequality of Opportunity in Sub-Saharan Africa. *World Bank Policy Research Working Paper* (7782).
60. PDHS. (2018). Pakistan Demographic and Health Survey 2017-18. Available at: http://nips.org.pk/abstract_files/PDHS%202017-18%20-%20key%20%20findings.pdf
61. Pervaiz, Z. and Akram, S. (2018). Estimating Inequality of Opportunities in Punjab (Pakistan): A Non-Parametric Approach. *Pakistan Journal of Commerce and Social Sciences*, 12(1), 136-152.
62. Pervaiz, Z. and Chaudhary, A.R. (2015). Social cohesion and economic growth: An empirical investigation. *Australian Economic Review*, 48(4), 369-381.
63. PMMS. (2019). Pakistan Maternal Mortality Survey 2019. Available at: <https://dhsprogram.com/pubs/pdf/SR267/SR267.pdf>
64. Ramos, A.M., Tomé, R., Trigo, R.M., Liberato, M.L. and Pinto, J.G. (2016). Projected changes in atmospheric rivers affecting Europe in CMIP5 models. *Geophysical Research Letters*, 43(17), 9315-9323.
65. Rawls, J. (2001). *Justice as fairness: A restatement*: Harvard University Press.
66. Roemer, J.E. (1993). A pragmatic theory of responsibility for the egalitarian planner. *Philosophy & Public Affairs*, 22(2), 146-166.
67. Roemer, J.E. (1996). *Theories of distributive justice*: Harvard University Press.
68. Roemer, J.E. (1998). Equality of Opportunity.
69. Roemer, J.E. and Trannoy, A. (2015). Equality of opportunity. In *Handbook of income distribution* (Vol. 2, pp. 217-300): Elsevier.
70. Rosa Dias, P. (2009). Inequality of opportunity in health: evidence from a UK cohort study. *Health Economics*, 18(9), 1057-1074.
71. Rosa Dias, P. (2010). Modelling opportunity in health under partial observability of circumstances. *Health Economics*, 19(3), 252-264.

72. Rosa Dias, P. and Jones, A.M. (2007). *Giving equality of opportunity a fair innings*. In (Vol. 16, pp. 109-112): Wiley Online Library.
73. Saidi, A. and Hamdaoui, M. (2017). On measuring and decomposing inequality of opportunity in access to health services among Tunisian children: a new approach for public policy. *Health and Quality of Life Outcomes*, 15(1), 1-29.
74. Sanoussi, Y. (2017). Measurement and analysis of inequality of opportunity in access of maternal and child health care in Togo. *BMC health services research*, 17(2), 81-87.
75. Sanoussi, Y. (2018). Inequality of Health Opportunity Among Children Aged under 5 Years in Togo. *Available at SSRN 3321019*.
76. Sanoussi, Y., Ahinkorah, B.O., Banke-Thomas, A. and Yaya, S. (2020). Assessing and decomposing inequality of opportunity in access to child health and nutrition in sub-Saharan Africa: evidence from three countries with low human development index. *International journal for equity in health*, 19(1), 1-16.
77. Sen, A. (1985). Well-being, agency and freedom: The Dewey lectures 1984. *The journal of philosophy*, 82(4), 169-221.
78. Sen, A. (1988). The concept of development. *Handbook of development economics*, 1, 9-26.
79. Sen, A., Anand, S. and Peter, F. (2004). *Why health equity?* In: (pp 21-33): Oxford University Press.
80. Shorrocks, A.F. (1999). *Decomposition procedures for distributional analysis: a unified framework based on the Shapley value*. mimeo, University of Essex.
81. Singh, A. (2011). Inequality of opportunity in Indian children: The case of immunization and nutrition. *Population Research and Policy Review*, 30(6), 861-883.
82. Solar, O. and Irwin, A. (2010). *A conceptual framework for action on the social determinants of health*. Retrieved from
83. Stevenson, A. (2009). Factors influencing immunization rates. *The Clinical Advisor*, 1, 19-26.

