Impact of Food Insecurity on Health Care Utilization in Pakistan: Role of SDG 2 in Achieving Health Equity

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Abstract

The global community aims to eradicate hunger by 2030 through a renewed focus on agricultural development, specifically SDG 2, to ensure food insecurity and nutrition. Food insecurity, a significant socioeconomic issue, affects over 7.5 million households in Pakistan, impacting 25% of the population and negatively influencing the health status of 40 million individuals. Therefore, this research aims to explore the connection between inpatient and outpatient healthcare utilization and food insecurity by highlighting those with severe health risks and resource constraints. This study used secondary data from the Pakistan Social and Living Standards Measurement Survey (PSLM) 2018-19, collected by the Pakistan Bureau of Statistics. The study used data for 24809 households from different areas of Pakistan including both rural and urban areas of Pakistan. The food insecurity Experience Scale (FIES) is used to estimate food insecurity and Instrumental Variable Probit Regression (IVprobit) is utilized for analyzing the effect of food insecurity on healthcare utilization. IVprobit model is used to eliminate the bias arising from the endogeneity of the food insecurity variable. The study reveals that higher food insecurity scores decrease access to modern healthcare for outpatient and inpatient care, with factors like age, sex, residence, household size, social protection, and illness characteristics also influencing individual behavior. Thus, the study's results indicate that modern healthcare utilization, particularly outpatient treatment for households, could improve the food insecurity status of households in Pakistan.

Keywords: SDG; Food Insecurity; Healthcare Utilization; FIES; Probit; Equity

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1. Introduction

1.1. Defining Food Insecurity

Food security indicates a condition wherein every individual, without exception, possesses consistent, well-rounded, and economically viable means to obtain adequate, harmless, and healthful nourishment that aligns with their food preferences and culinary needs, enabling them to lead vigorous and flourishing lives. Conversely, food insecurity represents the unpredictability or restricted accessibility of safe, nutrient-dense food. There are approximately 800 million food-insecure individuals in the developing world, and in the years to come, it will probably get harder to fulfill their nutritional and food demands. (Shaikh, Babar and Hatcher; 2019)

The United Nations (UN) has pledged to eradicate starvation by 2030 under the Sustainable Development Goal (SDG). Reducing population growth rates can strengthen economies, lessen poverty, and ultimately lower fertility, since two to three billion more citizens are anticipated over the next few decades, mostly from the least developed countries (Godfray and Garnett, 2014).

The rapid growth rates in Asia's most populated economies, including Bangladesh, Pakistan, India, and Indonesia, are causing significant changes in eating patterns. This could significantly impact global food consumption, necessitating a focus on food insecurity to reduce poverty. Undernourishment can lead to reduced productivity, decreased profits, and prolonged poverty. Despite Asia's robust economy, the number of undernourished people has consistently increased, from 526 million in 1995-1997 to 567 million in 2006-2008. Addressing this issue is crucial to reducing poverty and promoting global economic growth (FAO, 2011). Although everyone needs food to survive, food insecurity is a reality today and cannot be denied. At the 1996 World Food Summit (WFS), every member of the UN pledged a commitment to eradicate hunger, and the first Millennium Development Goal (MDG) was to cut the rate of hunger in half by the year 2015. Due to several factors, including the rising trend in food prices and the lack of political determination on the part of most governments in developing nations, it doesn't appear easy at the time to attain this key factor necessary for everyone. However, the challenge of feeding both a nation's population and the world's population shows why all countries developing or advanced in terms of technology—place such a high value on securing their food insecurity. In other words, it affects nearly every area of an economy and culture, making it a global concern that goes beyond food and feeding people (Shaikh, Hatcher, 2005).

Food insecurity characterizes such a situation in which a family unit experiences the availability of sufficient food nourishment due to constrained financial resources or other limitations. A major problem for health and nutrition in the United States is the emergence of food insecurity, when food is inaccessible to households because they don't have enough money or other resources to buy it (Gunderson, 2015). Humanity's biggest concerns in the twenty-first century are establishing global food security, environmental sustainability, and socioeconomic fairness. Severe obstacles stand in the way of reaching targets for nutrition and global food security. As an illustration, it is projected that the COVID-19 pandemic has caused undernourishment to rise from 8.4 to 9.9% globally as of 2019, leaving over 2.37 billion people to lack access to enough dietary sources, and 2.2 billion adult obesity. (Lu et al., 2022).

The global hunger and malnutrition crisis is on the rise, with 83 million people experiencing hunger in 2017 across 45 countries. Undernutrition rates are lower in highly urbanized areas, developing countries, African countries, and Asian countries. Research shows that people with low incomes do not experience food insecurity, contradicting the notion that people in poverty feel deprived. There is a relationship between food insecurity and negative health outcomes (World Bank, 2017). Food insecurity has been linked to adverse health consequences in children, with children in households struggling with it experiencing psychosocial difficulties, frequent stomachaches, increased hospitalization, and behavioral issues. Additionally, food insecurity has been linked to increased obesity rates. These negative health findings are based on diverse data sources, statistical methodologies, and resilience across different food insecurity levels. Despite efforts to address this issue, the number of people experiencing hunger and malnutrition continues to rise (Gunderson, 2008).

1.2. The Current Situation of Food Insecurity in Pakistan

According to the Global Hunger Index (2021), Pakistan is ranked 92 out of 116 countries, with a score of 24.7, in the year 2021, indicating a "severe" hunger situation. Sri Lanka and Bangladesh, two of the nation's neighbors, received better scores, 76 and 65, respectively. Due to decreased income and double-digit increases in food prices, more Pakistanis are experiencing food insecurity. The biggest challenge to obtaining a balanced diet, according to the World Food Program (WFP), is the availability of fairly priced food. Pakistan's rice crop was lost by 15% in the 2022 floods, causing further food insecurity. The National Food Policy (NFP) of Pakistan has led to the launch of agricultural programs and marketing tactics, but the results have not been encouraging. The NFP aims for sufficient food production,

stable food prices, and consumer access to food. Food output has expanded dramatically since 2006, but prices have varied frequently. As the number of districts experiencing food insecurity rose from 74 in 2004 to 95 in 2008, the nation's state is deteriorating (Hussain and Routray, 2012).

