Food Insecurity in Pakistan:

Prevalence and Correlates

By

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SCHOOL OF ECONOMICS

QUAID-I-AZAM UNIVERSITY

ISLAMABAD PAKISTAN

2021

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A thesis submitted to Quaid-i-Azam University, Islamabad, in partial fulfilment of the requirements for the award of degree of Master of Philosophy in Economics.

SCHOOL OF ECONOMICS,

QUAID-I-AZAM UNIVERSITY, ISLAMABAD

2021

Certificate

This is to certify that the thesis titled "**Food Insecurity in Pakistan: Prevalence and correlates**". Submitted by Maryam Javed, Registration number 02091913037 is accepted in its present form by School of Economics, Quaid-i-Azam University, Islamabad, as satisfying all the requirements for the partial fulfilment of the degree of Master of Philosophy in Economics.

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Dedicated to

My beloved parents and siblings for their endless love, support,

sacrifices and encouragement.

Declaration

I, Maryam Javed, daughter of Muhammad Javed Iqbal, Registration no: 02091913037, Candidate of MPhil Economics at school of Economics, Quaid-i-Azam University, Islamabad, do hereby declare that the thesis "Food Insecurity in Pakistan: Prevalence and Correlates" submitted for the partial fulfilment of Master of Philosophy (MPhil) degree in Economics, is my own work. All the errors and submissions are purely on my part, and I also sombrely pronounce that it will not be submitted for attaining any other degree in the future from any institute.

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ABSTRACT

Our current study aimed at three main objectives. The foremost objective is to measure the extent and depth of food insecurity while the second objective is to explore of the distribution of food insecure population with respect to various dimensions. The third objective is to explore the factors that causes food insecurity. Study is based on microdata of Household Integrated Economic Survey (2018-19) which is a country representative survey covering 24,789 households (160,095 Individuals) from all regions of country. Food insecurity is measured using three approaches across Pakistan, at regional and at provincial level. In the first approach we have taken the gross calories, in the second approach we have adjusted the calories with loss. While in the third approach we have excluded the gift or assistance from food basket. Head count ratio and food insecurity gap was used to determine the status and depth of food insecurity. Findings has shown that overall, 42.54% of households and 45.89% of the population in Pakistan suffers from food insecurity. It was interesting to explore that a significant household are marginally food insecure, and a minor subsidy / support can take them out of the trap. Rural – Urban comparison revealed that urban areas are relatively more prevalent to food insecurity. In addition, at the provincial level, Sindh has the highest food insecurity, while Punjab has the lowest. Study's second main goal is to examine the distribution of food insecure population with respect to different dimensions such as household size, number of earners and dependency ratio. Findings from the distribution of food insecure population with respect to household size, number of earners and food gap increases, proportion of food insecure households also increases. We found that in general large households, households with least earners and high dependency ration are more prone to food insecurity. The last objective of our study is to explore the determinants of food insecurity in Pakistan. For this purpose, binary logistic model technique was used. Results has shown that all the independent variable i.e., region, head gender, head education, proportion of graduates, rooms, house occupancy status, dependency ratio, inequality and mean calories consumed showed the significant impact on food insecurity status.

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Chapter 1

INTRODUCTION

1.1   INTRODUCTION

Food insecurity is a global issue and has been going on for centuries. An idea of food security comes from healthy nutritious diet which includes dairy, protein, fruits, and vegetables. In simple food insecurity refers to a situation in which people do not have access to essential food. As we know that Food, shelter, and clothing are basic human needs. Among these Man's most basic need is a food without which he cannot live but unfortunately a significant number of people in the world are food insecure.

Getting an appropriate level of food is a basic human right but when a person does not get required level of calories, then he becomes a victim of food insecurity. The share of income spend on the consumption pattern of food is an indication of how prosperous the house will be and how developed the country will be. If the income increases as a result the spending on food will also increases but that increase will not be so much high, because whenever the income increases, the extra income is never spent on all food consumption, but also spent on non-food items. This phenomenon is known as Engel's law. The keen perception behind Engel's law is that he has allocated food first in budget allocation. There are many people who find it very difficult to complete two meals a day. For them, access to nutritious food is not only difficult but impossible as many people are struggling with hunger, so eliminating food insecurity is an important and big challenge.

Generally, there are two types of food insecurity, namely chronic undernourishment, and transitory food insecurity. Chronic food insecurity indicates the constant failure on the part of the household to gain access to enough food. It arises due to a limited access to resources and is structural in character. Whereas Transitory food insecurity occurs

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because of the economic and human induced failures as well as natural disasters causing food shortages that temporarily affects all or a part of the country's population (Maxwell, (1995)).

The most popular definition of food security is "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Food and Agriculture Organization of the United Nations, (2010)).[1] This definition clearly differentiates the concept of food insecurity and poverty. In measuring the food insecurity, we look at the access to nutritious and safe food. While in measuring poverty we look at the consumption of food, clothing as well as other necessities of life. The definition of food insecurity presented by FAO is based upon four dimensions: Availability of food, physical and economic accessibility of food, utilization of food, stability of food. Availability of food means people have the availability of sufficient amount of good quality food whether it is from their own country's production or imported from other countries. Physical access to food means that people have access to nutritious food required for healthy living. While economic access to food means that their income is not so low and market price is not so high which they cannot afford. Utilization of food focuses on nutritious diet, clean drinking water as well as non-food items such as sanitation and health facilities (Babar, 2020). Stability of food means there should be the stability in factors such as market prices of food, natural disasters, unemployment, social protection etc. It is a condition that causes anger, stress, depression, and other illness in people. Besides, it is a very serious problem that leads to many crimes, if we look at it, we can achieve peace and long-term development.

Food insecurity is a multidimensional and multifaceted phenomenon that comes in many forms such as chronic food insecurity, transitionary food insecurity, hunger, malnutrition, undernourishment, anaemia, and acute food insecurity that occurs because of natural disasters and volatility of food system (Agarwal, (2010)). Food insecurity varies at

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[1] FAO (Food and Agriculture Organization)

individual, regional, provincial, national, and international level because of their socio and demographic factors.

Pakistan is an agricultural developing country but still our agricultural productivity cannot meet food consumption of the growing population. Because of this, we are suffering from food shortage. In 2014-16 about 37.6 million people of Pakistan are undernourished (Film Action Oregon (Organization) et al., 2017). According to the recent report of ("The State of Food Security and Nutrition in the World 2020," 2020)), pandemic has increased the number of people suffering from hunger in the world. Prevalence of food insecurity has reached to 9.9% in 2020 as it was 8.4% in 2019. In terms of population, 720 to 811 million people in the world suffered from hunger in 2020. In Pakistan, food insecurity is chronic in nature (Hashmi, et al. (2019)).

1.2. OVERVIEW OF FOOD INSECURITY IN PAKISTAN

Pakistan is among those few countries of the world which are victim of high food insecurity. Food and Agriculture Organization periodically collects data on food insecurity statistics for each country. By reviewing these statistics, we can easily gauge the trend of food insecurity in Pakistan. Food insecurity conditions over the past few years are listed in the Table 1.1.[2]

The statistics show that the mixed trend of food insecurity is visible in Pakistan. From 2001 to 2003, food insecurity appeared to be on the rise. Which indicates that every fifth person is undernourished. Then, from 2004 to 2009, food insecurity began to decline, which is a good sign. From 2008 to 2013, prevalence of food insecurity has been a constant trend of 15.9%. In the next few years, malnutrition has decreased more. But in the period from 2018 to 2020, food insecurity is on the rise again. One of the possible reasons for this is corona virus in the country. Which has shut down people businesses. Due to a lack of income people are slowly becoming undernourished again.

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[2] The statistics reported in Table 1.1 are based on are based on Per Capita Minimum Dietary Energy Requirements (MDER) as estimated by FAO. The estimated figures of MDER are also reported in table.

Table 1. 1Prevalence of undernourishment (percent) (3-year average)

Year	Percentage	% Change	MDER
2000-2002	21.1 %	-	1700 (2000)
2001-2003	21.8 %	3.3%	1703 (2001)
2002-2004	21 %	-3.7%	1707 (2002)
2003-2005	19 %	-9.5%	1711 (2003)
2004-2006	17.6 %	-7.4%	1715 (2004)
2005-2007	16.4 %	-6.8%	1719 (2005)
2006-2008	15.8 %	-3.7%	1722 (2006)
2007-2009	15.8 %	0.0%	1726 (2007)
2008-2010	15.9 %	0.6%	1729 (2008)
2009-2011	15.9 %	0.0%	1733 (2009)
2010-2012	15.9 %	0.0%	1736 (2010)
2011-2013	15.9 %	0.0%	1738 (2011)
2012-2014	15.1 %	-5.0%	1741 (2012)
2013-2015	13.9 %	-7.9%	1743 (2013)
2014-2016	12.8 %	-7.9%	1745 (2014)
2015-2017	12.4 %	-3.1%	1747 (2015)
2016-2018	12.1 %	-2.4%	1749 (2016)
2017-2019	12.2 %	0.8%	1748 (2017)
2018-2020	12.9 %	5.7%	1749 (2018)

Source : http://www.fao.org/faostat/en/#data/QC

1.3   MOTIVATION OF THE PRESENT STUDY

Eradicating food insecurity is a big challenge. The first goal of Millennium development goals is to end hunger. Malnutrition has harmful effect on the health of children as they became a prey of stunted growth, weight loss and height loss etc. Hunger and malnutrition have weakened the immune system, which can lead to so many diseases, and some people lose their lives too. When we looked at the trends of food insecurity,

we found out that there is a large population in Pakistan that suffers from food insecurity. Our motivation is that we wanted to see the exact status of food insecurity in Pakistan and at the same time we also wanted to see the factors that causes food insecurity.

1.4   OBJECTIVES OF THE PRESENT STUDY

There are three main objectives of present study:

1. The first and foremost objective is to measure and explore the extent of food insecurity in Pakistan, regions, and provinces from 2018 to 2019.

2. The second objective is to explore the distribution of households with reference to food insecurity and food security by considering various dimensions such as household size, number of earners, dependency ratio and food gap.

3. The last objective of this study is to workout with the correlates of food insecurity in Pakistan. For this we have taken such factors which cause food insecurity and then we applied logistic model because of the nature of the data.

1.5   LAYOUT OF THE THESIS

This study comprises of nine chapters, after the introductory chapter, we will present the overview of global picture of food insecurity. Here we will discuss the food insecurity continent wise and later our focus will be on measuring food insecurity in Asia. Finally, we will summarize the discussion. The third chapter comprises of review about food insecurity in Pakistan. In this chapter, first we will talk about the studies for the measurement of food insecurity in Pakistan then we will talk about the studies that worked on finding the correlates of food insecurity in Pakistan. In chapter four, we will discuss about the analytical framework. Analytical framework comprises of region and period of analysis as well as the dimensions of research. Chapter five is all about data and variables. This chapter contains sources of data and the construction of variables for the measurement and correlates of food security in Pakistan. In the chapter six, we will present the methodology and econometric model used for the measurement and

correlates of food insecurity in Pakistan. In this chapter, first we will talk about the approaches used for the measurement of food insecurity in Pakistan. while the second part of the research consist of models applied to find the correlates of food insecurity in Pakistan. The next two chapters are based on the results. In chapter seven, we will discuss in detail about the results of measurement of food insecurity in Pakistan. While in chapter eight, we will discuss about the results of correlates of food insecurity. Summary and conclusions are presented in last chapter of the study.

Chapter 2

OVERVIEW OF FOOD INSECURITY: A GLOBAL PICTURE

2.1   INTRODUCTION

In this chapter, we have examined global food insecurity because any country in the world, even if it has a fast-growing economy, is still fighting with problems like undernourishment and hunger. According to report of FAO, food insecurity is based on four dimensions e.g., availability, accessibility, utilization, and stabilization. Our current research is on Pakistan in which we have focused on the third dimension i.e., utilization. That's why when we look at global picture of food insecurity, our focus is on prevalence of undernourishment. This chapter consists of five sections. After Introduction, the overview of global food insecurity is presented in Section 2.2. While third section is on food insecurity with reference to continents. In Section 2.4 we have discussed prevalence of food insecurity in South Asia. Finally, the discussion is summarised in Section 2.5.

2.2   AN OVERVIEW OF GLOBAL FOOD INSECURITY

Food insecurity not only effects a single country, but it is a worldwide problem. Statistics shows that food insecurity was high throughout the world in ancient times, but as the problem gradually came to light, the government of each country began to take steps to address it. We have observed at the global analysis in terms of third dimension of the FAO i.e., undernourishment. When this issue was considered, gradually the first objective of Millennium Development goal became to eliminate it because this issue was giving rise to many more evils. Statistics reported in Table 2.1 show the percentage of world population that is under nourished during last two decades.

Table 2. 1 Global Overview of Undernourishment (Percentage of Population)

Year	Under Nourishment	Year	Under Nourishment
2000	13.0	2011	9.0
2001	13.1	2012	8.9
2002	13.3	2013	8.8
2003	13.1	2014	8.3
2004	12.9	2015	8.3
2005	12.4	2016	8.3
2006	11.5	2017	8.1
2007	10.6	2018	8.3
2008	10.1	2019	8.4
2009	10.0	2020	9.9
2010	9.2		

Source : http://www.fao.org/faostat/en/#data/QC

In 2000, 13% of the world's population was undernourished. Over the next two years, food insecurity increased to 13.3%. The main reason behind the increase in population insecurity was the worst economic condition of the least developed countries in the world. Instead of progressing, they were going downhill. In less developed countries, agricultural production was low and modern technology was lacking, as well as employment opportunities were scarce. Food insecurity is more prevalent due to the above reasons. Food insecurity has been declining since 2004. Since then, food insecurity has stagnated from 2014 to 2016. In 2017, food insecurity reached 8.1% due to agricultural growth and industrial development. From 2019, food insecurity has been on the rise around the world. One of reason for its increase could be the pandemic situation in the country, which has spread all over the world.

In nutshell we observed that during last two decades, percentage of undernourished population across the globe has substantially decreased. This is due to technological improvement which resulted in high per acre yield and improved food quality. It is worth mentioning that situation of food insecurity is not same across different parts of the world. In next section we will discuss the prevalence of undernourishment across continents of the world.

2.3 AN OVERVIEW OF FOOD INSECURITY ACROSS CONTINENTS OF WORLD

In this section we will look at the trends of undernourishment in continents. The statistics reported in Table 2.2 shows that food insecurity is very low in North America and Europe. Food insecurity is less than 2.5% from 2000 to 2020. North America is an economically developed continent, with countries such as Canada and United States experiencing high levels of economic growth and high levels of human development. Besides, the GDP of north America is higher than Europe.

Table 2. 2 Continent Wise Undernourishment (Percentage of Population)

Years	Africa	Asia	Oceania	South America	Northern America	Europe
2000	24.8	14.1	6.9	11.1	Below 2.5	Below 2.5
2001	23.9	14.5	6.5	10.9	Below 2.5	Below 2.5
2002	23.5	14.8	6.3	11.5	Below 2.5	Below 2.5
2003	23.4	14.5	7.0	9.7	Below 2.5	Below 2.5
2004	23	14.4	7.0	9.3	Below 2.5	Below 2.5
2005	21.3	13.9	6.9	8.8	Below 2.5	Below 2.5
2006	20.7	12.7	6.2	8.2	Below 2.5	Below 2.5
2007	20.6	11.2	6.6	7.8	Below 2.5	Below 2.5
2008	20.1	10.5	6.3	6.6	Below 2.5	Below 2.5
2009	19.6	10.4	6.5	6.7	Below 2.5	Below 2.5
2010	18.0	9.5	5.3	5.7	Below 2.5	Below 2.5
2011	18.6	9.2	5.2	5.3	Below 2.5	Below 2.5
2012	18.2	9.1	5.5	4.8	Below 2.5	Below 2.5
2013	18.4	8.7	5.5	4.4	Below 2.5	Below 2.5
2014	16.7	8.5	6.0	3.8	Below 2.5	Below 2.5
2015	16.9	8.3	6.1	4.2	Below 2.5	Below 2.5
2016	17.5	8.0	6.2	5.4	Below 2.5	Below 2.5
2017	17.1	7.8	6.3	5.2	Below 2.5	Below 2.5
2018	17.8	7.8	6.2	5.4	Below 2.5	Below 2.5
2019	18.0	7.9	6.2	5.8	Below 2.5	Below 2.5
2020	21.0	9.0	6.2	7.8	Below 2.5	Below 2.5

Source : http://www.fao.org/faostat/en/#data/QC

Like united states, Europe is also very developed. The development of agriculture and the development of industries have a great hand in improving the economic condition of

Europe. Europeans are very educated and skilled. Due to an advancement in agriculture sector and modernization in other fields, food insecurity is very low here.

Oceania have seen a mixed trend in food insecurity. In early years, food insecurity was low from 2000 to 2002. Food insecurity was high in year 2003 and 2004 at the rate of 7%. There have been ups and downs over the years. Oceania includes both developed and underdeveloped countries. Any kind of natural disaster in less developed countries can cause rise in food insecurity.

Food insecurity in south America was 11.5% in 2002. From 2003 to 2014, food insecurity decreased significantly to 3.8%. But since 2015, there have been growing trends in food insecurity. After independence, there is no economic system mostly in the developing countries of south America. The south America has a feudal system that makes the rich richer and the poor poorer. Because of the feudal system, poor families in developing countries easily become the victim of food insecurity.

Asia has the second highest food insecurity. Statistics also shows that food insecurity was highest in 2002 at 12.2%. The figures have been declining since 2003. By 2020, food insecurity is on the rise again. Asia has two-third of the world's population and has inequality which makes it food insecure.