84. Trannoy, A., Tubeuf, S., Jusot, F. and Devaux, M. (2010). Inequality of opportunities in health in France: a first pass. *Health Economics*, 19(8), 921-938.
85. WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division (2023). Trends in maternal mortality 2000 to 2020; <https://www.who.int/publications/i/item/9789240068759>.
86. Tsawe, M. and Susuman, A.S. (2020). Examining inequality of opportunity in the use of maternal and reproductive health interventions in Sierra Leone. *Journal of Public Health*, 42(2), 254-261
87. UNICEF. (2023). Levels & Trends in Child Mortality Report 2020 <https://www.unicef.org/media/79371/file/UN-IGME-child-mortality-report-2020.pdf>
88. Van Den Heuvel, O., DeMey, W., Buddingh, H. and Bots, M. (1999). Use of maternal care in a rural area of Zimbabwe, a population-based study. *Acta obstetricia et gynecologica Scandinavica*, 78(10), 838-846.
89. Vega, J.R.M., de Barros, R.P., Chanduvi, J.S. and Cord, L.J. (2011). *Do Our Children Have a Chance?: A Human Opportunity Report for Latin America and the Caribbean*. World Bank Publications.
90. Vélez, C.E., Azevedo, J.P., Posso-Suárez, C.M. and Posso, C. (2010). Oportunidades para los niños colombianos: cuánto avanzamos en esta década. Banco de la República de Colombia.
91. Wagstaff, A. and Claeson, M. (2019). The millennium development goals for health: rising to the challenges. 2004. *World Bank: Washington, DC*.
92. Wardlaw, T., Salama, P., Brocklehurst, C., Chopra, M. and Mason, E. (2010). Diarrhoea: why children are still dying and what can be done. *The Lancet*, 375(9718), 870-872.
93. WHO. (1978). "Primary Health Care", in *International Conference on Primary Health Care Alma-Ata*.
94. WHO. (2013). *The economics of the social determinants of health and health inequalities: a resource book*, World Health Organization.
95. WHO. (2009). "Children's Environmental Health." from <http://www.who.int/ceh/en/>.
96. WHO. (2021). *Tracking universal health coverage: 2021 global monitoring report*: World Health Organization.

97. World Bank. (2005). *World Development Report 2006: equity and development*. The World Bank.
98. World Bank. (2006). Visualize Inequality. Available at: http://www1.worldbank.org/poverty/visualize_inequality/Overview/overview.html
99. World Bank. (2022). Life expectancy at birth, total (years) – Pakistan. Available at: <https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=PK>
100. World Health Organization. (2021). Expanded Programme on Immunization. Available at: <https://www.emro.who.int/pak/programmes/expanded-programme-on-immunization.html>
101. World Health Organization. (2012). Maternal Health. Retrieved from: http://www.who.int/topics/maternal_health/en/
102. World Health Organization. (2016). Immunization. Retrieved from <http://www.who.int/topics/immunization/en/>
103. World Health Organization. (2019). Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.
104. World Health Organization. (2021). *Tracking universal health coverage: 2021 global monitoring report*. World Health Organization.
105. Yaya, S. and Ghose, B. (2019). Global inequality in maternal health care service utilization: implications for sustainable development goals. *Health Equity*, 3(1), 145-154.
106. Zere, E. and McIntyre, D. (2003). Inequities in under-five child malnutrition in South Africa. *International journal for equity in health*, 2(1), 1-10.
107. Barros, R.P., Molinas Vega, J.R., Chanduvi, J., Giugale, M. and Hasan, A. (2012). “*Do Our Children Have a Chance ? A Human Opportunity Report for Latin America and the Caribbean*” (World Bank, ed.). The World Bank.
108. Conde-Agudelo, A., Belizán, J.M. and Lammers, C. (2005). Maternal-perinatal morbidity and mortality associated with adolescent pregnancy in Latin America: Cross-sectional study. *American journal of obstetrics and gynecology*, 192(2), 342-349.

109. Hoyos, A. Narayan, A. (2011). *"Inequality of Opportunities Among Children: How Much Does Gender Matter?"* World Bank, Washington, DC. World Bank.
110. Navaneetham, K. and Dharmalingam, A. (2002). Utilization of maternal health care services in Southern India. *Social science & medicine*, 55(10), 1849-1869.
111. Rawls, J. (1971). *Justice as fairness: A restatement*: Harvard University Press.
112. Saidi, A. and Hamdaoui, M. (2017). On measuring and decomposing inequality of opportunity in access to health services among Tunisian children: a new approach for public policy. *Health and Quality of Life Outcomes*, 15(1), 1-29.
113. Singh, A. (2011). "Inequality of Opportunity in Indian Children : The Case of Immunization and Nutrition". *Population Research and Policy Review*, 30, 861-883