According to the Ministry of Health and UNICEF's National Nutritional Survey (2018), 63.1% of families in the country are "food secure." The study includes the Food Insecurity Experience Scale from the Food and Agriculture Organization. The Food and Agriculture Organization of the United Nations (FAO, 2018). Three categories are identified by the scale: mild (consisting of worries about access to food); moderate (compromises variety/quantity of food and often skips meals); and severe (chronic hunger). 18% of Pakistani households that are categorized as "food insecure" also experience "severe" food insecurity, which is alarming. Compared to Sindh and Baluchistan, KP and Gilgit-Baltistan have generally better food insecurity. Furthermore, according to FAO's (2018) recent projections, the nation is not keeping up with lower-middle-income nations in terms of progress in any aspect of food insecurity. Pakistan's per capita income is US$1,497, yet the country still has issues with undernourishment, micronutrient deficiencies (iron, calcium, and vitamin A), and unsafe drinking water. In underdeveloped countries, the per capita intake of foods high in nutrients—such as meat, poultry, fish, milk, vegetables, and fruits is around six to ten times lower. The ability of Pakistan's population to obtain food and the country's capacity for food production determine how secure the country's food supply is, much like in other developing nations (Hussain, and Routray, 2012).

1.3.   Food Insecurity and Healthcare

For the past twenty years, the public health community has been fascinated by the social determinants of health (SDH), which are non-medical factors that may be impacted by social policies and have a major influence on health. We refer to clinical services as "medical care" rather than "health care" to reduce any potential misunderstanding between the terms "health" and "health care." The Commission on the Social Determinants of Health of the World Health Organization defines SDH as "the situations in which individuals are born, develop, live, work, and age" and "the underlying drivers of these conditions". The term "social determinants" often refers to factors that may influence behaviors related to one's health, such as walkability, recreational possibilities, and the availability of healthful meals in an area. Nonetheless, there is mounting proof that a range of health outcomes, including income, wealth, and education, are essentially impacted by socioeconomic determinants (Marmot, and Wilkinson, 2005).

Food insecurity can trigger people to use healthcare services more frequently due to the worsening of chronic ailments and the need for costly healthcare. Individuals facing food insecurity often struggle to allocate resources among essential needs, resulting in tight food budgets. Healthy diets are generally more expensive, and those with food insecurity often have poorer dietary quality. Unhealthy eating habits, such as low Healthy Eating Index scores, empty calorie consumption, and little food change, are associated with unhealthy eating. Additionally, reducing medical expenditures may delay essential medical treatment and prescriptions, increasing future medical costs (Jia et al., 2021).

Food insecurity may lead to increased healthcare utilization due to the worsening of chronic ailments and the need for costly healthcare. This cycle of food insecurity is perpetuated by individuals struggling to allocate resources among essential needs, resulting in tight food budgets. Ideally, healthier diets are more expensive, and those with food insecurity often have to make trade-offs between different needs, resulting in a more expensive lifestyle (Jia et al., 2021).

1.4. Pakistan's System for Providing Healthcare

The World Health Organization (WHO) acknowledges that health is an independent priority and a key component of development and poverty alleviation (WHO, 1998; 2001). Since a healthy population improves the quality of life, good health is essential to the development of every country. In addition to allowing individuals to fully engage in the production of wealth and productive activities, health is a key measure of human growth. Since healthcare utilization reflects attempts to both enhance health outcomes and fulfill international responsibilities to make excellent healthcare more accessible, it is therefore a strategic public health and policy problem that should worry stakeholders. Many people, particularly in developing nations, have barriers to accessing healthcare, and research has linked these issues to socioeconomic disparities (Buor, 2003; Habicht and Kunst, 2005).

Pakistan has the sixth-highest population in the world. Sadly, Pakistan was one of the six nations in the world where 50% of maternal fatalities took place in 2008. According to statistics, a woman dies in Pakistan every 20 minutes from maternal causes that arise during the postnatal period. In a similar vein, out of every 1,000 born, 45 die within the first 28 days of life and 77 never reach their first birthday According to the pattern of child mortality for children under five, 26% of deaths happen during the postnatal phase, and more than half happen during the newborn phase i.e., the first 28 days (Khan et al,2012).To improve population health, the government began implementing vertical preventive programs, such as the Maternal and Child Health Project's Strengthening via the Training of Lead

Health Visitors (LHVs) and the Expanded Program of Immunization for Mass Population. The health indicators have improved as a result of these activities. Maternal mortality has also dropped, currently standing at 276 per 100,000 live births from 800-1000 per 100,000 live births in the late 1940s. For example, infant mortality has fallen from 220 per 1000 live births to 72 per 1000 live births (Kurji, Premani, and Mithani, 2016). Research on the variables influencing the population's health-seeking habitats is desperately needed because, despite Pakistan's adequate resources, the country lags far behind many other nations in terms of healthcare delivery and utilization. Health-seeking behavior has been explored in many international settings, and its significant correlates include the physical, demographic, socioeconomic, and cultural factors additionally the organization of the healthcare sector. However, very few studies in this regard have been conducted in Pakistan (Shaikh, and Hatcher, 2005).