Africa has the highest food insecurity of all continents. Statistics shows that one in fourth person in Africa suffers from food insecurity. In 2000, 8.4% of Africans were undernourished. But the intensity of food insecurity did not decrease much in so many years, even in 2020 it was 21%. Poverty is high in Africa. Half of the population lives below poverty line in Africa. Besides, economic condition is very bad, and its GDP is very low. That's why African's are more prevalent to food insecurity.

In the next section we will focus on the prevalence of food insecurity in South Asia. In specific we will compare the statistics of different countries of South Asia including Pakistan, India, Bangladesh, and Sri Lanka.

2.4 AN OVERVIEW OF FOOD INSECURITY IN SOUTH ASIA

The estimates of undernourished population in countries of South Asia are presented in Table 2.3. The statistics reveals that food insecurity is highest in Afghanistan among South Asian countries. In 2002, food insecurity was very high i.e., 47.8%. The main reason for this seems to be that local wheat and grain production as well as livestock farming is very low in Afghanistan. Since 2005, food insecurity has begun to decline. In 2018-2019 food insecurity start increasing because of severe drought in the country and in 2020 it reached 25.6%. This is interesting to note that during two decades percentage of undernourished population reduced by almost 22% points.

Table 2. 3 Undernourishment in South Asia (Percentage of Population)

Year	Afghanistan	Bangladesh	India	Nepal	Pakistan	Sri-Lanka
2000-2002	47.8	15.9	18.4	23.5	21.1	16.9
2001-2003	45.6	15.1	20.1	21.7	21.8	16.3
2002-2004	40.6	14.9	21.5	19.8	21.0	16.1
2003-2005	38.0	14.4	22.1	17.6	19.0	15.6
2004-2006	36.1	14.2	21.6	16.8	17.6	14.7
2005-2007	33.3	13.8	19.6	15.9	16.4	14.1
2006-2008	29.8	13.9	17.5	14.9	15.8	12.8
2007-2009	26.5	13.6	16.6	13.0.	15.8	11.9
2008-2010	24.4	14.7	16.3	11.6	15.9	11.4
2009-2011	23.7	15.2	16.0	10.5	15.9	11.3
2010-2012	24.7	15.7	15.6	9.2	15.9	10.9
2011-2013	28.2	15.5	15.0	8.1	15.9	10.3
2012-2014	26.3	15.1	15.1	7.0	15.1	9.2
2013-2015	24.2	14.2	14.9	6.4	13.9	8.1
2014-2016	21.5	14.0	14.7	5.3	12.8	6.8
2015-2017	22.2	13.3	14.2	4.5	12.4	6.3
2016-2018	23.0	12.5	13.8	4.2	12.1	5.9
2017-2019	23.4	10.8	14.0	4.3	12.2	6.0
2018-2020	25.6	9.7	15.3	4.8	12.9	6.8

Source : http://www.fao.org/faostat/en/#data/QC

India is the second most undernourished country in south Asia. From 2001 to 2006, the food insecurity situation in the country was very bad at the rate of 21.6%. Firstly, India has a very large population and very little resources. Secondly, due to its large population, people are suffering from poverty and there is no stability in farming. The percentage have been declining since 2007 and since then food insecurity has risen again, reaching 15.3% in 2019.

Bangladesh ranks third in south Asia in terms of malnutrition. In 2002, 15.9% of the people in Bangladesh were undernourished. There was a very slight change in the percentage of undernourishment from year 2004 to 2010. But when Bangladesh overcame poverty and its economy stabilized, undernourishment reached 9.7% in 2018 to 2020.

Sri Lanka ranks fifth among south Asian countries with the reference of undernourishment. Food insecurity has been high in recent years. According to statistics, food insecurity was 16.1% from 2000 to 2004. Sri Lanka is heavily dependent on agriculture, so when the best technology came in the fields of agriculture and the irrigation system improved, malnutrition began to decline from 2005 and even from 2018 to 2020, only 6.8% of the population was malnourished.

According to the statistics, Nepal ranks sixth in food insecurity among south Asian countries. In the first few years, from 2000 to 2004, there was a growing trend of food insecurity in Nepal. With the advancement of agricultural development employment opportunity increased. food insecurity decreased significantly, reaching 4.3% in 2017. But after the arrival of corona virus food insecurity has risen again in 2019 to 4.8%.

If Pakistan is compared to all Asian countries, it ranks fourth in terms of food insecurity. From 2000 to 2004, 21% of people are undernourished. In 2005 statistics began to show a declining trend. Malnutrition remained at 15.9% from 2010 to 2013. After that, from 2019, malnutrition began to increase again. The growing food insecurity in Pakistan is due to the country's growing population, inflation, and declining agricultural production. Apart from Nepal and Sri Lanka, the situation in Pakistan is better than in Afghanistan and India. If we look at Bangladesh and Pakistan, the situation in Bangladesh was bad in the

beginning, but when Bangladesh overcame poverty and its economic situation improved, the situation in Bangladesh became much better than in Pakistan. Similarly, if Pakistan and India are compared, then the population of India is 1.38 billion, which is more than Pakistan. Due to its large population, India lacks resources, which makes India more vulnerable to food insecurity. On contrary, if we compete Pakistan with Afghanistan, Afghanistan has had food insecurity for 20 years. Afghanistan's economy is in dire straits and there is little agriculture development. But looking at above statistics, the situation in Pakistan is alarming for food insecurity. So, there is a need to conduct a study in case of Pakistan for the factors that causes food insecurity. Which is one of the prime objectives of our present study.

2.5   CONCLUSION

Food insecurity is a multifaceted problem. We have seen this problem in terms of undernourishment. Mixed food insecurity trends have been observed for each country. Global analysis shows that the problems that cause food insecurity are inter-related among all the countries around the globe. However, it is encouraging to note that in general percentage of undernourished population has substantially declined in all parts of globe.

CHAPTER 3

REVIEW OF EMPIRICAL STUDIES CONDUCTED ON FOOD INSECURITY IN PAKISTAN

3.1. INTRODUCTION

Food insecurity is one of the major problems and much work has been done on the empirical analysis of food insecurity in Pakistan. In this chapter we will summarize earlier work and highlight literature gap. The earlier literature can broadly be divided in two parts: first, studies measuring food insecurity and second studies exploring the determinants of food insecurity in Pakistan. This chapter comprises of four sections. After Introduction, we will summarize the studies that have measured food insecurity in Pakistan. In Section 3.3. we have discussed the studies that have explored determinants of food insecurity. Last section 3.4 summaries the entire discussion.

3.2. MEASUREMENT OF FOOD INSECURITY IN PAKISTAN

In this section we will present summary of the studies that measured food insecurity in Pakistan. A significant number of studies have been conducted that worked on the measurement of food insecurity in Pakistan. Given below is the crux of major studies:

Ahmad, et al. (2004) has conducted a study in Tehsil Depalpur of District Okara. Primary data was gathered from Tehsil Depalpur of District Okara. In Tehsil Depalpur, three villages were selected due to random sampling technique. From each village, randomly five households with no land and fifteen farmers with 12.50 acres of land were selected. The study has used the Aggregate Household Food Security Index (AHFSI) to measure the status of food security at household level. The AHFSI method indicates how much per capita food is available for human consumption. The result of Body mass index (BMI) has shown that almost 36 percent of population calories requirement were greater than their

calories consumption. 88% of average availability of food for consumption was available to 36% of undernourished population. While 11.9% was gap between average availability and average requirement of food. Study found that per capita low income was responsible for less food security at household level.

Ansari, et al. (2006) has conducted a study to access the status of food insecurity among children's residing in urban areas, Pakistan. Data was gathered from cross-sectional survey through structured questionnaire during the period of 2000. Twenty-four hours nutrition intake information was collected through food-frequency questionnaire. Results has shown that the children between the age of 6-18 were 22.1% stunted, 9.6 % wasted and 24% underweight respectively. Univariate analysis has given the information that household size, peri urban residence, no proper arrangement of sanitation system and outside usage of water source were responsible for households stunting growth. Besides this urban residence spent a large proportion of their income in buying food and low-income households with large family size cause a serious threat to food security.

Hussain and Routray (2012) has examined the status of food security in Pakistan. Both primary and secondary data sets have used. Consumption data was collected from HIES (2006), While the production data was collected from Agricultural Statistics (2004-2005) of the Ministry of Agriculture, Food and Livestock of Pakistan, Economic Surveys and Food Security Analysis (2003). Research tools such as Net food availability (domestic food production), Total food availability with trade national food requirement, Self-sufficiency ratio, Food deficit/surplus index (%), Consumers purchasing power for food, Un-accessed portion of food and Food gap (%) was used to investigate the incidence of food insecurity. Self-sufficiency ratio results has shown that Pakistan is almost 25% deficient in the production of pulses and 75% deficient in its production of oil seeds. Punjab is breadbasket in our country more than 40% food surplus supply come from Punjab. On contrary Gilgit Baltistan was 50% deficient in food supply. Data on food consumption ratio has shown that country's population fulfils 70% of their subsistence food requirement, while 30% was food gap. Administrative units such as Punjab, Sindh, Baluchistan, KPK, FATA, GB and AJK have fulfilled 74%, 64%, 64%, 84%, 58%, 62%, and 62% of their subsistence food requirement. The food gap was 26% in Punjab, 36% in Sindh, 36% in Baluchistan, 16% in KPK, 42% in FATA, 38% in GB and 38% in AJK.

Bashir, et al. (2012) has examined the status of food insecurity in the rural areas of Punjab, Pakistan. Study has used primary as well as secondary data. Primary data was collected through stratified sampling technique from 12 districts of Punjab using questionnaire. While secondary data was collected from Government of Pakistan (2011), world bank (2011), Food and Agriculture organization (2011). Food insecurity was analyzed in two phases. In the first phase, food security trends were observed at national level. In the second phase a seven-day recall method was used to find out the food security status of landlessness households by calculating their per capita calories intake. Two threshold level of food security were used i.e., FAO (1770/day/person, (FAO, (2007)) and GOP (2450 kcal/day/person (GOP, (2003)). Findings from general trends has shown that cereals such as rice, wheat, barley, and maize contribute major portion toward dietary intake. In 2001 to 2004 the availability of wheat remained below its consumption demand because of wheat crises. According to FAO threshold level almost 94% of respondents were food secure at national level. On other hand GOPs food security line was calculated for rural households. About 23% of rural households were food insecure. The reason behind higher food insecurity at rural households where the laborers belong to lowest income groups as more calorie's requirements were needed to laborers than job worker.

Asghar and Ahmad (2013) has investigated the incidence of food insecurity for both general and farmer households in Pakistan, at regional and at provincial level. Latest data set was collected from Pakistan social and living standard measurement (PLSM) during the period of 2007-08. Calorie consumption method was used. Result has shown that in Pakistan, 50.4% of general households and 39.5% of farming households were food insecure. At provincial level, food insecurity was found to be highest among general and farming households in Sindh i.e., 60% and 58%. While Punjab had the lowest general (i.e.,42%) and farming (i.e., 30%) food insecure households. At regional level, proportion of general food insecure households (i.e., around 52%) at urban areas were more food insecure than rural areas (i.e., 48%). The current analysis concluded that food insecurity was lower in farming households than in general households.

Rasul and Hussain (2015) has examined the status of food insecurity for Pakistan including plains (Punjab and Sindh) as well as mountains (Baluchistan, FATA, AJK, KPK and GB). The data was collected from Planning and Development Department, Northern Areas (2003), Ministry of National Food Security and Research (2013), KPK Bureau of Statistics (2011), Government of Gilgit-Baltistan (2007). Results has shown FATA (79%), AJK (77%), and GB (46%) were highest food

deficient among five mountain Administrative Units. Mountainous areas were commonly food deficient in the production of pulses and cereals which contribute 50 percent of calories intake. In Punjab 38.5% of population was food insecure with net availability of food as 3,022 kcal/day/per capita. While in Sindh province 44.3% of population was food insecure with net availability of food as 2,563 (kcal/ day/ capita). Food insecurity was higher in mountain areas rather than plains because of socioeconomics and biophysical factors. Statistics has shown that 61.2% in Baluchistan, 67.7% in FATA, 56.2% in KPK, 46.9% in AJK and 52.4% of population in GB were food insecure in Pakistan.

Aziz and Iqbal (2016) has conducted research at provincial level in Pakistan. Data was gathered through HIES during the period of 2010 to 2011. Head count ratio, food insecurity gap (FIG) index and squared food insecurity gap was constructed to examine the status of food insecurity at household using the recommended calorie requirement approach. Study has revealed that 67% of households in Pakistan were food insecure. On average the threshold level for calorie availability was 1803 kcal/per adult in Pakistan. The food insecure households in Pakistan were 24% fall short of their subsistence calorie requirement with 7.69% severity of food insecurity. At provincial level, Sindh ranked first among provinces with 76% of food insecure households. Food insecure households were 27% below their threshold level i.e., 1732 kcal/ per adult with highest 9.22% severity of food insecurity. Khyber Pakhtunkhwa ranked second with 65% of food insecure households. Food insecure households cannot be able to meet 20% of their subsistence calories requirement (i.e., 1894 kcal/ per adult) with 6% severity of food insecurity. Punjab ranked third among provinces with 64% of food insecure households. On average these food insecure households fall below 23% their recommended subsistence calories threshold level i.e., 1804 kcal/per adult with 7.7% severity of food insecurity. Baluchistan ranked fourth among food insecure households with 63% of food insecure households. The recommended availability of calories requirement was 1836 kcal/per adult. Food insecure households cannot be able to meet 23% of recommended calories with 6.7% of depth of food insecurity.

Cheema and Abbas (2016) have assessed the incidence of food insecurity at National and Regional level in Pakistan. Data was collected from Pakistan Social and Living Standard Measurement (PSLM) for the period of 2010-11. Food security index methodology was used for the incidence of food insecurity at household level. In addition, Foster-Greer-Thorebecke (FTG) index was used to measure severity and food insecurity gap for Pakistan. Study has revealed that 28.63% of

households were food insecure at national level. In contrast, food insecurity at regional level was higher (30.71 percent) in rural zone than in urban areas (24.47 percent). Possible reasons for the increase in rural areas were lack of information on food utilization and lack of income generation opportunities. Beside this 5.28% of food insecurity gap was found in Pakistan. According to the relevant analysis, food insecurity gap was very small in Pakistan. On contrary, Food insecurity gap was lower in urban areas (i.e., 4.4%) than in rural areas (i.e., 5.72%). Moreover, the study has claimed that if government takes some remedial measures, the food needs for food insecure households can be met.

Ahmed, et al. (2017) has analyzed food security status for small farming households in Punjab province. The study was primarily addressed in Punjab province because of its large share in the cereal production and its major contribution towards national agricultural GDP of Pakistan. Multi-stage stratified sampling technique was used to gather the data from 576 farm households. Dietary Intake Assessment (DIA) method was employed because of the small farming households with lowest income. Study has shown that more than 78% (three-fourth) of farming HH were found to be food secure out of which fully food secure farming HH was 48% while 31% of farm HH was observed at the edge of food security, falling neither above nor below the threshold (2450 kcal/day). On other hand, 21% (one-fourth) of HH were food insecure with 0.047 and 0.2092 was total food insecurity gap (TFIG) for per and all households. Squared food insecurity gap (SFIG) was 0.060. Farmers observed that 79% increase in food prices, 53% crop diseases, 44% shortage of irrigation water and 35% rise in health expenses were major livelihood issues. Other livelihood issues observed by farmers were rise in debt, unemployment, and bad climate.

Ishaq and Khalid (2018) has analyzed the regional trends of food insecurity in Pakistan during 2004-16. HIES data set was used. Dietary Energy Consumption (per adult equivalent) methodology was used to measure food insecurity at household level. According to the study, from 2004 to 2005 Pakistan had 30% food insecurity. While in urban areas it was more than 40% and in rural areas it was around 25%. From 2007 to 2008, there were increasing trends in food insecurity. In 2011, food insecurity was reduced to 30% in Pakistan. By 2014 the trends were on the rise again and in the last year food insecurity had reached 25% at national and regional level. Statistics has shown that food insecurity in Pakistan was reduced by 5% from 2004-05 to 2014-16. The analysis found that increasing trend in food insecurity is because of natural disasters and rising prices. Results also showed that food insecurity is higher in urban areas than in rural areas. At provincial

level, 37% of households in Sindh were food insecure during the year 2004-05 while this rate decreased to 27% in 2015-16. In Baluchistan 2004-05, 33% of households were food insecure and in 2015-16 food insecurity increased to 47%. Baluchistan had more fluctuations than any other province. In Punjab food insecurity was reported 30% in 2004-05, it increased to 33% in 2013-14 then it was 30% again in 2015-16. Khyber Pakhtunkhwa had the lowest food insecurity in 2004-05 i.e., 17% it decreased to 12% in 2015-16.

Asim, et al. (2018) conducted the study to measure food insecurity status in case of Pakistan. Data was gathered from FAO for the period of 1990 to 2013. Food security index (FSI) was used to measure food insecurity at household level. Four indicators such as Food self-sufficiency index, Food production per capita index, Real food price index and Food availability per capita index were used for the construction of FSI for Pakistan. Results has shown that food insecurity fall from 26% in 1991 to 19% in 2013. Food security index has shown that, in spite of increase in food production or accessibility of food, the food security situation has deteriorated over time in Pakistan. The main reason for the deterioration of food security is the growing population.