APPENDIX-A

Decomposition of the HOI in Scale and Distribution effects of MHCS

Postnatal Care	Skilled Birth Attendant	Antenatal Care	Maternal Health Care Services	Scale Effect				Distribution Effect				Scale Effect + Distribution effect	HOI										
				Initial Coverage 2013	Final Coverage 2018	D- Index 2013	1-D- Index 2013	Final Coverage 2018 (1-D-index 2013)	Initial Coverage 2013 (1-D-index 2013)	Final Coverage 2018(1-D-index 2013) - Initial Coverage 2013(1-D-index 2013)	Scale Effect in Percentage		Final Coverage 2018	D-index 2018	D-index 2013	1-D-index 2018	1-D-index 2013	Final Coverage 2018 (1-D-index 2018)	Final Coverage 2013 (1-D-index 2013)	Final Coverage 2018(1-D-index 2018) - Final Coverage 2013 (1-D-index 2013)	Distribution Effect in Percentage	HOI 2013	HOI 2018
43.0%	49.0%	34.0%	Initial Coverage 2013	34.0%	46.0%	25.0%	75.0%	35.0%	26.0%	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	25.7%	36.6%
27.0%	65.0%	46.0%	Final Coverage 2018	46.0%	21.0%	25.0%	75.0%	35.0%	26.0%	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	25.7%	36.6%
16.0%	20.0%	25.0%	D- Index 2013	25.0%	75.0%	35.0%	26.0%	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%
84.0%	80.0%	75.0%	1-D- Index 2013	75.0%	35.0%	26.0%	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%
22.0%	52.0%	35.0%	Final Coverage 2018 (1-D-index 2013)	35.0%	26.0%	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%
36.0%	39.0%	26.0%	Initial Coverage 2013 (1-D-index 2013)	26.0%	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%
-14.0%	12.0%	9.0%	Final Coverage 2018(1-D-index 2013) - Initial Coverage 2013(1-D-index 2013)	9.0%	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%
-13.6%	12.2%	8.9%	Scale Effect in Percentage	8.9%	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
27.0%	65.0%	46.0%	Final Coverage 2018	46.0%	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
16.0%	14.0%	21.0%	D-index 2018	21.0%	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
16.0%	20.0%	25.0%	D-index 2013	25.0%	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
84.0%	86.0%	79.0%	1-D-index 2018	79.0%	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
84.0%	80.0%	75.0%	1-D-index 2013	75.0%	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
22.0%	56.0%	37.0%	Final Coverage 2018 (1-D-index 2018)	37.0%	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
22.0%	52.0%	35.0%	Final Coverage 2013 (1-D-index 2013)	35.0%	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
0.0%	4.0%	2.0%	Final Coverage 2018(1-D-index 2018) - Final Coverage 2013 (1-D-index 2013)	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
0.2%	4.0%	2.0%	Distribution Effect in Percentage	2.0%	2.0%	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
-13.5%	16.2%	10.9%	Scale Effect + Distribution effect	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
36.0%	39.5%	25.7%	HOI 2013	25.7%	36.6%	10.9%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
22.5%	55.7%	36.6%	HOI 2018	36.6%	10.9%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
-13.5%	16.2%	10.9%	Change in HOI	10.9%	16.2%	39.5%	55.7%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%

APPENDIX-B

Decomposition of the HOI in Scale and Distribution Effects of CHCS

Maternal Health Care Services	Scale Effect							Distribution Effect							HOI							
	Initial Coverage 2013	Final Coverage 2018	D- Index 2013	1-D- Index 2013	Final Coverage 2018 (1-D-index 2013)	Initial Coverage 2013 (1-D-index 2013)	Final Coverage 2018(1-D-index 2013) - Initial Coverage 2013(1-D-index 2013)	Scale Effect in Percentage	Final Coverage 2018	D-index 2018	D-index 2013	1-D-index 2018	1-D-index 2013	Final Coverage 2018 (1-D-index 2018)	Final Coverage 2013 (1-D-index 2013)	Final Coverage 2018(1-D-index 2018) - Final Coverage 2013(1-D-index 2013)	Distribution Effect in Percentage	HOI 2013	HOI 2018			
Fever/Cough Treatment	73.0%	71.0%	4.0%	96.0%	68.0%	70.0%	-2.0%	-2.5%	71.0%	5.0%	4.0%	95.0%	96.0%	67.0%	68.0%	-1.0%	-1.3%	-3.8%	70.5%	66.7%	-3.8%	
Diarrhea Treatment	71.0%	61.0%	5.0%	95.0%	58.0%	67.0%	-9.0%	-9.0%	61.0%	6.0%	5.0%	94.0%	95.0%	58.0%	58.0%	-1.0%	-0.8%	-9.7%	67.2%	57.5%	-9.7%	
Immunization	26.0%	42.0%	21.0%	79.0%	33.0%	21.0%	12.0%	12.4%	42.0%	14.0%	21.0%	86.0%	79.0%	36.0%	33.0%	3.0%	2.8%	15.2%	20.8%	36.0%	15.2%	
HOI																						