Cultural traditions and beliefs sometimes lead to self-care, home remedies, and traditional healer consulting in rural areas. The older ladies in the home are a great source of advice that should never be disregarded. These variables, which are more prevalent in women, cause delays in seeking treatment, not only for their health but also for illnesses afflicting their children. In addition to age, gender, and marital status, other factors that are linked to health-seeking behavior include family size and parity, educational attainment, and the employment of the family head, regardless of age, family socioeconomic standing, or educational attainment, traditional customs, and beliefs have persisted (Shaikh, and Hatcher, 2005)

This research aims to investigate the impact of food insecurity on the behavior of individuals seeking outpatient care from modern healthcare facilities throughout their illness. When healthcare is used, specifically to improve health, it will prove to be more effective (Sari, and Handayani, 2021). It is believed that studying the outpatient behaviors of people who experience food insecurity will provide a general overview of the treatments that should be carried out to enhance their overall health. Furthermore, it is believed that increasing public health standards will improve human resource quality and decrease the state's administrative burden that may result from future gaps in health quality. This study intends to investigate the impact of food insecurity on outpatient treatment by investigating the relationship between demographic variables who are at high risk for health issues and have resource limitations using the food insecurity indicators. Most of the studies previously focused on determinants and indicators of food insecurity in Pakistan this study will address the outcomes of food insecurity on household health utilization and healthcare expenditures and will investigate the adverse impacts of food insecurity on the health of mothers and children in

Pakistan. In this study, food insecurity scores will be measured by the FIES method which is also a unique attempt of this nature in Pakistan.

2.   Literature Review

A systematic approach to compiling and synthesizing previous research that serves as a strong basis for knowledge development and theory expansion is the literature review. It addresses research problems more effectively than any single study by integrating viewpoints and conclusions from multiple empirical investigations. Previous literature, often known as "background research," "theoretical framework," or "literature review," should be considered in research endeavors. This procedure offers evidence in support of the research question and hypotheses, as well as the study's objective. However, for a literature review to be accepted as a valid research strategy, it must be accurate, exact, and trustworthy. The work completed, findings made, and clarity of reporting determine an academic review's value.

2.1.   Concept of Food Insecurity

Despite the world's food surplus, 17 percent of the global population, including 852 million women, lack access to food and suffer from hunger daily. Chronic hunger claims more lives than natural disasters, illnesses, or armed conflict. Women, responsible for up to 80% of food production in underdeveloped nations, only control 1% of the land. Lack of access or entitlement is a direct cause of hunger's persistence as stated by Arif, and Khalid (2007).

Sari, and Handayani, (2022) stated that demonstrated that the experience of access to food, which is utilized to evaluate food insecurity, is an endogenous variable, the food insecurity score significantly influences the decision to forego using basic healthcare services for outpatient care. Individuals are more likely to forgo healthcare services if their food insecurity score is higher. Based on the poverty line, this beneficial effect is experienced by people in both the poor and non-poor groups. This research demonstrates that individuals in non-poor groups and those who are food insecure prioritize addressing their fundamental food needs.

In their study, Lee et. Al., (2013) examines that in developing nations, most household income is spent on purchasing basic meals, and high food prices can affect the population's nutrition and health negatively. The purchasing power of disadvantaged households is reduced by high and fluctuating food prices, which poses a serious threat to nutrition and health, particularly for women and children. Strong policy measures are required to diminish the influence of rising and fluctuating food prices on nutrition and well-being. The immediate focus may be

on assisting underprivileged households and farmers to manage the dangers of sporadic increases in food prices and instability. Effective short-term relief may be provided by carefully targeted safety nets, including monetary or in-kind transfers, feeding initiatives, and temporary employment opportunities.

2.2.   Food Insecurity in Pakistan

Khan et. al., (2012) also investigated and reported that more wheat, rice, maize, pulses, oilseeds, meat, and milk must be produced to enhance food availability. The districts located in Sindh have the highest likelihood of having a sufficient supply of food. In terms of policy, the provinces of AJK, Punjab, FATA, NWFP, and the northern territories need to pay more attention to boosting the supply of food.

Hussain and Routray, (2012) indicated for Pakistan to meet the goals of its national food strategy, all levels of its present policies must be reviewed. Even in the existence of a formal financial system and a sufficient supply of inputs, the efficient use of natural resources—particularly land and water is crucial to maximizing the production potential of key food commodities.

By giving these properties to graduates in agriculture, the Punjabi government has taken a few initial steps toward the usage of fertile areas. When this strategy for raising agricultural output is shown to be effective, it may serve as a model that other AUs can follow. The planned development of large water reservoirs in Pakistan has already politicized the topic of water resources. It is not enough to only create policies; institutions must also be evaluated for their performance. Policies about marketing and pricing may appear to be public-friendly, but their real inability to manage price volatility, and cosmetic shortages, or promote universal standards of quality and measurement stems from the bad performance of the institutions involved.

However, according to the study conducted by Hussain and Routray, (2012) results, Pakistan is still falling short, particularly when it comes to accomplishing the goals outlined in its national food strategy. The country is believed to be producing less than 40% of its potential, although this is only because of inefficient utilization of the land and water resources that are available, a weak input market, and an outdated formal credit system. Even though it produces less than it can, the country is almost self-sufficient in most main food commodities. Food accessibility and consumption by the public differ even when food production is sufficient since a significant portion of the produced food is inaccessible owing to important economic, physical, and occasionally natural causes. The key economic factors

have brought about price instability, ineffective marketing systems, and higher inflation rates resulting in lower food purchasing power of the people.

2.3.   Issue of Food Insecurity Worldwide

Research on the first pillar of food insecurity, sustainable food production, was conducted in 1996 by Quisumbing et al. In sub-Saharan Africa, women produce 70–80% of the food consumed by households; in Asia, they produce 65 percent; and in Latin America and the Caribbean, they produce 45 percent. Despite unequal access to land, knowledge, and inputs like improved seeds and fertilizer, they can do this. Women farmers may get yields that are on par with or, as some studies indicate, noticeably greater than those of males provided they have equal access to resources and human capital. There are several different laws controlling women's land rights. Land ownership by women is prohibited under many religious regulations. Local customs can override civil law rights granted to women to property inheritance In Africa, women are mostly in charge of providing food.

2.4.   Healthcare and Behavioral Model

Godfray and Garnett, (2014) stated that sustainable intensification is essentially a straightforward logical deduction based on several premises. The challenges are such that tools from all forms of agriculture should be taken into consideration. (i) It is almost a given that there will be a significant increase in food demand over the coming decades and that increasing production must be one response—but not the only one—to ensure food insecurity. (ii) Converting new land to agriculture would seriously harm the environment. (iii) Minimizing the environmental impact of food production is crucial for the well-being and prosperity of future generations. However, acknowledging these suppositions does not explain how SI is best attained; rather, it just describes its aspirational nature. It will require a significant program to pursue SI.