Study by Hashmi, et al. (2019) has assessed food insecurity trends in case of Pakistan and at regional level. The study was based on the previous studies in a sense that it has covered the two hike periods (2007 and 2011) of food prices. Pooled data has been collected from HIES for the period of 2005-06 to 2013-14. Daily minimum caloric intake required per person method was used. Results has shown that in Pakistan there was a continuous increasing trend in food insecurity over the last 10 years. In 2005-06, 58% of households were food insecure, this percentage increases to 77.4% in 2013-14. Urban and rural areas in Pakistan have also shown the similar trend but the ratio of rural region is less than urban region. Statistics has shown that 82.2% of households in urban areas while 74.9% of households in rural areas are food insecure for the period of 2013-14.

Babar (2020) has conducted research for Pakistan and at provincial level. To measure the status of food security at household level an index was formed based on calorie requirement (per day/per person). Head count ratio was calculated to measure the incidence of food insecurity. Consumption data was gathered from latest data set of Household integrated economic survey (HIES) for the period of 2015-16. Researcher had discovered that 70% of the population was food insecure in Pakistan. At provincial level, Baluchistan had highest level of food insecure households i.e., 85%. In Sindh 75% of households were food insecure, while 70% in Punjab and 55% in Khyber

Pakhtunkhwa. Food insecurity gap was also calculated to address the severity of food insecure households. Results has shown that food insecure households in the country fell 20.21% below the threshold level i.e., 2150 kcal/per day/ per person. Khyber Pakhtunkhwa had the lowest rate (1.27%) of food insecurity gap among all provinces, while Baluchistan had the highest calories short fell of 37%. Sindh and Punjab had a food insecurity gap of 24% and 21%.

Another study by Hameed (2020) has been conducted in Pakistan at regional level. Minimum dietary energy requirement (MDER) technique was used to estimate food insecurity status. Primary data was gathered from HIES (2015-16). Result has shown that about 38% of households were food deficient at national level. About 40.5% and 36.7% were in rural and urban areas. Provincial level outcomes showed that 50 percent in Baluchistan, 41.2 percent in Punjab, 35.8 percent in Khyber Pakhtunkhwa and 35.3 percent in Sindh households were those whose calories requirement were more than their consumption. Study claimed that the status of food insecurity would improve if the Government of Pakistan introduce social safety projects.

Iqbal, et al. (2020) has conducted a study in Pakistan's Sub-Saharan areas of lower Sindh to analyze the status of food insecurity among child laborers. This is the first study in Pakistan to analyzed food insecurity among child laborers working in various fields. Data regarding nutrition and sociodemographic was obtained through questionnaire from the period of May to November 2017. Five to fourteen years old Child laborer working in vegetable market, agriculture, restaurants, domestic work, and hotels were chosen as a respondent in sampling technique. Results has shown that 51.1% of children were victim of food insecurity. 15.5 percent of children were suffering from stunted growth, while 30 percent children were wasted. The incidence of stunting was highest (27.2%) among children working in agriculture, while the incidence of wastage was highest (35%) among migrant child laborers working in market.

Sheikh, et al. (2020) has analyzed the adolescents status of food insecurity in rural Sindh, Pakistan. Data was collected through cross sectional survey starting from 2015 to 2016. It was a descriptive study based on questionnaire, all the information regarding food insecurity status was collected using Household Food Insecurity Access Scale (HFIAS). HFIAS has nine fundamental questions in accordance with food intake throughout the most recent four weeks (30 days). Study has revealed that 61% of households and 47.6% of adolescents were food secure. 15.1% of households and 14.4% of adolescents were victim of mild food insecurity. whereas 16.8% of households and 33.4% of adolescents have experienced moderate food insecurity. There were 7.1% of households and

4.6% of adolescents with severe food insecurity. Total 52.6 percent of adolescents were food insecure as compared to 39 percent of households. Study has also observed that boys were more food insecure than girls as they consume less food than their requirement.

In Table 3.1 we have summarized all the studies with their region and period of analysis that have measured food insecurity in case of Pakistan.

Table 3. 1 . Studies Measuring Food Insecurity in Pakistan

Study	Period of analysis	Region
Ahmad, et al. (2004)	2001-02	Tehsil Depalpur of District Okara, Pakistan
Ansari, et al. (2006)	2000	Urban areas, Pakistan
Hussain and Routray (2012)	2006	Pakistan
Bashir, et al. (2012)	2011	Rural areas, Punjab
Asghar and Ahmad (2013)	2007-08	Regional and provincial level, Pakistan
Rasul and Hussain (2015)	2003-13	Plains (Punjab and Sindh) and mountains (Baluchistan, FATA, AJK, KPK and GB)
Aziz and Iqbal (2016)	2010-11	Provincial level, Pakistan
Cheema and Abbas (2016)	2010-11	National and provincial level, Pakistan.
Ahmed, et al. (2017)	2017	Punjab, Pakistan
Ishaq and Khalid (2018)	2004-16	At regional level, Pakistan.
Asim, et al. (2018)	1990 to 2013	Pakistan
Hashmi, et al. (2019)	2005-06 to 2013-14	Pakistan
Babar (2020)	2015-16	Provincial level, Pakistan
Hameed (2020)	2015-16	At regional level, Pakistan.
Iqbal, et al. (2020)	2017	Sub-Saharan areas of lower Sindh, Pakistan.
Sheikh, et al. (2020)	2015 to 2016	Rural Sindh, Pakistan

If we examine all these studies, there are very few who have analyzed the incidence and severity of food insecurity at the provincial and regional level in Pakistan. Dynamics of consumption have also changed. There is hardly any study conducted on the latest data set. Even the last study has used the data set during the period of 2015 to 2016. HIES latest data set is on 2018-19 and no study has worked on it. While the focus of all the studies was on measuring food insecurity instead

of distribution. Now in the next section we will discuss the studies that worked on the correlates of food insecurity in Pakistan.

3.3. CORRELATES OF FOOD INSECURITY IN PAKISTAN

In this section we will present summary of the studies worked on determinants food insecurity in Pakistan. In Pakistan many studies have been conducted that worked on the determinants of food insecurity in Pakistan.

Hakeem and Shaikh (2003) has conducted research in the district (i.e., North-Nazimabad, Nazimabad, and Federal Area, North Karachi and Liaquatabad) of Karachi, Pakistan. Data was collected through cluster sampling started for the period of 13 February 2001 till 23rd April 2001. Questionnaire was used as the research tool in which several questions were asked from the respondents. Per capita calorie availability methodology was used to access the status of food insecure households. Findings has shown that low-income households residing in urban areas of Pakistan increases the chances of food insecurity. As these households spent less income on food expenditure due to which children also suffer from stunted growth. Furthermore, Poor intake of milk, meat and fruits also lead to an increase in food insecurity status. On other hand, provision of health care and better education decreases the chances of food insecure households.

Iram and Butt (2004) has explored the determinants of food security for Pakistan. Data was gathered from Pakistan Integrated Household Survey (PIHS) (1999). Direct calorie intake method was used to assess the status of food security. For this purpose, daily calorie intake (per capita) was calculated by summing up the quantity consumed of every food items. All the food items were incorporated whose data was available in PIHS (1999) survey and converted the food intake into calories by using Food composition table (Government of Pakistan, 2001). Through this Per capita calorie intake was generated as a dependent variable. Dependency ratio, toilet facility, households' occupancy status, availability of piped water, mother's years of schooling, mothers age, and annual income of households were taken as independent variables. Ordinary least square technique was applied to estimate the determinants of food security. Findings has shown that mother age has positive significant impact on the per capita calorie intake of household. As mother gets older, she becomes more experienced in the calorie consumption of household members in accordance with their age, gender, and job. Annual income of the household, safe

drinking water, urban region and per capita rooms has also shown the positive impact on the availability of per capita calorie intake of household. Similarly, unavailability of sanitation facility, dependency ratio and provincial dummies (i.e., Punjab, Sindh and N.W.F.P) showed negative impact on per capita calorie intake. Poor sanitation system causes many health-related problems such as diarrhea and for recovery household members need more per capita calories intake.

Ansari, et al. (2006) has explored the determinants of food insecurity among children's residing in urban areas, Pakistan. Data was gathered from cross-sectional survey through structured questionnaire during the period of 2000. Parental characteristics such as no formal schooling of mother (odds ratio, 3.2; 95% confidence interval) and father (odd ratio, 2.1; 95% confidence interval) increased the likelihood of children with stunted growth. Girls were more likely to become the victim of stunted growth than boys (odd ratio, 2.4; 95% confidence interval). Furthermore, age distribution played no significant impact on the difference in stunted growth between girls and boys. Feeding (i.e., the child with family food; odd ratio, 2.1; 95% confidence interval) and childcare practices played a significant impact on the stunted growth of children. Household food insecurity adjusted with effects of age (adjusted odd ratio, 2.9; 95% confidence interval) were strongly related with stunted growth. Study has revealed that prevalence of stunted children has increased with age. Survey asserted that both parents' years of schooling and maternal education were assets to proper nutrition, growth, and survival of their children. As the educated women have more knowledge regarding hygiene and health care activities.

Ejaz, et al. (2009) have conducted research in 120 districts of Pakistan, at provincial level, Azad Jammu, and Kashmir, FATA and in Northern areas. Three part of food insecurity such as food availability, consumption and absorption have been taken in investigation. Districts have been classified on the basis of three components of food insecurity. Data was collected from Social Development Policy Institute (SDPI) 2003. Ordinary least square technique was applied to estimate the determinants of each part of food security. Results has shown that production of grains (rice, maize, pulses, wheat), milk, poultry meat, fruits, oilseeds, and fish were positively related with food availability in rural areas. Factors such as adult literacy, male and female attending school, marginal cultivators and electrified houses played an important role towards the food accessibility in rural areas when they were available in districts. In the same way factors such as female literacy, immunization, no of hospitals, locality of district and safe drinking water showed an impact on food absorption in rural areas. Furthermore, study also revealed that 67%

of districts were food insecure. Among these food insecure districts, about 46% of households were extremely food insecure.

Sultana and kiani (2011) has analyzed the status of food security at household level in Pakistan, at provincial and at regional level. Primary data was collected from PSLM for the period of 2007-08. Binary logit model was used for estimation purpose. Results of binomial model has shown that negative coefficient of urban region of residence depicts that one unit increase in urban residence decreases the household food security by 0.407 units. Dependency ratio showed a negative impact on household food security with 1% level of significance. On other hand head educational level higher than intermediate level increases the probability of household's food security by 0.353 units. While social capital showed the insignificant impact on household's food security status.

Bashir, et al. (2012) has explored the socio-economic factors that contribute towards the food security at rural household. Primary data was collected through stratified sampling technique from 12 districts of Punjab using questionnaire. While secondary data was collected from Government of Pakistan (2011), world bank (2011), Food and Agriculture organization (2011). Both Binary logistic model and Multinomial model was applied. Monthly income of households, Total no of earners, small ownership of asset and intermediate level education showed a significant positive impact on the rural household's food security status with 1% significance level. While household size, head age and family structure showed a significant but negative impact on food security. Interpretations of multinomial model were made on the basis of coefficient of variables. Households with higher income ranges from Rs. 5001 to Rs. 10,000 were 15 times more probable to become food insecure as compared to households with no net income. Head age is an important indicator of its capability to do something. As the head of household became older (i.e., above 35 years) it reduces the chance of household to become food secure by 83%. Households with more than 4 family members were less likely to become food secure. Heads who have completed more years of schooling (up to intermediate) were more probable to become food secure. Livestock owned households (i.e., small animals) were 37 times more likely to become food secure as compared to the households with zero milking animal.

Similarly, another study by Asghar and Ahmad (2013) has also analyzed the socio-economic determinants of food insecurity for farmer and general households in Pakistan. Data was gathered from PSLM (2007-08). Logit model was used to investigate the determinants of food insecurity in

Pakistan. Partial effects were estimated to examine the effect of change in single variable on the probability of household food insecurity status by keeping all other variables constant. Dependency ratio, number of rooms, Head education, log of annual income, agriculture income, household size square and house occupancy status were negatively associated with food insecurity. While household size and head age were positively associated with food insecurity. Findings from significant continuous variables partial effects has shown that one unit increase in annual income decreases the probability of general food insecure households by 27.56% and farmer households by 13.29 %. A unit increase in number of rooms decline the probability of food insecure households (7.56% for general, 3.01% for farmer). Similarly, a unit increase in education decline the probability of food insecure households by (1.56% for general, 9.09% for farmer). It was concluded that income, education, and household size were the important factors contributed towards food insecurity status. Education opens up new opportunities for earning a living. On other hand due to the large number of members in a household, people do not have the access to the required calories.

Mahmood, et al. (2014) has investigated the determinants of food security in the rural areas of Faisalabad, Pakistan. Multistage sampling technique was applied to gather the data. It was descriptive study based on questionnaire in which several questions were asked from the respondents for investigating the factors effecting the household food security status. Results has shown that 10,000 to 15,000 of the monthly income was spent on food expenditure. In other words, household income increases the likelihood of food security status. Their also exists a strong positive association between income of respondent and their knowledge regarding food security. The possible reason was that highest income growth was related to the education of the members. As the members are more educated, they have more knowledge about balance diet which enhances food security status. Furthermore, it was also found that there exists a strong association between respondents age and their knowledge regarding food security. This showed that youth and literate people have more awareness regarding healthy diet than aged and illiterate respondents.

Study has been conducted by Ashfaq and Razzaq (2014) to investigate the factors effecting the household food security status in rural areas of Faisalabad. Researchers gathered the data themselves in 2012 by using stratified random sampling technique. It was a descriptive study based on questionnaire in which several questions were asked at household level. To compare

food security to different segments of the population, respondents were classified as female, farmers, and workers. Logistic model technique was used. Findings has shown that better education increases the probability of households to be food insecure. While health expenditure decreases the chances of food security status. Health expenses indicates that the health of members was deteriorating due to not getting the required calorie intake of the food, which further led to increase in expenses and lessen the expenditure on food items. other factors such as age, gender, household size and loan were insignificant on households' food security status.

Aslam and Rasool (2014) has investigated the major factors influencing the food security status in Lahore, Pakistan. Data was collected through questionnaire based on the sample of 90 respondents during the period of 2013. Ordinary least square technique was used. The result has shown that electrified houses, employed persons, consumption (milk, fruits, and grains) and safe drinking water showed the positive and significant impact on household food security. Clean drinking water has a huge impact on human health as lack of clean drinking water spreads many diseases such as diarrhea and cholera etc. Therefore, safe drinking water ensures food absorption which causes positive impact on food security status. Electrified houses represent the prosperity of household and its economic power which ensures food security. On contrary infant mortality, size of households and sick persons showed significant and negative impact on food security status. Large household size reduces the expenditure on food which ultimately led to food insecurity. The reason for the number of sick people in the house was lack of nutritious food and poor hygiene. Furthermore, infant mortality also lessens expenditure on health and healthy food.

Aziz and Iqbal (2016) analyzed the causes of severity of food insecurity at provincial level in Pakistan by utilizing the latest data set of HIES (2010-2011). Logit model was used to estimate the factors affecting household food insecurity status. Six explanatory variables were incorporated as the determinants of household food insecurity status. Findings has shown that the households heads who have attained higher level of education than twelve years of schooling were more probable to decrease the household food insecurity status by 32%. No of rooms (per adult equivalent) was an important indicator in knowing the wealth status of household. odd ratios showed that expansion in average housing decreases the probability of household's food security by 90%. Households with a secondary source of income and a male as a head were (odd ratio 34% and odd ratio 5%) less likely to experienced household food insecurity. while on other hand

dependency ratio and household size were (odd ratio 12% and odd ratio 6%) positively associated with household food insecurity.

Cheema and Abbas (2016) explored the determinants of food insecurity in Pakistan. Data was gathered from PSLM during the period of 2010 - 2011. Logistic regression results have shown that female head, livestock, foreign remittance, and head education were negatively related with food insecurity status. Education played an important role in enhancing knowledge, skills and more income generating opportunities. Therefore, education declines the food insecurity status. Household with live ownership decreases the probability of household to be food insecure by 0.54 times in accordance with households who do not have any livestock ownership. Foreign remittance decreases the chances of food insecurity by 0.287 times. Remittances has led to increase in income and more food consumption. Analysis also concluded that households headed by female were less likely to be poor than those headed by men. While on other hand poverty increases the household food insecurity status by 28.82 times. In urban areas head education, livestock ownership, foreign remittances and female head played a significant (p < 0.01) and negative impact, while poverty played a positive impact on food insecurity status. Findings were similar in rural areas of Pakistan.

Ahmed, et al. (2017) has investigated the determinants of household's food security status for small farmers and the role of markets in boosting the food security status for rural areas. Data was gathered from 576 households using questionnaire during the period of (1970 to 2001). Logistic regression results have shown that factors such as monthly income, family size, health expenses, food prices and debt were contributing towards the food security status for rural households. Increase in household size by one unit decreases the probability of household food security by 10%. Increase in household size has a devastating effect on food security due to limited resources. Distance to road and transportation cost both were the strong indicator of market accessibility and availability to food. Distance to road showed a negative impact on the status of food security. One unit increase in distance to road decrease the chances of food security by 2%. Interestingly, Distance to road make a big difference in farmers income as they need labor and resources for the selling of their products which indirectly effects the food security status. Increase in health expenses decreases the household food security status by 10 to 12%. Poor sanitation system contributes towards the increase in health expenses. On contrary, rising food prices and debt adversely effects small farming households' food security status.