2.5.   Healthcare Utilization and Impact of Food Insecurity

Cole, et al. (2018) wrote in their research paper that the complexity of the problem of food insecurity demands consideration for the health of the planet and its inhabitants. An integrated system of interventions backed by multidisciplinary research and technological innovation will have to be put into place.

Universal megatrends will affect these endeavors. To start comprehending the possible contributions that various technologies could make, the food wedges framework offers a straightforward yet helpful architecture. It will be beneficial to improve the food wedge structure even further. The International Union of Food Science and Technology's Food Insecurity Committee is looking at a particular

wedges framework version that might be more indicative of the food value chain. Jia et al. (2021) investigated the issue of health utilization and food insecurity and found a correlation between food insecurity and increased hospitalizations and use of mental health services among adult US citizens between 2009 and 2016. Additionally, in patients with pre-existing diet-related comorbidities, it is linked to fewer outpatient visits. People who are food insecure eat poorly and visit primary care physicians less frequently. Food insecurity has grown due to COVID-19-related job losses and income losses, which have an impact on access to preventative treatment. Reduced rates of outpatient visits can also be attributed to comorbidities or poor nutrition. There are neglected possibilities to identify and manage nutritional intake and food insecurity during hospital stays and mental health consultations.

2.6. Socio-Demographic Factors and Healthcare Utilization

Despite other socio-demographic predictors of poor health, analyses of Canadian population survey data show significantly higher odds of mood and anxiety disorders, signs and symptoms of depression, and suicidal ideation among adults in food-insecure households. This suggests that there is a particularly strong correlation between household food insecurity and mental illness. Similar correlations have been documented worldwide as well as in the US, UK, Australia, and New Zealand. Strong correlations between depression and food insecurity have also been shown in studies of certain patient populations (such as those with type 2 diabetes, HIV, and hepatitis C). There is evidence of a graded association between the degree of household food insecurity and the likelihood of mental health issues (Tarasuk et al., 2018).

Between 2009 and 2016, a nationally representative sample of US individuals showed a correlation between food insecurity and higher rates of hospitalization and mental health care use. A lower frequency of outpatient care was linked to food insecurity in individuals with pre-existing diet-related comorbidities. Food insecure people had the lowest dietary quality, and those who were food insecure and had poor dietary quality were most likely to have low primary care usage. The COVID-19 pandemic has resulted in increased unemployment and economic loss, leading to a rise in the prevalence of food poverty. This might potentially impede access to preventative care. Although further study is required, these findings imply that combining programs and referrals for food insecurity and other health-related social needs across primary care offices, hospitals, and mental health facilities may assist improve health outcomes for patients from lower-income backgrounds. By recognizing and

addressing food insecurity, the healthcare system may more effectively lower barriers to treatment, include all Americans in reducing health inequities and enhance the provision of high-quality healthcare (Jia et al, 2021).

The outcomes of the study by Andarini et al. (2019) indicated a correlation between health-seeking behavior and treatment-related adverse drug reactions. However, in this scenario, the adverse drug reactions may be both a cause and an encourager of specific treatment patterns. When a patient has an unfavorable medication response, they will become more conscious of the situation and, if they self-treated or received traditional medical care at first, they will seek medical attention from a doctor for the next course of action.

2.7. Health-Seeking Behavior in Pakistan

Pakistan's health system needs to be reformed to reduce polarization and promote client-centered approaches. This includes hiring more female health workers, providing supportive environments, and creating a friendly environment. Financial incentives for public sector employees can boost service quality. State regulatory frameworks and ongoing training programs are crucial. A comprehensive healthcare system should prioritize rural residents, who are the poorest and only visible through foreign programs. Inter-sectoral collaboration-based behavioral health promotion campaigns targeting underprivileged populations like women, children, and the elderly are also recommended.

Shaikh and Hatcher (2012) documented that programs for rural industrialization and job creation depend heavily on revenue diversification for non-farm economic activity. However, due to its restricted scope, income diversification was unable to considerably raise the standard of living for the households in the study areas. Therefore, we recommend that the government and other relevant parties create policies that scale up (intensify) income diversification and facilitate low-income households' transition from high-risk, low-return activities to profitable ones to lessen the prevalence of food insecurity in the study area. Women from food-insecure families are less likely to receive healthcare than their counterparts from households with stable food supplies.

The demand for MHS was also highly associated with household income status and individual educational attainment. The study's conclusions have significant policy ramifications for Bangladesh's planning of reproductive healthcare services. In particular, when a pregnant woman is involved, health policies that aim to improve food insecurity and the economic empowerment of vulnerable households must be prioritized to promote maternal health and service

usage. The potential for improving maternal health utilization in Bangladesh through food-security-based initiatives should be the subject of future research (Bishwajit, and Yaya, 2017).

This study will contribute to the field of economics in several ways. There is limited research in Pakistan in which the impacts of food insecurity are examined on healthcare utilization and how limited resources restrict people from getting access to modern healthcare and medication. Prior research has only provided a limited amount of empirical evidence on the connection between population health and food poverty. This study aims to assess the relationship between home health utilization, healthcare expenses, and food insecurity. The purpose of this research is to determine the incidence of food insecurity in families and investigate the connection between food insecurity and healthcare usage, as well as the associated costs. Additionally, to provide insight into how food insecurity may affect healthcare expenses and vice versa, it aims to investigate the reciprocal association between food insecurity and out-of-pocket health expenditures. This research study aims to shed light on the relationships between food insecurity and healthcare consumption by examining these linkages. This will help policymakers to develop measures to lessen the damaging effects of food insecurity on health care utilization.