Sher, et al. (2018) examined the determinants of food insecurity in Khyber Pakhtunkhwa, Pakistan. Primary data was gathered through questionnaire. The screening questions approach was implemented to collect the information from 200 households. Binary logistic regression technique was applied for data analysis. Results has shown that farm and non-farm income, household head employment status have significant and positive association with household food security status. Conversely household size, distance from road, distance from food market and livestock value were inversely correlated with household food security. The farther a household is from the road, the higher the cost of transportation to get food from the market. Another reason for the outcome was that there were less chances to start your own business if the distance from the market was too long. Large household size reduces the probability of household to become food secure because there were many households with only one earner who bear the burden of all the members of households. On other hand family type, head age and dependency ratio were statistically insignificant on household food security status.

Another study by Abdullah, et al. (2019) was conducted in northern rural areas of Pakistan. Simple random sampling technique was applied to collect the data from 294 households from period starting from June 2016 to July 2016. Logistic model technique was used to show the relationship between dependent and independent variables that are speculated to influence the outcome. Results were interpreted on the basis of odd ratios. Gender, age, education, remittances, unemployment, inflation, assets, and disease played a significant role on the status of food security. Positive coefficients of Head age, remittances, inflation, and asset showed that odd ratio increases as the explanatory variables increases. On contrary, the negative coefficient of unemployment status of household members, gender and education of household members showed that odd ratios decrease as explanatory variables decreases. While other independent variables such as household size, distance from main road, livestock ownership, credit, market access, food aid, food price, money, flood, and drought were found to be insignificant. The study is based on descriptive statistics and found that about 80% of respondents were hopeful that the prescribed factors did not affect their household food security while the rest of 22% were going to be hopeless in near future.

Hashmi, et al. (2019) has explored the determinants of food insecurity in Pakistan. Primary data was gathered from HIES during the period of 2005 to 2014. Heckman two stage approach was used for the correction of sample biases caused by sample selection technique. The basic

assumption underlying this approach was that it targets the non-selected variable. In the first stage binary logistic model was applied. While in the second stage OLS technique was applied to correct the biasness that arise from restricted sample of food insecure households. Household size, female head, members with primary education, urban residence, electrified houses and poverty status were significant and positively associated with food insecurity status. On contrary head education, head age, members with different education level, production of food crops, assets value, livestock ownership, remittances and products produced by livestock were significant and reduces the chances of household to be food insecure.

Babar (2020) has analyzed the factors affecting the household food insecurity in Pakistan. Logistic regression technique was applied to estimate the determinants of food insecurity. Data was collected from HIES 2015 to 2016. Gender of head (male), Age of HH head, Expenditure, annual income, education, agricultural land, and cash transfer (Benazir Income Support Program) showed significant and positive impact on household food security status. On contrary as the household size increases it decreases the likelihood of household to be food secure. The older the head of the household, the more experienced he is and was on high post. Pakistan is a male dominant society and most of the expenses were borne by male head of household. Cash transfer enhances the wellbeing of the household, it also helped poor families as they can easily meet their household expenses. Increase in food expenditure improves the health status of members which increases the chances of household food insecurity status. Households with agriculture land ownership have less food expenditure as most of the food needs were met from home.

Hameed (2020) has explored the socio-economic factors of food insecurity with reference to Pakistan. Data was gathered from the latest data set of HIES 2015-16. Logistic model was used to estimate the causes of food insecurity. Findings has shown that head age and a male-headed household increases the probability of household to be food insecure by 1.03 and 1.37 odds generally. According to the analysis, women-headed households were better able to manage household's expenses and utilizes the resources efficiently. On other hand households' material resources such as agricultural land and livestock ownership decrease the probability of households to be food insecure by 0.97 and 0.92 odd ratios. Positive coefficients of household size, and overcrowding ratio also contribute towards the food security status. While increment in heads education lessen the chances of food insecurity. Family head schooling produces enhanced

income generation opportunities and better quality of living in contrast with less educated head of families.

Sheikh, et al. (2020) examined the determinants that causes adolescents food insecurity. Data was gathered from cross sectional survey in Hyderabad during the period of 2015 to 2016 June. Prevalence ratios were estimated to examine the association between socio demographic determinants and adolescents food insecurity by applying cox regression. Study has revealed that coefficient of gender contributed statistically significant impact on adolescents food insecurity. While age of adolescents, father or mothers education status, size of household (total number of siblings) and socio-economic status (i.e., middle, low, and high) were statistically insignificant.

Hameed (2020) has investigated the impact of socioeconomic factors on the status of food insecurity in Pakistan. The data was gathered from HIES (2013-14) and Households Integrated Income and Consumption Survey (2015-16). Bayesian logistic regression technique was used. Food security variable was generated by taking the difference between daily (kcal/adult/per capita) requirement and consumption. Income, parental and maternal employment, agricultural employment, agricultural land, livestock ownership, higher education and urban residence showed positive and significant impact on food security status. The possible reasons were employment opportunities as a source of income which leads to prosperity. If both parents were earning, neither one is burdened, and the household expenses were shared. Households engage in farming has an easy access to food. In urban areas, people are more educated and have more sources of income. Furthermore, they have more knowledge about balance diet. Dependency ratio decreases the chances of household food security status. On contrary, primary, and middle education of paternal, household head age, household size and marital status showed insignificant impact on food security status.

In Table 3.2 we have presented the summary of all factors/ determinants incorporated by above studies.

Table 3. 2 Determinants of Food Insecurity Considered by Various Studies in Pakistan

Study	Determinants of food insecurity
Hakeem and Shaikh (2003)	Head education, Income of household, Region, number of hospitals.
Iram and Butt (2004)	age, education, Income of household, dependency ratio, house occupancy status, number of rooms, Provincial dummies, toilet facility, safe drinking water
Ansari, et al. (2006)	Education, Gender of children, food availability, children age.
Ejaz, et al. (2009)	Literacy rate, female attending school, male attending school, Food availability, immunization, Locality, electricity facility, number of hospitals, provincial dummies, safe drinking water, marginal cultivators
Sultana and kiani (2011)	Education, income of household, dependency ratio, Region.
Bashir, et al. (2012)	Age, education, Income of HH, Earners, house occupancy status, HH size, livestock asset (large), livestock asset (small).
Asghar and Ahmad (2013)	Age, education, female education, income HH, dependency ratio, dwelling type, house occupancy status, number of rooms, household size, safe drinking water, region, electricity facility, provincial dummies.
Mahmood, et al. (2014)	Household education, income of household, household member age
Ashfaq and Razzaq (2014)	Age, gender, Household size, Household expenses, loan
Rasul and Hussain (2015)	educated persons, employed persons, household size, sick persons, children going to school, infant mortality, consumption of major items safe drinking water, electricity facility
Aziz and Iqbal (2016)	Education, gender, Dependency ratio, household size, Number of rooms, household secondary enterprise
Cheema and Abbas (2016)	Education, gender, Remittances, livestock asset (large) and livestock (small), Poverty status
Ahmed, et al. (2017)	age, education, Income of households, earners, household size, Monthly food expenses, employment loss, health expenses, Distance from food stuff market, distance from main road, transport cost, food price, debt, crop disease, irrigation water and bad climate
Sher, et al. (2018)	age, employment status, Income of households, dependency ratio, household size, household occupancy status, livestock asset (large) and livestock (small), Distance from food stuff market, distance from main road
Abdullah, et al. (2019)	Age, Gender, education, unemployment, disease, household size, livestock ownership, remittances, distance from main road, asset, inflation, credit, market access, food aid, food price, flood, drought
Hashmi, et al. (2019)	Age, gender, education, education of members, household size, livestock ownership, remittances, region, asset, electricity facility, poverty status, production of food crops, livestock production
Babar (2020)	Age, gender, Income of household, household size, Monthly food expenses, annual savings, safe drinking water, cash transfer, Agricultural land
Hameed (2020)	Age, gender, education, no of rooms, household size, Toilet facility, livestock asset (large), livestock asset (small), access to clean cooking fuel, Agricultural land, region, distance from main road, poverty status.
Sheikh, et al. (2020)	Paternal education, maternal education, Female attending school, male attending school, gender of children, household size, children age, Socio-economic status

It has examined that various studies have included socio-economic and demographic factors in their analysis that contribute to food insecurity such as age, head gender, head education, region of residence and dependency ratio. Dependency ratio showed the positive impact on household food insecurity while region of residence in rural areas and head education decreases the chances of household to be food insecure. In addition to these variables' consumption inequality and mean calories consumption are one of the most important variables that these studies have not reviewed. In the next section we will present the literature gap in which we are going to accomplish and summarize the whole discussion.

3.4   CONCLUSION AND LITERATURE GAP

In this chapter we have presented the summary of studies that have worked on the measurement and determinants of food insecurity in Pakistan. Numerous studies in Pakistan have measured food insecurity, as per our knowledge no study has yet been found in the literature that has worked on the latest dataset. There is a great need in Pakistan for studies that work on measuring food insecurity using latest data set. Different approaches have been used to measure food insecurity. But hardly any study incorporated food loss in their studies. Further it would also be interesting to analyze that what is the role of gifts and assistance in food security, no study has considered this dimension. Furthermore, inequality is also an important determinant of food insecurity, but there is hardly any study that has explored the impact of inequality in food insecurity. The present study is an attempt to fill these gaps.

Chapter 4

ANALYTICAL FRAMEWORK

4.1   INTRODUCTION

Food insecurity is a complex issue. Analytical framework has been created to explain the analytical basis for the prevalence and correlates of food insecurity in Pakistan. This chapter comprises of four sections. The first section 4.1 is on introduction of analytical framework. The second section 4.2 is on region and their period of analysis. Third section 4.3 tells us about the dimensions of present study. Finally, last section 4.4 concludes the whole analytical framework.

4.2   REGION AND PERIOD OF ANALYSIS

We have conducted the study of food insecurity in case of Pakistan. Due to the economic disparities among different areas, the situation regarding food insecurity varies from area to area. To analyze this situation at a vast level we have conducted our study at regional as well as provincial level within Pakistan. In specific we shall analyze food insecurity in in all provinces and Pakistan overall with rural and urban distinction. The study is based on the micro data of the latest round of Household Integrated Economic Survey (HIES) for the 2018-19. A detailed discussion of data source is given in chapter of Data and Variables. In the next section, we will explain the dimensions of our current study.

4.3   DIMENSIONS OF RESEARCH

In this this study we shall analyse food insecurity from various dimensions, such as first we shall measure the extend of food insecurity in all regions. After measuring food insecurity, we will analyse the distribution of food insecure households with respect to various dimensions. Finally, we will explore correlates of food insecurity in Pakistan.

4.3.1. *Measurement of Food Insecurity in Pakistan*

The first goal of present study is to look at the trends and measurement of food insecurity across Pakistan at regional (rural, urban) and provincial level. The first step in measuring food insecurity is to convert food intake into calories and then compare calories intake with the minimum required calories. These analyses are conducted in three ways; first we simply used the food calorie intake chart and worked out calories' intake at household level. Later on, we incorporated the food loss during consumption. Finally, we carried out analysis by excluding food intake from 'Gift and Assistance'. A detail of each approach is given below:

a) *Measurement of Food Insecurity by Converting Food Consumption into Calories intake using Calorie intake Chart (unadjusted analysis)*

To measure the food insecurity, we first convert food consumption to calories intake. Calorie intake chart is given in (Food Composition Table for Pakistan, (2001)) report by UNICEF Islamabad. This chart contains most of the food items calories intake that is reported in HIES. Complete information of food consumption is available in HIES data. This food consumption is converted into calories intake. To generate the annual required calories, we need the information about gender and age. For this purpose, we have utilized the equivalence scale chart constructed by Government of Pakistan (2003) showing minimum calories required with respect to age and gender. After calculating minimum required calories required and actual calories consumed, a household is categorized as food insecure if required calories are more than calories consumed.

b) *Measurement of Food Insecurity by Converting Food Consumption into Calories intake using Calorie intake Chart (adjusted analysis)*

Calories derived from food intake table inform us that these calories also account for a large portion of food loss e.g., if we buy 100 kg of meat, we never consume whole meat. As we lost a portion of food in the form of bones. Similarly, if we buy vegetables a large part of it also goes to the food loss. In the same way fruits skin and seeds are food wastage. Not all food groups include food loss, but some food groups such as vegetables, fruits, meat, and cereal are incorporate in food loss. In general, we have information

available on food group loss. We have taken food wastage information from de Laurentiis, et al. (2018) and Conrad, et al. (2018). In approach 2, only the edible portion of the food is included while the inedible portion such as bones, skin and seeds of various fruits and vegetables, particles in pulses all are excluded. We are purchasing raw items from market, so we have reduced their obvious loss and then extracted the new calories. After extraction of new calories, we repeat the whole analysis again. Basically, food loss was incorporated in this approach. In simple words the calories in approach 2 were adjusted with loss.

c). *Measurement of Food Insecurity by Converting Food Consumption into Calories intake using Calorie intake Chart (excluded gift or assistance)*

Consumption of calories obtained from food items in HIES is divided into four categories. The first category is labelled as 'purchased and consumed'. It includes calories that are consumed from food items that we purchase. The second category includes calories consumed from 'Own produced and consumed' items while the third category includes the consumption of food items we receive and consumed as in-kind income. The last category includes the food items received in the form of 'Gifts and Assistance'. In general gift and assistance is a help which is given to household in the form of donation. The consumption based on gifts and assistance do not reflect purchasing ability of household, it is neither purchased nor imputed income or own produced. In approach 3, we will not include the calories obtain from gift/assistance because we did not buy these things with our own income, nor did we make any effort to obtain them. The calories we get from these things make us artificially capable of consuming them. So, we want to analyse that if a person stops receiving such donations then what will be the situation. In simple words we consider food items that are either purchased, own produced or received as income.

4.3.2 *Distribution of Food Insecurity in Pakistan*
After classifying households in two broader categories called food secure and food insecure, we will analyze the distribution of household, especially food insecure households with respect to various dimensions, such as distribution of households with respect to food insecurity, distribution of food insecure household with respect to

household size and distribution of households with respect to number of earners. A detailed discussion on these dimensions is given in chapter 7.

4.3.3. Correlates of Food Insecurity in Pakistan

The third dimension of the present study is to explore the correlates of food insecurity in Pakistan. In this analysis we will analyse various socio-economic, demographic, and regional factors that may led to food insecurity in Pakistan. In this regard we shall divide households in two broader groups: food secure and food insecure. This analysis will enable us to understand how socio-economic, demographic, and regional factors cause food insecurity in Pakistan. A detailed discussion on correlates is carried out in next chapter.

4.4. CONCLUSIONS

In the present chapter we have presented the analytical framework that provides information on the region and period of analysis with emphasis on the dimensions of research. The present study is based on micro data of HIES for 2018-19. We will measure extend of food insecurity in Pakistan, its provinces and rural – urban segments of each province. After measuring food insecurity, we will analyze distribution of households with respect to various dimensions such as household size etc. Finally, we will explore the correlates of food insecurity in Pakistan.

Chapter 5

DATA AND VARIABLES

5.1 INTRODUCTION

Food insecurity is a situation in which households lack nutritious food for healthy living because of limited resources or money. In other words, Food insecurity exists when people cannot consume minimum required calories due to lack of resources. In this chapter we will discuss data and variables of the present study. This chapter has four sections. After introduction. the second section provides information about the sources of our data. The third section will tell us how we construct our variables. The last section is on the conclusion.

5.2 DATA SOURCES

The present study is based on micro data of the recent round of Household Integrated Economics Survey (HIES) conducted during 2018-19 which is collected by Federal Bureau of Statistics, Pakistan. HIES is the only country representative data on consumption of households. Its data is assembled as a team consisting of both enumerators i.e., male and female. Stratified two-stage sampling technique was used in survey.

Latest HIES (2018-19) stipulates important information on savings, liabilities, household income, consumption pattern, consumption expenditure, health, information communication technology, education, population welfare, food insecurity experience scale and housing at national and provincial level. Survey also gathers information regarding items consumed in accordance with classification of individual consumption of purpose along with income and other social indicators which covers both urban as well as rural areas of all four provinces. Total 24,789 households were covered in latest survey

Table 5.1 gives information regarding total number of households at regional and at provincial level.

Table 5. 1 Households in HIES (2018-19)

Region	Rural	Urban	Overall
Pakistan	15929	8860	24789
Punjab	7830	3934	11,764
Sindh	3497	2718	6,215
KPK	3035	1449	4,484
Baluchistan	1567	759	2,326

Table 5.1 gives well representative sample, covering significant number of households. In terms of region, rural areas are covering more households than urban areas. Similarly, if we look at the provinces, Punjab has the highest number of households and Baluchistan has the lowest number of households.

HIES provides a comprehensive information of household composition and consumption. The data covers detailed information of 134 food items which are broadly classified into following food groups:

i.   *Tobacco and Chewing Product,*
ii.   *Milk, Cheese and Eggs,*
iii. *Meat,*
iv.   *Fish,*
v.   *Fruits,*
vi.   *Dry Fruits,*
vii. *Vegetables,*
viii. *Condiments and Spices (whole and powder),*
ix.   *Sugar, Jam, Honey, Chocolate & Confectionery,*
x.   *Mineral Water, Soft drinks, Fruit & Vegetable Juice,*
xi.   *Readymade Food,*
xii. *Bread and Cereals,*
xiii. *Edible Oil and Fats,*
xiv. *Coffee, Tea and Coca,*

5.3.   CONSTRUCTION OF VARIABLES

In this section we will discuss the effectiveness of the variables we have included in our current study and how we have constructed them. This section divides into two parts. First part involves the construction of variables we have taken to measure food insecurity. In the second part, we have included the variables that cause food insecurity.

5.3.1. Construction of Variables for the Measurement of Food Insecurity

To identify a food insecure household, we merely compare actual calories consumed with the minimum required calories. A household is food insecure if the calories consumed are less than calories required. In this regard first step is to define unit of measurement for the estimation of minimum required calories. The next step is to calculate actual calories consumed. Comparison of required and consumed calories will give us the information that either household is food insecure or not.

a).   Unit of measurement for the estimation of minimum required calories

It is the known fact that consumption requirements vary with age, a child need more calories than an infant, teenagers need more than children and young need even more calories. Similarly, calorie requirements vary across gender, male and female of same age have different calorie requirements.[3] In this regard a common approach is to construct equivalence scales. Government of Pakistan (2003) has given a calorie intake chart showing minimum calories required with respect to age and gender for a normal healthy person, as shown in Table 5.2.

This calorie intake chart will be used to calculate minimum calories requirement for each household. For instance, a household with one boy of eight years, one girl of 16 years, women of 35 years and a man of 38 years need 8930 calories per day. Multiplying this by 365 will give annual required calories.

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[3] It is also to be noted that apart from age and gender, calories requirement depends upon physical activities undertaken by an individual. An active person needs more calories as compare to nonactive individual. Further healthy person also needs more calories than unhealthy person. It is the data limitation of HIES that no such information is available. Therefore, present study will consider age and gender as the only parameters of calorie intake.

Table 5. 2. Minimum Calories Requirements (Per Day)

Age Group	Males	Equivalence Scales	Females	Equivalence Scales
Less than 1 Year	1010	0.42979	1010	0.42979
1 Year to 4 Years	1304	0.55489	1304	0.55489
5 Years to 9 Years	1768	0.75234	1768	0.75234
10 Years to 14 Years	2816	1.19830	2464	1.04851
15 Years to 19 Years	3087	1.31362	2322	0.98809
20 Years to 39 Years	2760	1.17447	2080	0.88511
40 Years to 49 Years	3640	1.54894	1976	0.84085
50 Years to 59 Years	2460	1.04681	1872	0.79660
60 Years or more	2146	0.91319	1632	0.69447
National Average	2350			

Source: Government of Pakistan (2003)

b).   Annual Calories Consumed

The microdata of HIES provides a detailed information of all food items consumed by a household during a reference period. We already mention in previous chapter that there are 134 food items, divided into 14 food groups. The amount of food consumed is given in following categories:

- *Paid and Consumed, (consumption of food items purchased from market)*
- *Own Produced and Consumed, (consumption of food items produced at home)*
- *In kind Income Consumed, (consumption of food items, received as income)*
- *Gift and Assistance, (consumption of food items, received as gift / assistance)*

Calories consumed from all these sources are aggregated to get total calories consumed. Further consumption of food items is reported with following frequencies:

- *Fortnightly, (it includes all food items purchased during last two weeks. The perishable goods like milk, cheese, eggs, meat, fruits, and vegetables are included in this category)*

- *Monthly, (it includes all food items purchased on monthly basis. The non-perishable goods like biscuits, rice, wheat, pulses, cooking oil, tea, coffee and spices etc are included in this category)*

In order to calculate annual calories consumed we multiplied fortnightly consumption with 26.0714 and monthly consumption with 12. The calories associated with each food item is taken from Food Consumption Table for Pakistan (2001)[4]

c). Identification of Food Insecure Households.

Annual calories required are compared with the annual calories consumed and food insecure household are identified as follows:

$$HHS_j = \begin{cases} = 1 & ACC_J < ACR_j \\ = 0 & ACC_j \geq ACR_j \end{cases} \qquad (5.1)$$

Where, ACC_j are the annual calories consumed by jth household. ACR_j are the annual minimum required calories by jth household and HHS_j is the Household status with respect to food insecurity. A Household is food insecure if $HSS_j = 1$, and food secure if HHS_j is zero.

5.3.2. Construction of Variables for Correlates of Food Insecurity

After identifying food insecure households, the next task is to explore correlates of food insecurity in Pakistan. In this regard the present study shall explore the role of regional, demographic, and socioeconomic variables.

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[4] The Food Consumption Table for Pakistan (2001) covers most of the commodities reported in HIES. However, for very few commodities like canned food we collected information manually from superstores or different websites.

a).   Regional Factors

1. *Region of residence*
Region of residence basically shows the area/locality of households (e.g., urban, rural). Region of residence not only tells us about the area of a house but also shows the characteristics of that area. For example, food facility, health care facility, more job opportunity etc. This variable seems to be an important centre that can be associated with food insecurity. It is general perception that Pakistan is an agriculture-based country and all the agricultural products for instance cereals, fruits and vegetables are grown and produced in rural areas. On the contrary, most of the people in rural areas are working as a farmer and they get a share of crop as compensation, which do not solve their rest of problems like shelter, clothing etc. But the problem of access to food is solved. This is the reason that there is very little chance of food insecurity in rural area. On other hand, the agricultural products are not grown in urban areas and the people must go to the market to buy them so there is a greater chance of food insecurity. Hameed (2020) has included region as an independent variable in their studies.

As this variable is very important and we have considered it as a binary variable in our analysis with '0' for urban areas and '1' for rural areas.

2. *Consumption inequality*
Consumption inequality refers to the difference consumption patterns across households. High consumption inequality indicates huge differences in consumption. The area with high consumption inequality is likely to be more prone to food insecurity and vice versa. Consumption inequality can be measured in two ways; monetary terms or in terms of calories consumed. Variations in calories consumed are directly linked with food insecurity.

Therefore, the present study worked out consumption inequality by considering calories consumed as the unit of analysis. In this regard we have divided households into 29 zones, each zone represents an administrative division. For justifiable comparison of calories

consumed we worked out Per adult equivalent household calories consumed. The number of adult equivalents were calculated by considering equivalence scales given in Table 5.2.

In order to workout Per adult equivalent household calories consumed we calculated adult equivalents in a household and then divided total calories consumed by number of adult equivalents in a household. In specific following formula was used to calculate Per adult equivalent household calories consumed (PAEHCC):

$$PAEHCC \frac{\text{Calories Consumed by Household}}{\text{Number of Adult equivalents in a Household}} \qquad (5.2)$$

Finally, we worked out Gini Coefficient of Consumption inequality for each administrative division.[5] (Rao, 1969) gave following formula to calculate Gini coefficient:

$$G = \sum_{i=1}^{n}[P_i Q_{i+1} - P_{i+1} Q_l] \qquad (5.3)$$

Where P_i is cumulative population share of *ith* household and Q_i is the cumulative consumption share of *ith* household in the given administrative division. It is to be noted that population was measured in adult-equivalents and consumption as calories intake. The estimates of Gini Coefficient of Consumption Inequality for all administrative divisions of Pakistan are given in Table 5.3.

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[5] Gini Coefficient is one of the most common measure of inequality. It satisfy all desirable properties of a good inequality measure. For detailed description of Gini Coefficient see (Idrees and Eatzaz, 2017).

Table 5. 3 . Estimates of Gini Coefficient of Consumption Inequality

Province	Administrative Division	Gini Coefficient
Punjab	Malakand	0.3403
	Hazara	0.6063
	Mardan	0.2917
	Peshawar	0.4502
	Kohat	0.4672
	Banu	0.4157
	Dera Ismail khan	0.3836
Capital	Islamabad	0.5960
Punjab	Rawalpindi	0.4224
	Sargodha	0.4897
	Faisalabad	0.4675
	Gujranwala	0.5129
	Lahore	0.5771
	Sahiwal	0.4191
	Multan	0.2686
	Dera Ghazi Khan	0.2448
	Bahawalpur	0.2086
Sindh	Larkana	0.4296
	Sukkur	0.4914
	Hyderabad	0.3587
	Mirpur Khas	0.3591
	Karachi	0.5844
	Shaheed Benazir Abad	0.3420
Baluchistan	Quetta	0.4280
	Zhob	0.4472
	Sibi	0.4565
	Nasirabad	0.3785
	Kalat	0.4369
	Mekran	0.5823

3. *Mean consumption*

Mean Consumption is the average calories consumed by an adult equivalent in each administrative division. For mean consumption we have calculated Per adult-equivalent calories consumed (PEACC). It is obtained by dividing total calories consumed with the number of adult equivalents in administrative division:

$$\text{PAECC} = \frac{\text{Total Calories Consumed by all Individuals in Administrative Division}}{\text{Number of Adult} - \text{Equivalent in Administrative Division}} \qquad (5.4)$$

PEACC is an important determinant of food insecurity. In general, it is likely to have negative effect on food insecurity. The present study will consider mean consumption as another correlate of food insecurity, this will enable us to understand that how it effects the food insecurity. The estimates of Per-adult Equivalent Calories Consumed are reported in Table 5.4.

Table 5. 4. Average Daily Per-adult Equivalent Calories Consumed

Province	Administrative Division	Per Adult Equivalent Calories Consumed
Khyber Pakhtunkhwa	Malakand	3148.3
	Hazara	9754.1
	Mardan	3060.1
	Peshawar	3665.7
	Kohat	4126.5
	Banu	4179.8
	Dera Ismail khan	3821.7
Capital	Islamabad	5085.6
Punjab	Rawalpindi	3561.8
	Sargodha	4785.6
	Faisalabad	4418.8
	Gujranwala	4163.9
	Lahore	4886.0
	Sahiwal	3722.1
	Multan	3141.6
	Dera Ghazi khan	3226.4
	Bahawalpur	2635.7
Sindh	Larkana	3486.6
	Sukkur	4656.9
	Hyderabad	2999.2
	Mirpur Khas	3368.7
	Karachi	7494.6
	Shaheed Benazir Abad	3060.9
Baluchistan	Quetta	5734.5
	Zhob	5224.4
	Sibi	4528.0
	Nasirabad	3570.0
	Kalat	3599.9
	Mekran	6733.0

b)   Head Characteristics

1. Head Gender

The head of the household is not an elder, but the head of the household is the one who has the economic power in his hands who knows how to solve the big issues of the household. The characteristics of the head of household also play an important role in determining the status of food insecurity in this regard. So, it is very important to know who the head of house is i.e., male or female. Our country Pakistan is a male dominant society due to which most of the heads of households in Pakistan are men. By and large female are the head of household when their husbands have died or are disabled or suffer from some other disease etc. In this case, financial burden on widows increases. Statistics also shows that Female literacy rate in Pakistan is very low. As a result, very few women are employed. So, there is a tradition in Pakistan that male-headed households are less likely to be involved in food insecurity whereas women will have more chance of food insecurity. Abdullah, et al. (2019); Hameed (2020); Aziz & Iqbal (2016) and Sheikh, et al. (2020) have included the head of household in their study.

we have also taken the head of household as a binary variable. "1" means that the head of household is male. "0" means that head of the house is female.

2. Head Education

Head education also plays an important role among the other characteristics of a head. It is of a general view that person's education is closely related to its employment level. The more educated a person is, the better the chances of getting a good job. As a result, their earning also increases. If the head is educated, he knows how to make best utilization of their resources in a minimum budget. As well as it is of a greater chance that the rest of the household members will be educated, and their standard of living will be better. It is general perception that families with educated heads are less likely to be food insecure than illiterate household heads. Even in rural farm household, if the head is educated, he can bring new methods and technological advancement in the farming which will not only increase his income but also brings prosperity at home. Literature has shown that

Abdullah, et al. (2019), Hameed (2020) and Aziz and Iqbal (2016) has given great importance to the head of education.

The head education could be taken in many ways e.g., literate, or illiterate form and there could also be a benchmark for head education e.g., primary, secondary, matric, intermediate etc. We have taken the education of head in his/her years of schooling for example: "0" means he/she is illiterate. "1" means he/she is primary pass. "10" = means he/she is matric pass etc.

c)   Other Household Characteristics
1. Proportion of Graduates
The education of family members also plays a very important role just as the education of the head. Proportion of graduates shows the education profile of household members. Proportion of graduates explains how many people in a household who are of age 20 or older have passed 14 classes. Graduates are usually employed or even if they are not employed, they have a better chance of being employed. Graduates would not be dependent on households. So, the house where most of the adults are graduates, the chances of prosperity in that house are higher and there will be a less chance of food insecurity. Hashmi, et al. (2019) have taken higher education of household members with at least graduation. While Bashir, et al. (2012) have taken education level as graduation and above.

Here we could also take many more variable as a benchmark for the education profile of household members e.g., number of literates, illiterates, proportion of SSC, proportion of HSSC etc. We have taken the higher education as a benchmark i.e., proportion of graduates. If we compare the graduates the comparison will not be correct because if there are only six people in a house and four of them have not graduated as these four people are less than 10 years old, here the comparison is not possible. So that's why first we have created the variable age at least 20, which includes the people equal or over the age of 20. Secondly, we have created the variable at least graduates, which includes the people whose education is greater than 13 years. Third, we have calculated proportion of graduates by the following formula:

$$proportion \ of \ graduates = \frac{at \ least \ graduates}{age \ at \ least \ 20} \quad (5.5)$$

2. Rooms per Persons

The financial status of a house is also demonstrated by the rooms per person. Rooms per person is an important variable as it shows the openness of home and is a sign of its prosperity. It is generally believed that the more rooms per person are, the richer the people will be and the better their living standard will be. On the contrary, in a house with fewer rooms, the people will be poor and barely able to make ends meet. If there is an addition of one person, it is very difficult for him to live in the house and most of all, the extra burden will fall on the breadwinner in the household. So, there would be the negative impact of rooms per person on food insecurity. When the number of rooms per person increases as a result food insecurity decreases and vice versa is the case. Aziz and Iqbal (2016); Asghar and Ahmad (2013) have taken number of rooms per adult equivalent in their studies. To generate this variable, we have divided all the rooms according to the number of persons in a household.

$$Rooms \ per \ person = \frac{HH \ SIZE}{NO \ OF \ ROOMS} \quad (5.6)$$

3. House occupancy status

House occupancy status is a second variable which shows the financial status of a house. It tells us whether a house is owned or rented. If the house is owned by a family, it shows that they are the residence of that area and the money from their income is not spent on paying the rent of their house but is spent on their food, clothing etc. while the rest of money is added to their savings. In contrast, families who lived in rented accommodation are thought to have moved to that area in search of employment, so a good portion of their income is spent on the rent. As a result, they spend less on other household needs such as food, clothing, education etc. and easily become the victim of food insecurity.

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Studies have shown that researchers have not focus on this variable, but we find this variable very important as it is associated with household food insecurity status. We have taken house occupancy status as binary variable. "1" indicates that the house is owner occupied. "0" indicates that the house is on rent or subsidized rent.

4. Dependency Ratio

The characteristics of household members such as number of earners and household size plays a major role in determining the status of food insecurity. Dependency ratio calculates the average of number of people who are dependent. Basically, it tells us about the proportion of non-earners. Dependency ratio captures the number of earners as well as HH size. The total number of people in a family determines the household size of the family. As the household size increases, the more food costs and the pressure of daily necessities falls on the bread earner. It is generally believed that households with more earners will have better financial status and they spent large portion of their salary on food. Secondly, there are more chances for the children of this household to get a job. In contrast the households with large population and low-income earners will hardly be able to meet basic household needs. Such households are usually more prone to food insecurity. So, dependency ratio shows positive impact on food insecurity. Sher, et al. (2018); Aziz and Iqbal (2016) and Asghar and Ahmad (2013) have included dependency ratio as an independent variable in their studies.

To find out the proportion of dependent persons, we calculated dependency ratio. In this variable, we have divided the number of dependents by Household size.

$$Dependency\ ratio = \frac{number\ of\ dependents}{HH\ size} \qquad (5.7)$$

Dependency ratio is between 0 and 1. "1" means all are dependents. "0" means all are earners and "0.95" means 95% persons are dependent.

5.4. CONCLUSION

In the present chapter we have discussed the data and variables of the present study. In specific we explained the construction of variables for the present study. In next chapter we will explain methodology for the measurement of food insecurity and econometric models for estimating correlates of food insecurity.

Chapter 6

METHODOLOGY AND ECONOMETRIC MODELS

6.1 INTRODUCTION

In this chapter we shall discuss methodology and econometric models used in the present study to measure food insecurity and explore its determinants. This chapter consist of four sections. The first section is on introduction. The second section is on methodology for the measurement of food insecurity in Pakistan. In the third section we will discuss the econometric model for exploring the correlates of food insecurity in Pakistan. The fourth section sums up the whole discussion.

6.2 MEASURES OF FOOD INSECURITY

In last chapter we explained the procedure of identifying food insecure households. Once the food insecure households are identified, the next step is to measure the extent and depth of food insecurity in region. In this regard we will work out Head count index and Food Insecurity gap:

a. Head Count Index of Food Insecurity

Head Count index gives the proportion of food insecure in sample. The proportion will be calculated in two ways:

- **Food Insecure Households:** It is simply proportion of food insecure households in the sampled households and will be calculated by following formula:

$$PFIH_i = \frac{FIH_i}{TH_i} \qquad (6.1)$$

Where, *FIH_i* is the number of food insecure Households in region *'i'*, *TH_i* is the total number of Households in region *'i'* and *PFIH_i* is the proportion of Food Insecure Households in region *'i'*.

Calculating proportion of food insecure households may suppress or articulate food insecurity, as household size is ignored. Incorporating household size will portray a better picture, as it will give the proportion of food insecure population rather than households. Therefore, at second stage we will calculate proportion of food insecure population.