3.   Theoretical Framework

A comprehensive collection of principles known as the conceptual or theoretical framework is employed to direct and comprehend the course of the research process. Research frequently reveals that a single theory is insufficient to adequately handle all of the problems or formulate the issue that has to be resolved. The study's foundational theories and models provide the basis of a theoretical framework. An illustration of the connections between constructs based on the observations the researcher hopes to make throughout the study is called a conceptual framework. As a result, a conceptual framework allows for the use of several ideas to contextualize the research study rather than just one theoretical framework Health and food instability are linked, affecting one another. Social factors (work, education, etc.) are important in determining the results of food insecurity and health.

The Andersen Behavioral Model of Health Services explains that health usage and the motivations behind certain activities are greatly influenced by utilization. This paradigm looks at need, enabling, and predisposing variables. To understand why individuals seek or avoid healthcare services, providing valuable insights for developing effective interventions and policies. In explaining this

model, the study presented by Shao, Shuang, et al (2018) helps us better understand the health condition and health-seeking behaviors of Chinese migrants and residents who have just received "Hukou." In contrast to the inhabitants of "Hukou," migrants' health was better in the 2534 age range, and their use of health services was less common. For migrants, the Anderson healthcare model uses factors like moderate and severe symptom states within the previous month and these were a major predictor of health service consumption. Furthermore, the variance in the utilization of health care was strongly influenced by the ethnicity of the predisposing factors. Future research on minority immigrant health service consumption warrants close attention. The study's findings would help bring attention to healthcare system change. To remove obstacles for migrants, it recommends that policymakers create procedures and policies that guarantee fair and simple access to medical care. Some examples of these include expanding health insurance coverage and promoting healthy habits and behaviors in a culturally relevant way. To increase migrant populations' access to and use of health care, more thorough studies are required in the future to determine the size of the health utilization gap between migrant and native-born populations.

According to Bharga and Lee's (2016) study, food insecurity may cause disadvantaged groups to use healthcare services more frequently, which is consistent with Andersen's behavioral model of healthcare consumption. Previous studies on homeless and low-income people corroborate this. According to the report, the bulk of healthcare costs for elderly people who are food insecure should be covered by public health insurance programs like Medicare. Treatment plans may also be impacted by food insecurity, especially for illnesses like diabetes and hypertension, mainly related to diet. Healthcare professionals should create procedures to recognize individuals who are food insecure and deal with their particular issues. Reducing food poverty among senior citizens may enhance health, lower the need for medical services, and save overall healthcare expenses.

According to the Grossman (1972) model of health demand, people frequently struggle to meet their health demands due to financial restrictions since health is seen as a utility. Their current budget will be allocated to satisfy fundamental necessities of food due to limited resources and priority for addressing food demands.

In this research, we aim to study that a person's inability to access certain household resources, such as money, time, and opportunities, is correlated with their level of food insecurity. A person's ability to find employment will be

restricted by this illness, which will lower their income and make it challenging for them to afford basic expenses like housing and medical care

When someone needs healthcare but doesn't utilize it or waits to get it, their health might deteriorate, which can lower their income and increase their medical expenses as their sickness worsens, ultimately pushing them into poverty.
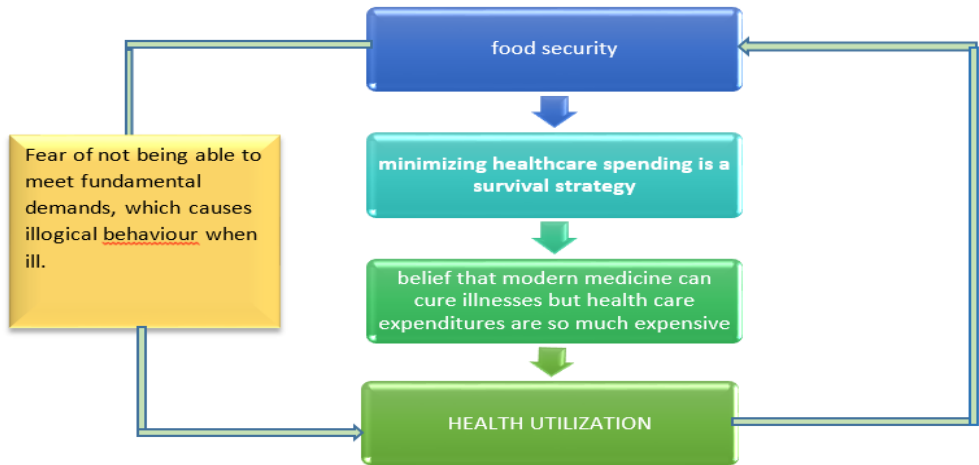
4.   Methodology

To get new information, research is a deliberate, systematic process that requires careful preparation and interventions. For research to be valid and trustworthy, it must have a well-designed methodology that is objective, reproducible, and dependable as well as appropriate conduct, data collecting, and logical analysis. This is because improper methodology might provide inaccurate results. A scientific study's research methodology section describes the methodological choices taken, together with the methods used for data collection and analysis, along with their justifications. It should explain why the selected methods are appropriate for tackling the research problem. A well-designed research procedure improves the reliability and validity of the results. Depending on the topic, there are three different forms of research methodology: mixed-method, qualitative, and quantitative. Think about possible ethical dilemmas and study constraints before selecting a suitable research methodology (Garg, 2016). Therefore, this section presents the data and econometric techniques used in the study.

4.1.   Data Source

Secondary data from the Pakistan Social and Living Standards Measurement Survey (2018–19) published by the Pakistan Bureau of Statistics, is used in this research. A provincial-level survey, Social and Household Integrated Economic Survey (HIES)) currently conducted, covers 24,809 households and offers comprehensive outcome indicators on housing, water sanitation and hygiene, education, health, population welfare, information and communication technology (ICT), food insecurity experience scale (FIES), and income and expenditure. The people who took part in the MEPS Household Survey, for which food insecurity data were gathered, comprise our sample.

4.2.   Food Insecurity Experience Scale Estimation

The Food Insecurity Experience Scale (FIES) measures food insecurity by looking at a survey participant's "lived experience" with access to food. The scale expands upon experience-based evaluation instruments that monitor the controlled procedure via which an individual usually addresses food insecurity (Allee, Lynd, and Vaze, 2021).

A statistical technique for assessing the degree of food insecurity at the household or individual level is the Food Insecurity Severity Index (FIES). It is predicated on replies to eight inquiries concerning the availability of sufficient food. The Pakistan Bureau of Statistics initially gathered the FIES statistics with the HIES data for the 2018–19 fiscal year. The eight questions ranged in complexity from easy to challenging, including topics like going without eating for the entire day owing to financial constraints and worrying about running out of food. The person in charge of meal preparation in the family, the responder, was asked if there had been any instances of varied degrees of food insecurity severity in the previous year.

4.3.   Measurement of Food Insecurity through FIES

The Food and Agriculture Organization (FAO) developed a series of questions to assess food insecurity. Missing responses to FIES questions were excluded from 24809 households in the PSLM data. The survey module allowed for recording "don't know" and "refused" responses, but these were classified as "missing" for analysis. 1s were assigned to affirmative responses and 0s to negative ones. The raw score ranged from 0 to 8, as the FIES consisted of eight questions.

According to FAO (2018The study uses a raw score to measure food insecurity severity across different countries and situations. The raw score is the

total of positive answers to eight FIES questions, with lower scores indicating less severe food insecurity. The study categorizes respondents into high, medium, low, and deficient food insecurity based on the total positive responses to the Household Food insecurity questionnaire. Food insecurity is divided into four groups: food secure (0), mild (1-3), moderate (4-6), and severe (7-8). The study assumes that every individual in the household has the same level of food insecurity, as the question of food insecurity is at the household level.

4.4. Endogeneity of Food Insecurity Variable

This research examines the relationship between food insecurity and modern healthcare use, revealing that it is endogenous. This is due to the fundamental endogeneity conundrum, where an unmeasured third can affect both explanans and explanandum. This problem is part of selection bias, which can be difficult to determine when variables have a two-way relationship. To address this, the instrumental variables approach is used to estimate parameters in a linear model, and an instrumental variable (IV) is used to overcome endogeneity. When one or more explanatory factors are endogenous, the instrumental variables approach can be used to reliably estimate the parameters in a linear model. To get over endogeneity, an instrumental variable (IV) is used (Wooldridge, 2013).

In a regression model, the relationship between the error term (e) and the predictor variable (x) is known as endogeneity. There are two main scenarios in which it might happen: either the outcome variable predicts x rather than merely responding to it (simultaneity bias) or significant factors are left out of the model (omitted variable bias). IVs are commonly used to address endogeneity issues in social sciences, but finding a suitable instrument can be challenging. Despite alternative methods, IV-based estimation remains popular for cross-sectional and panel datasets due to its strict assumptions and conditions for finding suitable IVs. Choosing the right instrument can significantly improve the performance of the chosen econometric model (Zaefarian, 2021).

An instrumental variable must be exogenous and partially connected to the endogenous explanatory variable, ensuring it doesn't have a relationship with the structural equation's error term. This exogeneity is achieved through the IV requirement, which isolates the endogeneity's influence. The relationship between instrument variation and instrumented variable variation is meaningful (Wooldridge, 2013).

4.5. Instrumental Variables Probit (IV Probit)

Instrumental Variables Probit (IV Probit) is a statistical technique that combines a probit model with instrumental variables. When dealing with binary outcome variables, the probit model is frequently applied in regression analysis where the dependent variable is binary. To address possible endogeneity problems in the probit model, instrumental variables are incorporated in IV Probit. Biased parameter estimates result from endogeneity, which is the association between the independent variables and the error term in the model. To demonstrate a causal link between the independent factors and the binary result, instrumental variables are used to extract the exogenous variation in the independent variables (Sari and Handayani, 2022). This study examines the impact of healthcare utilization on a person's contemporary healthcare use function, which is a binary choice. The IVProbit (Instrumental Variables Probit Model) function is used to estimate the parameters needed for this data. The study used the Instrumental Variable Probit regression model, a Probit model extension, to examine the data. The model works best when a variable suspected of being endogenous is one of many independent variables that impact a dichotomous dependent variable, which is approximated as a dummy variable. The study provides valuable insights into the relationship between healthcare utilization and contemporary healthcare use.

The following equation illustrates how the model works best in a scenario where a variable that has been suspected of being endogenous is one of many independent variables that are proposed to have an impact on a dichotomous dependent variable, approximated as a dummy variable. Certain econometric techniques must be used when modeling the risk variables for food insecurity and modern health utilization, taking into account any potential endogeneity. Only in situations where endogeneity is not an issue inside the given model can the traditional Probit model yield unbiased estimators. The present investigation employed a two-stage Probit model to identify and rectify the probability of food insecurity being endogenous inside the designated health utilization model. The best practice is to designate the primary structural model as follows:

$$MHUi = \alpha + \beta Xi + \gamma FI + ei \tag{1}$$

$$FI = \delta + \partial Xi + \mu HE + \rho AST + vi \tag{2}$$

Where FI is the food insecurity score and MHU* is a latent variable of modern healthcare use.

In Equation (1), MHUi is a dummy variable coded as 1 for health utilization respondents and 0 otherwise. The Xs is a vector of explanatory variables such as

age, residence, marital status, education, size of household, marital status, kind of illness, BISP, employment status, etc. In this study, we suspected that FI would be endogenous. The endogeneity problem arises if the error component in Equation (1) is correlated with the error term of Equation (2). This can be the case given that some key omitted variables, which affect modern health utilization also affect food insecurity. One way to overcome this issue is to apply instrumental variables. One important step in estimating instrumental variables is choosing the right instrument regression using Probit. In addition to the econometric characteristics that the instruments must have, they also need to guarantee some theoretical support and applicability. A brief review of the literature offers the necessary guidance for choosing an instrumental variable within the parameters of the intended investigation.