- **Food Insecure Persons:** It is proportion of persons in food insecure households to total population and is calculated by following formula:

$$PFIHP_i = \frac{FIHP_i}{TP_i} \qquad (6.2)$$

Where, *FIHP_i* is the number of persons in food insecure Households in region *'i'*, *TP_i* is the total number of persons in region *'i'* and *PFIHP_i* is the proportion of Food Insecure persons in region *'i'*.

Equations 6.1 and 6.2 are the Head count indices of food insecurity in terms of households and persons respectively. It always lies between '0' and '1' with zero reflecting no food insecurity and one reflecting 100% food insecurity. Head count index merely expresses the proportion of food insecure households / persons and does not capture intensity of food insecurity.

b. *Food Insecurity Gap*

Food insecurity gap covers the drawback of head count index of food insecurity. It basically tells us about the depth of food insecurity among households / persons. The food insecurity gap is calculated through following formula:

$$FISG_i = \frac{1}{n} \sum_{i=1}^{nf} \left[\frac{CR_i - CC_i}{CR_i} \right] \qquad (6.3)$$

Where, CR_i is the minimum required calories, CC_i is the actual calories consumed, n is the sample size and nf is the number of food insecure households. FISGi lies between zero and one, with zero reflecting no gap and one reflecting 100% gap from minimum required calories. A problem associated with this measure is that though it measures the extent of food insecurity but is insensitive to transfers between food insecure households.

6.3   ECONOMETRIC MODEL FOR CORRELATES OF FOOD INSECURITY

In this section we will discuss the econometric model to explore the correlates of food insecurity in Pakistan. Our dependent variable is binary (assuming value '0' or '1') with '0' indicating that household is food secure and '1' reflecting that household is food insecure. In such situations, Ordinary Least Square method cannot be applied, as because of its following properties i.e., Best, linear, un-biased and efficient estimators. Ordinary least square is best if there is no endogeneity, heterogeneity, and auto-correlation problem

The simplest alternative method is Linear Probability Model in probability that dependent variable is one is linear function of explanatory variable(s) but this model has certain drawbacks, such as the predicted values can cross the limit of zero and one. The error term follows Bernoulli Distribution which creates heteroscedasticity. A plausible solution is to consider a probability model in which predicted values remain within range of '0' and '1' and the relation between explanatory variable(s) and dependent variable (a dummy variable) is nonlinear. In this regard Logit model and Probit model are two alternative options. These two models have essentially the same interpretation. The Logit mode assumes of cumulative distribution function (CDF) of logistic distribution and the Probit model used CDF of standard normal distribution. The Logit has relatively flatter tails. The present study will consider Logistic model due to its simplicity. Further we will work out

marginal effects, as they are easily interpretable. Given below is the econometric model for estimating correlates of food insecurity:

$$FI_i = \beta_0 + \beta_1 Region_i + \beta_2\ Inequality_i + \beta_3 Mean_i + \beta_4 Gender_i + \beta_5 Education_i$$
$$+ \beta_6 Graduate_i + \beta_7 Rooms_i + \beta_8 Owner_i + \beta_9 D.Ratio_i + \mu_i \quad (6.5)$$

where, FI is a binary variable, 1 if i^{th} household is food insecure and '0' otherwise. Region is also binary variable with 1 if i^{th} household belong to rural areas and zero otherwise. Inequality refers to consumption inequality in the administrative division of ith Household. Mean is the average calories consumed per person in the administrative division. Gender is another binary variable zero if household head is female and 1 otherwise. Education is the years of successful schooling of household head. The variable Graduate is the proportion of household members age 20 or above with at least 14 years of education. Rooms gives the number of individuals sharing one room. Owner measures the household occupancy status of household with 1 for house owner and zero otherwise. Finally, D-Ratio is the dependency ratio in i^{th} Household.

6.4   CONCLUSIONS

In the present chapter we have discussed the methodology and econometric models used for the measurement and correlates of food insecurity. Head count ratio will be used for the measurement of food insecurity, depth of food insecurity will be measured by Food Security Gaps. Furthermore, logit model will be employed explore the correlates of food insecurity in Pakistan.

Chapter 7

MEASUREMENT AND DISTRIBUTION OF FOOD INSECURITY IN PAKISTAN

7.1   INTRODUCTION

In this Chapter we will present the estimates of food insecurity in Pakistan and its provinces including rural and urban areas. The present study is based on micro data of HIES for 2018-19. This chapter contains four sections. The first section is on introduction. The second section comprises of our foremost primary objective that is to measure food insecurity status in case of Pakistan. In the third section we will discuss the status of food insecurity at provincial level in Pakistan. In the fourth section we will discuss distribution. The fifth section sums up the whole discussion.

7.2   FOOD INSECURITY IN PAKISTAN

In this section we have presented the status of food insecurity for overall Pakistan at provincial and at regional level in accordance with the previously mentioned three approaches. In the first approach we incorporate the gross calories to measure unadjusted food insecurity. while in the second approach we incorporate food loss and measure the adjusted food insecurity. In the last approach we excluded the gift and assistance to examine the status of food insecurity. we have measured food insecurity for household and persons. At household level, we have calculated proportion of food insecure households. On contrary at persons level, we have estimated the proportion of food insecure population. This section is further sub divided into sub sections. First, we

will present the estimates of Head Count indices of food insecurity and after that in next sub section estimates of Food Insecurity Gap will be explained.

7.2.1 Head Count Indices of Food Insecurity

In the present section, we have examined the status of food insecurity at aggregate household and per capita level. Table 7.1 depicts the position of food insecurity in case of Pakistan. It is evident from Table 7.1 that there is not much difference in food insecurity from all three approaches. The only difference is that when we are shifting from the first approach to the second approach, the percentage increases a little bit. This means that when we are taking adjusted calories, the difference is very small because of the food items such as wheat, rice and pulses have very little food loss. Moreover, the items that contains high level of food loss does not affect the consumption bundle at greater extent. Similarly, approach 3 gives us an indication that gifts and assistance have no big role in the consumption bundle. About 1.49% of our society may get food insecure if there are no gifts and assistance.

First, we have analyzed food insecurity at aggregate household level, but here we did not incorporate the size of household. If we incorporate the size of household and analyze it on the basis of number of persons, it results in per capita food insecurity. so, our results showed that if we do not incorporate household size, our values will underestimate.

For Pakistan, empirical assessment according to unadjusted approach shows that 42.54% of households and 45.89% of individuals suffer from food insecurity. Pakistan is an agricultural country but still a large proportion of its population is food insecure because it is not meeting the required calorie consumption of the people. The facts and figures in the table shows that almost half of the population in Pakistan is below the minimum required calories. There has been no development in the agricultural sector in Pakistan. The dependence on the agriculture sector is based on old methods. On the contrary, due to the poor economic situation, there are very few employment opportunities.

Table 7. 1   Head Count Indices of Food Insecurity in Pakistan

Region		Household Food Insecurity			Population Food Insecurity		
		Approach 1 (Considering Gross Calories)	Approach 2 (Adjusting Calories for food loss)	Approach 3 (Excluding Gifts & Assistance)	Approach 1 (Considering Gross Calories)	Approach 2 (Adjusting Calories for food loss)	Approach 3 (Excluding Gifts & Assistance)
Pakistan	Urban Areas	51.56%	54.25%	52.88%	54.95%	57.53%	56.00%
	Rural Areas	37.52%	39.95%	39.11%	41.06%	43.52%	42.28%
	Overall	42.54%	45.06%	44.03%	45.89%	48.40%	47.05%
Punjab	Urban Areas	57.77%	60.52%	59.86%	60.98%	63.73%	62.76%
	Rural Areas	31.22%	33.24%	33.43%	34.17%	36.18%	35.93%
	Overall	40.10%	42.36%	42.27%	42.98%	45.23%	44.74%
Sindh	Urban Areas	45.03%	47.24%	45.62%	49.10%	51.10%	49.68%
	Rural Areas	45.89%	48.55%	46.63%	49.02%	51.81%	49.65%
	Overall	45.51%	47.98%	46.19%	49.05%	51.51%	49.66%
Khyber Pakhtunkhwa	Urban Areas	51.20%	54.45%	52.17%	55.90%	58.92%	56.58%
	Rural Areas	42.43%	45.27%	43.92%	46.96%	49.69%	48.03%
	Overall	45.27%	48.23%	46.58%	49.84%	52.66%	50.78%
Baluchistan	Urban Areas	43.47%	46.50%	44.13%	46.59%	49.32%	46.92%
	Rural Areas	40.84%	44.03%	41.35%	41.08%	44.09%	41.67%
	Overall	41.70%	44.84%	42.26%	42.85%	45.77%	43.36%

Next, we are assessing food insecurity at regional level. Rural areas have covered a significant large number of households and persons than the urban area. The food insecurity situation that is emerging from three different approaches is worse for urban areas than for rural areas. The findings are similar with Hameed (2020). The main reason is that the occupation of the people in the villages is farming. In the villages, people have lands etc. on which they cultivate for their livelihood, so they have easy access to food items. Most of the population in rural areas depend on feudal lords, their need for calories requirement is met in return for their services. In contrast in kind income is not common in urban areas, we have a lot of facilities but there is no provision of farming opportunities and livestock ownership. Beside this if rural and urban areas are compared, food prices are higher in urban areas because of this most of their income is spend on buying food. In urban areas, there is a proportion of upper and middle class who is food conscious, and their calories intake are less than their required calories. Food items that contain low calories i.e., junk food is more common in urban areas. For these reasons urban areas are more prone to food insecurity.

We have also analyzed food insecurity at the provincial level from three different approaches. Statistics shows that Punjab has covered large sample size, Sindh and Khyber Pakhtunkhwa covered average number of households and persons while Baluchistan has small sample size. Sindh ranks first in food insecurity among provinces. Findings are similar with the study of Aziz and Iqbal (2016). Underutilization level in Sindh is slightly higher than the national average. Poverty rate is also very high in Sindh province that's why a significant proportion of the poor community suffer from food insecurity. Khyber Pakhtunkhwa ranks second in food insecurity among provinces. 45.27% of households and 49.84% of persons deprived of their minimum required calories consumption. According to Aziz and Iqbal (2016), KPK considered to be the second most food insecure province. Due to the growing population Khyber Pakhtunkhwa is dependent on other provinces for access to food Zaidi, et al. (2015). Baluchistan ranks third in Pakistan at the provincial level in food insecurity. It is the poorest province out of all four provinces. Income and wealth inequality disparities are more prevalent in Baluchistan. Our results

are ecstatic constitution in case of Baluchistan that the situation of food insecurity is better than Khyber Pakhtunkhwa and Sindh. There is also a lot of inequality in land ownership. Food insecurity is lowest in Punjab compared to all other provinces. Punjab is the breadbasket of all the provinces of Pakistan. Most of the grain comes from Punjab which provides food to the whole country. As Punjab is the source of agricultural production in the country. There is a great lack of development in agricultural sector in Punjab sector too. That is why there is also food insecurity among the people here. 40.10% of households and 42.98% of persons are undernourished as their calorie requirement are less than their calories consumption.

According to the detailed analysis, households and people's access to basic utilities is less in terms of electricity, gas, and housing in rural areas than in urban areas. Furthermore, severe floods in Sindh in 2010 and 2011 destroyed crops and infrastructure, reducing growth and economic activity. In the rural areas of Khyber Pakhtunkhwa, 42.43% of households and 46.96% of persons are food insecure. Primarily rural districts in KPK are mainly affected by food insecurity due to unequal distribution of wealth and disparities in poverty at district level. While the food insecurity situation was higher in urban areas, a large of the population suffering from food insecurity. Food insecurity in Khyber Pakhtunkhwa households has been found to be moderate to severe level. Food insecurity in Baluchistan is slightly higher in urban areas than in rural areas. Analysis has shown that 43.47% of households and 46.59% of persons are food insecure in urban areas while the proportion is less than that of rural areas. The provision of government hospitals and health facilities to the people in Baluchistan is very low. Wheat production in Baluchistan is very low, whereas a large proportion of rural and urban population is dependent on agriculture sector. Detailed analysis clearly showed that in the rural areas of Punjab, 31.22% of food insecure households and 34.17% of food insecure persons have been found while in urban areas food insecurity has been found to be very severe. The reason for food insecurity in urban areas is due to the reduction in net sown area out of land utilization, low number of factories and the decrease in fish production.

7.2.2. Food Insecurity Gap

In the previous section, we have examined the proportion of population who is food insecure. Now the question arises, what is the intensity of food insecurity? so for this purpose we have analyzed the depth of food insecurity in Pakistan, at provincial and at regional level. According to our analysis, the severity of food insecurity in Khyber Pakhtunkhwa is lower than other provinces. Table 7.2 depicts the position of depth of food insecurity in case of Pakistan.

Table 7. 2. Food Insecurity Gap in Pakistan

	Region	Population Food Insecurity
Pakistan	Urban Areas	22.92%
	Rural Areas	19.59%
	Overall	20.98%
Punjab	Urban Areas	24.72%
	Rural Areas	20.37%
	Overall	22.40%
Sindh	Urban Areas	23.55%
	Rural Areas	22.23%
	Overall	22.78%
Khyber Pakhtunkhwa	Urban Areas	18.51%
	Rural Areas	15.94%
	Overall	16.87%
Baluchistan	Urban Areas	21.87%
	Rural Areas	19.18%
	Overall	20.12%

The analysis has found that the depth of food insecurity in Pakistan is around 21% for Pakistan. This indicates that people who are food insecure are not much insecure and mostly clustered near the benchmark of minimum required calories.

The rural – urban comparison reveals that depth of food insecurity in relatively higher in urban areas of Pakistan and same phenomenon exists in all provinces. This indicates that not only prevalence of food insecurity (as seen in Table 7.1) but also depth of food

insecurity is relatively higher in urban areas. People in urban areas are more prone to food insecurity because they are forced to migrate towards cities in search of employment. Most of the labor class in urban areas do not have access to housing, while there are fewer housing problems in rural areas. In urban areas, we have more proportion of working class, but they do not get the minimum required calories in accordance with their age groups and become prey of food insecurity.

We have also analyzed the depth of food insecurity at provincial level. In Sindh province intensity of food insecurity among the people is 22.78%. According to Zaidi, et al. (2015) about 40% of children are underweight. Nearly two-third of mothers and children suffer from disease like anemia. Furthermore, half of the mothers and children suffer from vitamin A deficiency. Food insecurity also causes health issues. Facts and figure show that Sindh province is suffering from stunted development. In Khyber Pakhtunkhwa the seriousness of food insecurity among the people is 16.87%. The acute rise in food prices (32% to 74%) since after 2008 has put a heavy burden on low-income earners (*FINAL REPORT OF THE TASK FORCE ON FOOD SECURITY*, (2009)). In Baluchistan the depth of food insecurity among people is 20.12%. Most of the people are dependent on agriculture to earn their livelihood but a small portion of land is utilized for agricultural productivity. Another reason for the severity of food insecurity among Baluchistan is gender variation in education system. Illiteracy rate is also at a peak. In Punjab the prevalence of food insecurity among people is 22.40%. lack of employment opportunities due to energy crises in the industries, increase in the cost of production and slight changes in the income of people are the main reasons for the prevalence of food insecurity among the people.

Table 7.2 also presents the detailed depth analysis of food insecurity status at provincial level. According to agricultural production land, Sindh ranks second in the country. Due to unequal distribution of the land, the rural area of Sindh is suffering from devastation and malnutrition. Women empowerment is also very low in Sindh as there is more unemployment for women than men. In Khyber Pakhtunkhwa, a large proportion of the urban population is undernourished than rural areas. The literacy rate of women in Khyber Pakhtunkhwa is 33% while that of the men is 68%. In Khyber Pakhtunkhwa people

have lack of access to basic facilities such as clean drinking water, sanitation facilities etc. Basic facilities lead to under nutrition and illness among young and infants. In rural areas of Khyber Pakhtunkhwa livestock population is very small. According to (BOSPD, (2017)) total revenue from fisheries department is 356,400 rupees in year 2015 -16. In Baluchistan, the severity of food insecurity is lower among rural people than urban. Natural disaster makes a huge difference in our nutrition. It destroys health, crops, and development resources. Among all the provinces Baluchistan has suffered the most because of natural disasters. Droughts in 1997- 2001 have devastated the six districts, while the floods in 2012, 2011 and 2010 have affected the whole Baluchistan(Zaidi, et al. (2015)). Depth analysis of food insecurity in Punjab is found to be 20.37% in people living in rural areas while it is 24.72% for people living in urban areas. People living in urban areas of Punjab have very little ownership of small and large cattle. On the contrary, number of private breeding farm is very low.

The analysis of food insecurity revealed that though more than 40% of the population is food insecure but the depth of food insecurity ranges between 15 % – 24 % showing that a majority of food insecure individuals are clustered near the benchmark of the minimum required calories and a small push can reduce food insecurity in country and all regions of country. Therefore, it will be interesting to explore the distribution of population with respect to gap from the benchmark. In next section we will discuss the distribution of food insecure population with respect to various dimensions.

7.3. DISTRIBUTION OF FOOD INSECURITY IN PAKISTAN

In this section we will discuss the distribution of food insecure population with respect to various dimensions such gap of food insecurity, household size, number of earners and dependency ratio. These analyses will enable us to understand the dynamics of food insecure individuals, especially the household composition.

7.3.1 Distribution of Individuals with respect to the Minimum Required Calories

In this section we will discuss the distribution of individuals with respect to the minimum required calories. The focus will be on both sides of the benchmark, i.e., how individuals are distributed below and above the benchmark of minimum required calories.