Healthcare, as it is defined in this research, could not accurately reflect the worth of this condition. In reality, a self-reported measure might be impacted by a wide range of other circumstances including cultural variations in how people describe their subjective sensations. There is endogeneity when u and v are related. The endogeneity test in the Probit was conducted using the Wald test of exogeneity's parameter ρ (rho). The result was statistically significant, indicating the suitability of the instrumental variable or variables, and the employment of IV Probit is therefore justified. H_0 in this test is $\rho = 0$ (the variable is exogenous) with H_0 being rejected if the p-value is $\leq \alpha = 0.05$ (Wooldridge, 2010).

4.6. Measurement of Variables

4.6.1. Dependent Variable: Healthcare Utilization

This study's use of healthcare was determined by how someone who was sick and looked for outpatient care for recovery performed. Outpatient treatment is utilized for medical care when someone is sick since it is usually more flexible regarding prices and income than inpatient care or other preventive treatments (Sari and Handayani, 2022). This study examined the use of inpatient and outpatient healthcare services, evaluating the frequency of office and emergency department visits, out-of-hospital visits, inpatient hospital admissions, and hospital stays for respondents over the past three months. It also examined health problems associated with the use of these services and outpatient care, as well as the duration of hospital stays for those individuals. This study used a dichotomous variable to identify healthcare utilization, with 1 assigned to those seeking inpatient or outpatient care, and 0 for those not using it. Responses were coded based on whether the ill person had visited a modern healthcare facility for outpatient

treatment in the previous month, or if they had not pursued care from a modern facility before the survey.

4.6.2. Key Independent Variable

The Food Insecurity Experience Scale (FIES) was used to assess food insecurity, based on eight items. The Food and Agriculture Organization (FAO 2018) created this series of inquiries to assess a person's ability to obtain enough food. The food insecurity variable is dichotomous, with 1 for food insecurity and 0 for food insecurity. The FIES estimation was already done, and the rest categories were considered food insecure and secure.

4.6.3 Demographic, Socioeconomic, and Health Variables

This study includes independent co-variants in which there are socioeconomic variables i.e. education, income per capita, employment status, and social protection, as well as demographic factors including the number of people living together, age, sex, and marriage status. Health characteristics such as health expenditures, kinds of illness, and type of healthcare while seeking healthcare utilization.

Table 1: Description of the Variables Used in the Model

Variables	Description And Measurement
Healthcare utilization	1 if HH is utilizing healthcare; 0 = otherwise
Food insecurity	1 if HH is FS; 0 = otherwise
Age	HH head age in number of years
Gender	1 if HH head is female; 0 = otherwise
Marital status	Marital status of household head
Urban	1 if HH is urban; 0 = otherwise
Size of household	The total size of the household
Education	Education of household head in number of schooling years
Expenditures per household ln	Expenditures of HH head
Employment status	1 if HH is employed; 0 = otherwise
BISP	1 if HH is Receiving BISP; 0 = otherwise
Livestock	1 if HH is owner of livestock; 0 = otherwise
Farmer	1 if HH head is farmer; 0 = otherwise
Kinds of illness	1 if HH is suffering major disease; 0 = otherwise
Type of healthcare	1 if HH is availing private health facility; 0 = otherwise

5. Results and Discussions

5.1. Results

Table 2: Food Insecurity Scores in Pakistan by Using FIES

Categories Name	No of Household	Percentage
Food secure	15727	63.4%
Mild food insecurity	5,334	21.9%
moderate food insecurity	2381	9.6%
severe food insecurity	1264	5.1%

The FAO's food insecurity estimation is used to categorize the FIES food insecurity score, dividing it into mild, moderate, and severe categories

The study found that 63.4% of the sample experienced food insecurity, with 21.9% experiencing mild, 9.6% experiencing moderate, and 5.1% experiencing severe food insecurity. This classification helps simplify descriptive analysis and improve understanding of food insecurity.

This study emphasizes the age and gender of household heads, as they decide whether to send members to the last hospitalization. The average age of household heads is 45, with males leading 90% of households and females at 9.5%. The average household size is 6, and 64% of the population lives in rural regions. Class 8 is the average length of schooling in the sample. Only 30% of households respond to questions about their highest class. 91% of the sample is currently employed, and 8.8% receive social support, such as BISP. Out of families using healthcare, 7684 went to the hospital for serious diseases, 6668 for mild illnesses, 13% went to government hospitals, and 31% used private facilities.

The robustness checks on the food insecurity variable were conducted to ensure reliability and adaptability. Robustness is a system's ability to continue operating consistently and reliably despite fluctuations or unforeseen circumstances. It is essential for dependability and flexibility in various fields like software, engineering, and economics. The results showed a significant negative relationship between food insecurity and modern healthcare utilization, regardless of the use of IV. The effect of the food insecurity variable in the model with IV was more significant than the likelihood of not using modern healthcare.

Table 3: Estimation Results of the Instrument Variables

Variables	Coefficient	Standard Error	p-Value
Health Expenditures	0.000000847	0.000000289	0.003
Total Assets	.1352504	.019974	0.000
Electricity	-.4375994	.0438776	0.000
Safe Water	-.0611493	.0308559	0.048

By addressing endogeneity through appropriate modeling strategies, such as the use of instrumental variables or other econometric approaches, regression findings are more likely to be objective and trustworthy, enhancing the validity of statistical conclusions and strengthening sensible policy suggestions. The study used the Wald test of exogeneity with IVprobit to check the endogeneity of variables, revealing that the food insecurity variable was not exogenous. The p-value was less than $\alpha = 0.05$, indicating that there was insufficient information to determine its exogeneity. The F-test of joint power was also conducted to check the validity of the instruments, determining if a set of the model's coefficients

represents a significant portion of the variance in the dependent variable. The F-test value supports the rejection of the null hypothesis, indicating no relationship between the variables.