Statistics reported in Table 7.3 show the distribution of households. First, we will discuss the distribution of food insecure population. About 24% of the food insecure population is at most 10% below the minimum required calories and if we consider first two intervals, we will find that more than 44% of food insecure individuals are clustered in this range. The statistics reveal that a significant proportion of food insecure population is marginally food insecure, and a small push can take them out of the trap.

Table 7. 3.Distribution of Individuals with respect to the Minimum Required Calories

Range / Interval	Individuals Below the Minimum Required Calories (Distribution of Food Insecure Individuals)	Individuals Above the Minimum Required Calories (Distribution of Food Secure Individuals)
10% or less	23.71%	17.55%
10.1% to 20%	20.52%	14.84%
20.01% to 30%	16.28%	11.83%
30.01% to 40%	12.06%	8.78%
40.01% to 50%	8.24%	6.61%
50.01% to 60%	5.44%	4.89%
60.01% to 70%	4.34%	3.89%
70.01% to 80%	2.60%	2.77%
80.01% to 90%	1.91%	2.24%
90.01 % or more	4.89%	26.61%

Almost same situation prevails on the other side, about 33% of food secure population is at most 20% above the benchmark. This indicate that a minor crisis can pronounce food insecurity. In net shell we found that a significant proportion of individuals are scattered around both sides of the benchmark.

According to the analysis, this is very pleasurable to examine that almost 26% of individuals and households consume more than half of their required calories. From these two analyses of distribution, it can be inferred that the situation of food insecurity in Pakistan is not so worse. If the government takes a few steps, the food insecurity situation can be improved.

7.3.2. Distribution of Food Insecure population with respect to Household size

In this regard we have divided households in three groups; small size households (at most 4 persons), medium size households (5 to 7 persons) and Large size households (at least 8 persons). The distribution of food insecure households and their share in overall food insecurity are reported in Table 7.4.

Table 7. 4. Distribution of Food Insecure Population with respect to Household size

Household Size	Food Insecure Persons	Share in Food Insecurity	Population Share
Small Households (At most 4 persons)	29.98%	8.74%	13.37%
Medium Households (5 to 7 Persons)	45.90%	40.47%	40.47%
Large Households (More than 8 persons)	50.51%	50.79%	46.15%
Total	**45.89%**	100%	100%

The statistics reported in Table 7.4 show that in Pakistan, 13.37% of households have four or fewer members, but their share in food insecurity is significantly less (i.e., 8.74%) than their share in population. 40.47% of households in total population have five or seven members and incidentally share in food insecurity accounts for 40.47%. If we analyzed the third group, 46.15% of households in Pakistan have 8 or more members but their

share in food insecurity (i.e., 50.79 %) is more than their share in population. The findings of this table are that the share of small households in the population is high but the share in food insecurity is low. On contrary in the third group, the proportion of the population is relatively low in terms of share in food insecurity. Further the percentage of food insecure households is increasing with household size.

This implies that in general large households are more prone to food insecurity. Therefore, large household size can be regarded as one of the factors causing food insecurity.

7.3.3   Distribution of food insecure Population with respect to Number of   Earners Per Household

In this section we will discuss the distribution of Individuals with respect to earners. In this regard we have divided households in four groups. First group constitutes of the households without earner. It refers to households where the head of the house is expired or for some other reason there is no earner. The source of income in such households is land or house rent etc. In second group we have included households with only one earner. Our third group comprises of the households with two earners and last group consists of the households with more than two earners. The distribution of households with respect to number of earners per household are reported in Table 7.5.

Table 7. 5.Distribution of food insecurity with reference to Earners

GROUP	Food Insecure Persons	Share in Food Insecurity	Population Share
Households without Earners	1.47%	3.20%	4.56%
Households with 1 Earner	20.72%	45.16%	47.41%
Households with 2 Earners	12.78%	27.84%	26.54%
Households with 3 or more Earners	10.93%	23.81%	21.49%
Total	**45.89%**	100%	100%

Households without earners are 1.47% food insecure, but households with one earner are 20.72% food insecure. In addition, the households with two earners are 12.78% food insecure and the households with more than two earners are 10.93% food insecure. Overall, 45.89% of persons are food insecure. Statistics in table shows that as number of

earners increases, proportion of food insecure households decreases. Now we will compare share of household earners in population and in food insecurity. In Pakistan, 4.56% of households have no earner, but their share in food insecurity is significantly less (i.e., 3.20%) than their share in population. Similarly, 47.41% of households have one earner, but their share in food insecurity is slightly less (i.e., 45.16%) than their share in population. If we analyzed the third group, 26.54% of households in Pakistan have two earners but their share in food insecurity (i.e., 27.84 %) is little bit more than their share in population. In the fourth group, 21.49% of households in Pakistan have more than two earners but their share in food insecurity (i.e.,23.81%) is more than their share in population. The findings of this table are that the share of households without earner in the population is high but the share in food insecurity is low. On contrary in the third group, the proportion of the population is relatively low in terms of share in food insecurity.

7.3.4. Distribution of Food Insecurity with reference to Dependency Ratio

Dependency ratio is a better indicator, as it simultaneously captures household size and number of earners. The distribution of food insecurity with respect to household size is reported in Table 7.6.

Table 7. 6. Distribution of Food Insecurity with respect to Dependency Ratio

Dependency ratio	Food Insecure Persons	Share in Food Insecurity	Population Share
Households with Dependency Ratio 0.000 - 0.200	0.34%	0.73%	0.89%
Households with Dependency Ratio 0.201 - 0.400	1.22%	2.66%	3.05%
Households with Dependency Ratio 0.401 - 0.600	5.21%	11.35%	11.87%
Households with Dependency Ratio 0.601 - 0.800	19.37**%**	42.21%	41.35%
Households with Dependency Ratio 0.801 - 1.000	19.76%	43.05%	42.84%
Total	**45.89**	100%	100%

In this analysis, we have divided households into five groups according to dependency ratio. First are households with at most 20% dependency ratio. while the second one is households with 20% to 40% dependency ratio. Third one is the households with 40% to 60% dependency ratio. Fourth is the households with 60% to 80% dependency ratio. Finally, fifth one is households with 80% to 100% dependency ratio. Statistics in table shows that as number of dependency ratio increases, proportion of food insecure households increases. The findings of this table showed that according to the first four groups the share of households in the population is high but the share in food insecurity is low. On contrary according to the last group, the proportion of the population is relatively low in terms of share in food insecurity.

7.4 CONCLUSION

In the present chapter we have analyzed the status and depth of food insecurity for Pakistan, at regional and at provincial level. According to approach 1, 42.54% of households and 45.89% of the population in Pakistan suffer from food insecurity. while the severity of food insecurity in Pakistan is at moderate level. Urban areas are more prevalent to food insecurity at regional level. In addition, at the provincial level, Sindh has the highest food insecurity, while Punjab has the lowest. Furthermore, we have examined the distribution of food insecure population with respect to multiple dimensions such as minimum required calories, household size, dependency ratio and number of earners. We found that higher the dependency ratio more the households are exposed to food insecurity.

Chapter 8

CORRELATES OF FOOD INSECURITY IN PAKISTAN

8.1   INTRODUCTION

Food insecurity is a growing economic, nutritional, and social phenomenon. It has a profound effect on human health and wellbeing. Socioeconomic and demographic factors lead to food insecurity. In this chapter we will discuss the estimates of determinants of food insecurity in case of Pakistan. This chapter contains three sections. The first section is on introduction. In the second section we have applied the binary logistic model to explore the correlates of food insecurity status in Pakistan. The third section sums up the whole discussion.

8.2.   CORRELATES OF FOOD INSECURITY IN PAKISTAN

In this section we will present the estimates of factors affecting the status of food insecurity in Pakistan. Binary logistic regression model was applied to examine the effect of independent variables on food insecurity status of household. When our dependent variable has two categories i.e., acceptance and rejection we use the logistic model. Our dependent variable i.e., food insecurity status is binary response variable which can take the value of 1 if the household is food insecure and can take the value of 0 if the household is food secure.

For the better interpretation of binary logistic model, we find the marginal effects. The value of marginal effects tells us about the unit change in the value of regressor by keeping all other variables constant. Table 8.1 presents the results of marginal effects; all coefficients are highly significant at 1% level of Significance.

Table 8. 1. Correlates of Food Insecurity in Pakistan

Variables	Marginal Effect	z values
Region of Residence (Rural or Urban)	0.1610958	21.80 (0.0000)
Gender of Household Head (Male or Female)	0.1599268	15.68 (0.0000)
Education of Household Head (years of schooling)	- 0.0041201	-5.41 (0.0000)
Proportion of Adult (20 years and above) Graduates in a Household	- 0.1819281	-8.17 (0.0000)
One Room Shared by Household members	- 0.0163491	-6.57 (0.0000)
House Ownership (owner or not)	- 0.0820404	-8.60 (0.0000)
Dependency Ratio	0.1863919	10.06 (0.0000)
Per Adult Equivalent Mean Calories Consumed in Administrative Division	- 0.0000681	-19.88 (0.0000)
Gini Coefficient of Consumption Inequality in Administrative Division	0.7868378	16.96 (0.0000)

Region of residence is a dummy variable and takes the value of 1 if the region is urban and 0 otherwise. By keeping all the regressors constant, probability of a household residing in urban areas to be food insecure is 0.16 more than a household living in rural areas. This indicates that households living in urban areas are relatively more exposed to food insecurity. Urban residence lacks land and livestock ownership. Cultivable and sown area is very low in urban area. Most of the land is utilized for industrial and domestic use instead of agricultural purposes. Rural-urban migration is another cause of change in lifestyle and nutritional diet. Due to more working hours, urban dwellers consume unhealthy food such as junk food, snacks etc. Generally household living in the urban

areas do not have an occupation of agriculture, they need to go to the market to buy most of the food items with money. Urban poor dwellers such as daily wage earners and labor class are affected by high inflation which lowers their purchasing power parity. Nutritious food items such as fruits, vegetables and dairy commodity are easily and less costly available in rural areas than in urban areas. Food is comparatively expensive in urban areas and not everyone can afford it. Beside this people in urban areas are diet conscious that's why they suffer from lack of access to healthy food. As a result, food insecurity increases in urban areas. In contrast, households living in rural areas do not have access to the luxury facilities of urban areas, but their occupation is farming which meets their nutritional needs. Hence there is no need to go to the market to buy food. Most of the families in rural households depends on home-grown food. The accessibility and affordability for food is higher in rural areas due to lower prices and home production than in urban areas.

Head gender is significant at 1% level of probability and takes the value of 1 if head is male and zero otherwise. The marginal effect shows that probability of male headed household to be food insecure is 0.15 more as compared to a household headed by female. Females also have land ownership. They have all the food related knowledge such as food storage, processing, nutrition, and utilization etc., Besides, women are single handedly responsible for food preservation, processing, and preparation. Female headed households can manage kitchen expenses in a best economical way by reducing the expenses on other necessities such as clothing, luxuries etc., In this way females can fulfil the foremost basic human need i.e., food. When women take the economic power of the home into their own hands and participate in household decisions, their priority is to spend on food, child protection and health services from the budget. Women also take care to avoid malnutrition among children and take special care of their development so that they do not become the victim of stunted growth. While on the contrary, men cannot manage kitchen chores in the best possible way. It is because he does not possess related kitchen knowledge and experience. Men's priority will always be earning a heavy amount to fulfil other household expenses such as rent, bills etc. Moreover, females possess a good

knowledge about healthy nutritious diet and take special precautions to maintain the hygiene level. Due to these diseases are less prevalent and people are less prone to food insecurity.

Education of head is another important variable; it is taken as a continuous variable. 1 unit increase in the education of head decreases the probability of household to be food insecure by 0.00412 units. Head education is taken as the years of schooling completed. The more educated the head of household would be the better the chances of getting a highly paid job. So, there are less chances of the food insecurity in a household if the head has completed more years of schooling. Education plays an important role in an individual's life. It makes an individual determined and capable. Human capital is more important than physical capital. A skilled person uses his education to extract various sources of income. Even if the head of the household lives in rural areas and educated then he can earn more income from farming by employing new tools and techniques. Conversely, if the head of the household is educated and lives in an urban area, he can earn his livelihood by doing many online businesses. The education of women is also very important. But in our society, most of the heads of households are men. Therefore, it is very important for a man to be educated because man is responsible for meeting household expenses. Due to his ability, he can get a job in any field and can easily meet the expenses of household. The findings are similar with the study of Abdullah, et al. (2019).

Apart from the education of head, overall education profile of household is also very important. In this regard we have worked out proportion of adults (age 20 years or more) with at least 14 years of successful education. The marginal effect of this variable is -0.18192 indicating that probability of a household to be food insecure decreases by 0.18 with increase in proportion of adult graduates. Higher the proportion of graduates among adults, the more prosperous that household is and lower are the chances of food insecurity. If the members of households are highly qualified, then in this way they do not become a burden on the earner of household instead they become the helping hand of earner. Education not only becomes a source of food utilization and income in a

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household, but it also opens new employment opportunities for human being by enabling them. Online businesses are also very successful now a days. If people are capable and educated, they can earn good income through their qualifications. There are many areas where women are not allowed to work outside the home. But if women are educated, they can earn a living at home. In this way she would not be a burden to the head of the household. It is important for both men and women to be educated as the man has the responsibility of the house and woman trains the whole generation. Lack of education affects people's income and then they become food insecure due to which those countries are not able to meet the sustainable development goal. Thus, the expenses of households are divided among themselves and as a result food insecurity status decrease. Education is a valuable human asset that opens better employment opportunities. Increase in the year of schooling makes a person confident and a good decision maker. In addition, education enhances a person's work efficiency and income.

Next variable is room per person, it is a proxy for the financial status of a household. Rooms per person is inversely related with food insecurity status. 1 unit increase in the rooms per person decreases the household food insecurity status by 0.1634 units. If the household has large number of rooms per persons, then food insecurity decreases and vice versa. Rooms per persons are significant at 1% level. Richer families have more rooms per person. On the contrary, the poor do not have enough resources to live in spacious houses, so their livelihood is difficult. Less rooms per person is an indication of overcrowded households which means that the costs of running a home are limited. These households also have lower economic status which hinders them for consuming nutritious food. Especially the households with more elderly people and children have a greater impact on food consumption. Households with more rooms per person have balanced nutritional dietary behavior than households with less rooms per person. Due to the balanced nutritional diet children and women suffers less from the health-related issues such as anemia, stunted growth, diarrhea, and malnutrition. Therefore, more rooms per person is considered one of the measures of family versatility, which lessens the impact of adverse circumstances.

Household occupancy status is another variable that reflects the financial position of household. The marginal effect shows that probability of a house owner to be food insecure 0.08 less than a household who do not own house. If the house is own occupied, a large portion of the income is saved, and more money is spent on nutrition and as a result food insecurity decrease. Own occupied household is also very important to avoid nutritional insecurity. It shows the well-being of the household and is one of the necessities of life. Basically, Own occupied households showed the asset holding statement of a household members. This also indicates that the members of those households are not temporarily residing there in search of employment. On contrary, Dwellers from poorer areas usually move to urban areas in search of employment. So, Occupants residing in the rented house do not have the strong financial position because most of their income is spent on meeting the calories requirements of food. Households with better income opportunities are less likely to become food insecure than those households who had no or little opportunity at all.

Dependency ratio is positively related with food insecurity status of household. Higher the dependency ration greater that probability of household to be food insecure. The marginal effect in this regard is 0.18. Dependency ratio provides information on the total number of members in a household and how many of them are dependent on earner. The more people are there in a house, the less prosperous the house is because having more people puts the more burden on the earner and the needs are hardly met. On other hand due to the small number of members in the household, the peace of the house is maintained, necessities can be easily met, and the cost of food consumption will also be reduced. Dependency ratio is higher in households where individuals are economically inactive possibly elders and children. As children and elders are included in non-productive age group. Elders are officially not eligible for government job and do not have the ability to do any productive work. The conceivable reason would be as the age of individual increment, one may lose work and one could not take part in income creating opportunities. large household size needed more resources to ensure food requirement. Income decides the household's capacity to secure nourishment, as number of earners

remain to be an important variable which clarifies the characteristics of households to be food secure and food insecure. Households which manage to earn larger portion of money from any source have better access to calorie intake they need than those households which do not. Another reason is that high unemployment and less business opportunity linked with low wage rate payment, an inactive member lives on limited resources and the entire household suffers from food insecurity.

The next variable considered in our analysis is per adult mean calories consumed in administrative division. Our results show that mean calories consumed have negative impact of food insecurity, however the magnitude is too small. The people living in the district have at least enough resources to meet foremost necessity of life i.e., food consumption. In addition, there are many people in the district who do not have enough resources to eat even two meals a day. Irrigated lands are scarce in Hazara region. There is less development in agriculture sector only few NGOs worked on the improvement of agricultural knowledge, skills, and rural development. Crime rates are very high in Karachi due to lack of employment opportunities. Most of skilled workers are working as an unskilled labour on low wages to earn their livelihood. According to the (Bureau of Statistics, 2018), 98 manufacturing industries were established with 24,160 average daily employment during the period 2005 to 2006.Those divisions in which persons mean calories consumption are below their required level they have the more probability to fall in the food insecurity. The situation in Hazara and Mekran are very bad, but their mean calories consumption is high which was usually due to five or six households which had high income.

Finally, consumption inequality in region is positively related with food insecurity status. One percent increase in consumption inequality increases the probability of household to be food insecure by 0.78 percent by keeping all the variables constant at their mean. The more the variation is in the consumption pattern of people, the higher the food insecurity status. Mean calories consumption does not depict the clear picture. Therefore, we have analyzed the consumption inequality to examine the better condition of administrative division. It is obvious that the divisions that have higher mean calories consumption have

higher consumption inequality. One of the possible reasons for high mean calories consumption is the high income of a few households in this division. Hazara division falls in Khyber Pakhtunkhwa. This is a backward division of Khyber Pakhtunkhwa. Female literacy rate is very low. women's education is not given much importance here and they are not allowed to go out to earn a living. That's why food insecurity is very high. The cultivated area in Islamabad is very small and at the same time there are no employment opportunities. The net sown area in Karachi is very small i.e., 3,000 hectares and the rice production has not taken place for the last three years from 2014 to 2017. Mekran is a backward division of Baluchistan and the provision of facilities here is also very low. Consumption inequality is greater for those people who do not have any access to livestock ownership and farming opportunities.

8.4   CONCLUSION

In the present chapter we have explored the correlates of food insecurity in case of Pakistan. We have used the binary logistic model to present the estimates of determinants of food insecurity. In nutshell we found that education profile of household and financial status of household have negative impact on food insecurity and dependency ration has positive effect on food insecurity. In general household living in urban areas are more likely to be food insecure.

Chapter 9

SUMMARY AND CONCLUSIONS

Food insecurity is a primary issue for third world countries like Pakistan where a significant proportion of population is under nourished. The most popular definition of food security is "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Food and Agriculture Organization of the United Nations., (2010)). The definition of food insecurity presented by FAO is based upon four dimensions: Availability of food, physical and economic accessibility of food, utilization of food, stability of food. In the present research we have worked on the third dimension of food insecurity i.e., utilization of food. According to the recent report of ("The State of Food Security and Nutrition in the World 2020," (2020)), pandemic has increased the number of people suffering from hunger in the world. Prevalence of food insecurity has reached to 9.9% in 2020 as it was 8.4% in 2019. In terms of population, 720 to 811 million people in the world suffered from hunger in 2020. Generally, there are two types of food insecurity, namely chronic undernourishment, and transitory food insecurity. Chronic food insecurity indicates the constant failure on the part of the household to gain access to enough food. It arises due to a limited access to resources and is structural in character. Whereas Transitory food insecurity occurs because of the economic and human induced failures as well as natural disasters causing food shortages that temporarily affects all or a part of the country's population. (Maxwell, (1995)).

Numerous studies in Pakistan have measured food insecurity, but no study has yet been found in the literature that has worked on the latest dataset. There is a great need in Pakistan for studies that work on measuring food insecurity using latest data set. The

focus of all the studies was on measuring food insecurity instead of distribution. Different approaches have been used to measure food insecurity. But there is hardly any study found that worked on adjusting calories for food loss and excluding gift/assistance from food basket. Furthermore, many studies have worked on the determinants of food insecurity in Pakistan, However the impact of regional inequality and mean consumption are yet not explored. The present study is an attempt to fill the literature gap.

The study has three main objectives i.e., the first and foremost objective is to measure and explore the extent of food insecurity in Pakistan, regions, and provinces for 2018-19. The second objective is to analyze the distribution of food insecure population with respect to various dimensions such gap of food insecurity, household size, number of earners and dependency ratio. The third objective of this study is to work out the correlates of food insecurity in Pakistan.

The data is obtained from HIES (2018-19) survey which is conducted by Federal Bureau of statistics, Pakistan. This data is primary in nature and is the most available latest data set on food items. Latest HIES (2018-19) stipulates important information on savings, liabilities, household income, consumption pattern, consumption expenditure, health, information communication technology, education, population welfare, food insecurity experience scale and housing at national and provincial level. The status and severity of food insecurity is measured across Pakistan, at regional and at provincial level.

We have measured the status and severity of food insecurity from three different approaches. In the first approach we have taken gross calories. While in the second approach we have adjusted calories with loss. In the third approach, we excluded the calories received as a gift and assistance from our food basket. The findings of food insecurity from three approaches did not differ much. That is why we rely more on the results drawn from first approach i.e., gross calories.

Empirical assessment from first approach shows that 42.54% of households were food insecure at national level. If we incorporate the size of household and analyze it on the basis of number of persons, 45.89% of individuals suffer from food insecurity. At regional

level, urban areas are more prone to food insecurity than rural areas. The major reason for this is that Pakistan is agriculturally based country and majority of people occupation in rural areas are farming so they heavily rely on home grown production. At provincial level, Sindh ranked most food insecure among all provinces (i.e., 45.51%). While Khyber Pakhtunkhwa (45.27%), Baluchistan (41.70%) and Punjab (40.10%) ranked second, third and fourth in terms of food insecurity. The reason for high food insecurity in Sindh is due to high poverty rate. In contrast, Punjab has the lowest food insecurity as it is the breadbasket of all the provinces of Pakistan. At national level the severity of food insecurity is up to 21%. If the food insecure population is given the required calories of 21% then they can reach the level of food security. At the regional level the severity of food insecurity is 22.92% in urban areas and 19.59% in rural areas. At provincial level Punjab, Sindh, Khyber Pakhtunkhwa, and Baluchistan have not fulfilled 22.40%, 22.78%, 16.87% and 20.12% of their subsistence food requirement.

In the second objective we have discussed the distribution of food insecure population with reference to food gap, household size, number of earner and dependency ratio for Pakistan. Our focus in the distribution of food insecure population with respect to minimum required calories was to examine both sides to observe how many individuals are above and below the minimum required calories. The brighter side of the distribution is that almost 24% of the population is 10% below the minimum required calories. While darker side of the distribution is that 17.55% of the population is 10% above the minimum required calories. Empirical evidence from the distribution of population with household size showed that as household size increases, proportion of food insecure households also increases. The share of small-sized households in the population is high (13.37%) but the share in food insecurity is low (8.74%). On contrary in the large-sized households, the proportion of the population is relatively low (46.15%) in terms of share in food insecurity (50.79%). The findings from the distribution of food insecure population with respect to number of earners showed that as number of earners increases, proportion of food insecure households decreases. Lastly, empirical evidence from the distribution of

population with dependency ratio showed that as number of dependents in household increases, proportion of food insecure households also increases.

The third objective is to explore the determinants of food insecurity in Pakistan. All the independent variable i.e., region, head gender, head education, proportion of graduates, rooms, house occupancy status, dependency ratio, inequality and mean calories consumed showed the significant impact on food insecurity status. Region of residence, dependency ratio, head gender and consumption inequality are positively correlated with food insecurity. While head education, proportion of graduates, rooms per person, mean calories consumed, and house ownership are negatively correlated with food insecurity. Education plays a vital role in the characteristics of head as well in the characteristics of members. The more educated the household heads and members, the greater the chances of prosperity. Rooms per persons and household occupancy status showed the financial status of a household. In addition, if per adult is consuming less calories than the average requirement i.e., 2350 kcal/per day in a year, then he is suffering from food insecurity. Consumption inequality is not taken in monetary form but in terms of calories consumption. The more variation in the consumption pattern of people, the more they suffer from food insecurity.

- According to the current analysis, at the regional level, food insecurity is higher in urban areas than in rural areas. One of the main reasons is continuous rise in the prices of commodities, which reduces their purchasing power parity. To control inflation, the government needs to adopt effective monetary and fiscal policies.
- At provincial level, Sindh has the highest rate of food insecurity. The main reason behind this issue is the feudal system that leads to food inequality. In order to eradicate this issue, government needs to take some serious measures such as destruction of this typical feudal system, awareness among masses regarding their rights, women empowerment, wealth and income equality, availability of basic education among masses.
- It has been observed that large households affect household food insecurity. Therefore, the government should give due priority and attention to policies

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aimed at better family planning. Strategies for effective public participation are recommended when designing concepts and messages to convey knowledge about family planning.

- Head and members education played a significant impact on the household food insecurity status. Government should adopt effective measures to promote formal and informal education. Furthermore, the government should have to build more technical training centers where trainee is taught technical skills and the use of modern technology.

- Another policy recommendation from this present study is the positive impact of dependency ratio on food insecurity. Dependency ratio also increases because of high unemployment and less business opportunities. In this regard government should conduct some seminars and live sessions at minimum registration fee which gives awareness to public. The government should also design some strategies such as demand and supply side policies which reduces unemployment.

The limitation of the present study is that firstly, consumption information was available to us at the household level, not at the person level. We have assumed uniform distribution within households. Secondly, we did not have any food recipes and the calories consumed from cooked food are not same from every recipe. Lastly, many household members can afford food items but are consciously consuming less than the required calories due to dietary awareness.

The future direction is to work on the other side of the food insecurity i.e., supply side across Pakistan, at regional and at provincial level. We have worked on the distribution of food insecure population with respect to food gap, dependency ratio, household size and number of earners. The rest of the determinants of distribution such as household head, education of household head and members education can also be worked on. Correlates of food insecurity have been observed across Pakistan, but not separately in rural and urban areas. Furthermore, food insecurity gap can be divided into four groups and a multinomial model can be applied to analyze the patterns of food insecurity.

References:

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 201–210. https://doi.org/10.1016/j.jssas.2017.05.003

Agarwal, H. (2010). *(PDF) Food Security - A multidimensional issue*. https://www.researchgate.net/publication/221702155_Food_Security_-_A_multidimensional_issue

Ahmad, S., Siddique, M., & Ghafoor, A. (2004). Estimation of Food Security Situation at Household Level in Rural Areas of Punjab. In *INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY*. http://www.ijab.org

Ahmed, U. I., Ying, L., Bashir, M. K., Abid, M., & Zulfiqar, F. (2017). Status and determinants of small farming households' food security and role of market access in enhancing food security in rural Pakistan. *PLoS ONE*, *12*(10). https://doi.org/10.1371/journal.pone.0185466

Anila Sultana. (2011). Determinants of food security at household level in Pakistan. *AFRICAN JOURNAL OF BUSINESS MANAGEMENT*, *5*(34). https://doi.org/10.5897/ajbm11.1441

Ansari, N. B., Rahbar, M. H., Bhutta, Z. A., & Badruddin, S. H. (2006). Child's gender and household food insecurity are associated with stunting among young Pakistani children residing in urban squatter settlements. *Food and Nutrition Bulletin*, *27*(2).

Asghar, Z., & Ahmad, M. (2013). *Socio-economic Determinants of Household Food Insecurity in Pakistan*.

Ashfaq, M., & Razzaq, A. (2014). *Food Security Situation among Rural Households of District Faisalabad, Pakistan*. https://www.researchgate.net/publication/284278712

Asim, H., Shahzad, A. A., & Nafees, B. (2018). Food Security Analysis in Pakistan: A Multi-Indicator Approach Sectoral growth linkages of agricultural sector: Implications for food security in Pakistan View project Marshall-Lerner Condition for South Asia: A Panel Study Analysis View project Food Security Analysis in Pakistan: A Multi-Indicator Approach 1. *Kashmir Economic Review*, *27*(1). https://www.researchgate.net/publication/349669172

Aslam, M., & Rasool, S. (2014). Investigating the Impact of Major Variables Influencing Food Security in Lahore, Pakistan. *International Journal on Advanced Science, Engineering and Information Technology*, *4*(3), 143. https://doi.org/10.18517/ijaseit.4.3.388

Aziz, B., & Iqbal, Z. (2016). The Extent, Cause and Severity of Household Food Insecurity in Pakistan: Evidence from Micro Data. In *FWU Journal of Social Sciences* (Vol. 10, Issue 2).

Bashir, M. K., Schilizzi, S., & Pandit, R. (2012). *The Determinants of Rural Household Food Security in the Punjab, Pakistan: An Econometric Analysis*. http://www.are.uwa.edu.au

Bilal Babar, A. (2020). *INCIDENCE, DEPTH AND DETERMINANTS OF HOUSEHOLD FOOD INSECURITY: EMPIRICAL EVIDENCE FROM PAKISTAN*. https://doi.org/10.24327/ijrsr.2020.1101.5046

BOSPD. (2017). *DEVELOPMENT STATISTICS OF KHYBER PAKHTUNKHWA 2017 BUREAU OF STATISTICS PLANNING & DEVELOPMENT DEPARTMENT GOVERNMENT OF KHYBER PAKHTUNKHWA*. www.kpbos.gov.pk

Bureau of Statistics. (2018). *Development Statistics of Sindh*. www.sindhbos.gov.pk.

Cheema, A. R., & Abbas, Z. (2016). DETERMINANTS OF FOOD INSECURITY IN PAKISTAN: Evidence from PSLM 2010-11. *Pakistan Journal of Applied Economics*, *26*(2).

Conrad, Z., Niles, M. T., Neher, D. A., Roy, E. D., Tichenor, N. E., & Jahns, L. (2018). Relationship between food waste, diet quality, and environmental sustainability. *PLoS ONE*, *13*(4). https://doi.org/10.1371/journal.pone.0195405

de Laurentiis, V., Corrado, S., & Sala, S. (2018). Quantifying household waste of fresh fruit and vegetables in the EU. *Waste Management*, *77*, 238–251. https://doi.org/10.1016/j.wasman.2018.04.001

Ejaz, R., Khan, A., & Gill, A. R. (2009). *Determinants of Food Security in Rural Areas of Pakistan Determinants of Food Security in Rural Areas of Pakistan Determinants of Food Security in Rural Areas of Pakistan* (No. 17146). http://mpra.ub.uni-muenchen.de/17146/

Film Action Oregon (Organization), Internationaler Fonds für Landwirtschaftsentwicklung, UNICEF., Welthungerhilfeprogramm, & World Health Organization. (2017). *Building resilience for peace and food security*.

FINAL REPORT OF THE TASK FORCE ON FOOD SECURITY. (2009).

Food and Agriculture Organization of the United Nations. (2010). *The state of food insecurity in the world, 2010 : addressing food insecurity in protracted crises.* Food and Agriculture Organization of the United Nations.

Food Composition Table for Pakistan. (2001). *Food Composition Table for Pakistan*.

Hakeem, R., & Hakeem Shaikh, A. (2003). Food Insecurity in Metropolis of the Developing World-Observations from Central District of SINDH FOOD SECURITY AND NUTRITION SURVEY View project Studies onbiological control of sclerotial fungi View project. In *Article in Journal of the Pakistan Medical Association*. https://www.researchgate.net/publication/8907776

Hameed, A. (2020). *Estimating the Socio-Economic Factors of Food Insecurity in Pakistan: A Regional Level Analysis*. https://www.researchgate.net/publication/342926275

Hashmi, A. A., Sial, M. H., Akram, W., & Hashmi, M. H. (2019). Assessing food insecurity trends and determinants by using mix methods in Pakistan: Evidence from household pooled data (2005-2014). *Sarhad Journal of Agriculture*, *35*(1), 87–101. https://doi.org/10.17582/journal.sja/2019/35.1.87.101

Hussain, A., & Routray, J. K. (2012). Status and factors of food security in Pakistan. *International Journal of Development Issues*, *11*(2), 164–185. https://doi.org/10.1108/14468951211241146

Iqbal, M., Fatmi, Z., Khan, K., Jumani, Y., Amjad, N., & Nafees, A. (2020). Malnutrition and food insecurity in child labourers in Sindh, Pakistan: A cross-sectional study. *Eastern Mediterranean Health Journal*, *26*(9), 1087–1096. https://doi.org/10.26719/emhj.20.040

Iram, U., & Butt, M. S. (2004). Determinants of household food security: An empirical analysis for Pakistan. *International Journal of Social Economics*, *31*(8), 753–766. https://doi.org/10.1108/03068290410546011

Ishaq, A., & Khalid, M. (2018). *Food Insecurity in Pakistan: A Region-Wise Analysis of Trends* (No. 157).

Mahmood, S., Tabassum, A., Khan, S. A., & Jabeen, N. (2014). An investigation of determinants of food security in rural areas of Faisalabad, Pakistan. *Mediterranean Journal of Social Sciences*, *5*(4), 676–680. https://doi.org/10.5901/mjss.2014.v5n4p676

Maxwell, D. G. (1995). *MEASURING FOOD INSECURITY: THE FREQUENCY AND SEVERITY OF "COPING STRATEGIES."*

Rao, J. S. (1969). *Some contributions to the analysis of circular data*. http://localhost:8080/xmlui/handle/10263/4414

Rasul, G., & Hussain, A. (2015). Sustainable Food Security in the Mountains of Pakistan: Towards a Policy Framework. *Ecology of Food and Nutrition*, *54*(6), 625–643. https://doi.org/10.1080/03670244.2015.1052426

Sheikh, S., Iqbal, R., Qureshi, R., Azam, I., & Barolia, R. (2020). Adolescent food insecurity in rural Sindh, Pakistan: A cross-sectional survey. In *BMC Nutrition* (Vol. 6, Issue 1). BioMed Central. https://doi.org/10.1186/s40795-020-00343-w

Sher, G., Rabbi, F., & Hayat, U. (2018). Food insecurity and its determinants in rural Khyber Pakhtunkhwa, Pakistan. In *Asian J Agri & Biol* (Vol. 6, Issue 3).

The State of Food Security and Nutrition in the World 2020. (2020). In *The State of Food Security and Nutrition in the World 2020*. FAO, IFAD, UNICEF, WFP and WHO. https://doi.org/10.4060/ca9692en

Zaidi, S., Bhutta, Z., Qazi, S., Nawaz, G., Hayat, N., Mohmand, S., & Mejia Acosta, A. (2015). *Baluchistan Province Report: Nutrition Political Economy, Pakistan Institute of Development Studies Report from the Maximising the Quality of Scaling up Nutrition Programmes (MQSUN).*