The p-value for the IVs in the regression is less than 0.05, rejecting the null hypothesis. The instrument variables have a significant impact on food insecurity. Health expenditures have a positive impact on food insecurity perception. Total assets owned by a household negatively affect food insecurity, increasing expenditures on food and decreasing food insecurity levels. Safe water and electricity also negatively affect food insecurity status.

Table 4: Estimation Results of the Effect of Food Insecurity on the Utilization of Modern Healthcare

Variables	IV-Probit Coefficient	Robust S. E	P-value	dy/dx
Food insecurity	-0.662	0.1319	0.000	-0.66
Gender	0.0716	0.0941	0.447	0.071
Age	-0.0031	0.00180	-.0066	-0.004
Marital Status	0.00001	0.0001	0.264	0.000
Household. Size	-0.0130	0.0111	0.242	0.37
Urban	-0.0403	0.05686	0.478	0.071
High School	-0.1044	0.0583	0.073	-0.104
Intermediate	-0.1094	-0.1094	0.095	-0.108
Bachelor	-0.173	-0.1732	0.805	-0.17
Prof. Education	0.0234	0.0234	0.805	0.023
Expenditure Per Capita Ln.	-0.3310	0.1033	0.001	-0.33
BISP	0.3741	0.1079	0.001	0.37
Employment Status	0.0716	0.0214	0.001	0.07
Livestock	0.0300	0.1151	0.794	0.03
Farmer	-0.0450	0.1039	0.665	-0.045
Kind of illness	0.10549	0.0482	0.029	0.10
Type of healthcare	-0.84451	0.157	0.000	-0.84

Based on the IVprobit approach, the parameter estimation concluded (Table 4), demonstrating that, at a 95% confidence level, food insecurity has significant effects on the use of modern healthcare with a marginal effect value of 0.66. Food insecurity is a sign of poverty and difficulty meeting necessities. Demographic factors, especially age, also play a crucial role. While younger individuals are more likely to use modern healthcare, the need for healthcare increases with age, and older adults are more likely to use these services than younger ones.

Gender has a positive effect on modern healthcare utilization (MHU), but its impact is relatively small, indicating that gender is not a significant factor. Women use hospital care more frequently than men. Household size has a negative effect on MHU, with larger families using outpatient care less often than smaller ones. Location has the most significant positive impact on MHU, with Rural areas having lower utilization rates compared to urban and modern areas. In essence,

women and people living in urban areas are more likely to use modern healthcare services, while larger households and rural areas tend to use these services less.

The study reveals a significant negative association between per capita expenditure and healthcare visits, possibly due to uncontrollable variables or interactions. Social protection also accelerates healthcare utilization for low-income groups. Education, particularly matriculation and intermediate education, has a significant impact on healthcare utilization, possibly due to healthier lifestyles and self-medication when health issues arise. The study reveals that professional education significantly influences modern healthcare utilization, with postsecondary education being more prevalent among respondents. Employment status also positively impacts healthcare utilization, as steady jobs provide affordable healthcare through employer-sponsored health protection. However, concerns about prices can lead to unemployed individuals delaying medical care, potentially causing more health issues. Employment also influences access to certain healthcare services.

The use of modern healthcare in Pakistan is significantly influenced by health factors, with serious illnesses increasing the likelihood of using healthcare services. The type of healthcare also affects the availability, cost, and promptness of medical care. Private health facilities have a positive impact on healthcare utilization, as people prefer them.

5.2. Discussion and Conclusion

Food insecurity is an endogenous variable, with a negative correlation with healthcare use. The likelihood of forgoing medical treatment increases with food insecurity, suggesting that basic food needs take priority over health. Healthcare use trends differ between food-insecure and food-secure older persons, with food-insecure individuals using services more frequently. This is evident in doctor visits, inpatient hospital stays, and emergency room visits (Bhargava and Lee, 2016).

Due to limited resources, a person facing food poverty must prioritize their needs. People with this illness spend less money on their health, which includes using fewer healthcare services. (Baer et al., 2015; Campbell, 1991; Sari, 2022). Financial constraints have a psychological impact on how someone behaves when seeking therapy. Even more so, the fear of not getting enough food reduces the utilization of healthcare for maternity care (Sari and Handayani, 2022). The relationships between long-term health problems, healthcare expenses, and utilization may affect a household's level of food insecurity through several methods.

A household unit may have fewer resources available to maintain a healthy, balanced diet if one or more members are unable to work as much as possible due to an underlying health condition, or if the unit must pay a significant portion of their income for ongoing medical expenses (Dean., French, and Mortensen, 2020). Conflicting daily demands like food insecurity can lead to trade-offs with healthcare expenses, increasing the need for acute treatment and overall medical costs. Integrating outpatient, inpatient, and mental health care services could enhance the engagement of food-insecure individuals in preventive medical care, particularly with Medicaid and health-related social services (Sariand Handayani, 2022)

Large healthcare systems offer food prescriptions for chronic illness patients and hospital-based food pantries for primary care patients. They also provide strong referral networks using community organizations and underutilized federal funds. Poverty affects diabetes patients' ability to maintain glycemic control, with food insecurity potentially playing a significant role in the disparities in microvascular problems associated with diabetes. This study highlights the need for improved disease management strategies for Medicare beneficiaries (Jia et al, 2020).

The results align with previous studies and indicate a gradual advancement in enhancing healthcare accessibility and sufficient food choices availability. The study shows that age has a slight negative impact on healthcare accessibility and food choice availability. As people age, they require healthcare services more frequently than younger individuals, due to a preference for treatment over work and a disregard for seeking medical attention. However, as people age, their body's capacity declines, and illnesses become more complicated, necessitating more medical attention (Sari and Handayani, 2021)

Rural residents are more likely to avoid modern medical services due to the lack of healthcare facilities in these areas. Despite the availability of more healthcare facilities, individuals still struggle to access them due to their distance and accessibility. Additionally, rural residents tend to believe in traditional medical practices, further highlighting the challenges faced by these communities in accessing modern healthcare services.

Sociodemographic characteristics significantly influence health-seeking behaviors, with the impoverished having a higher likelihood of visiting public hospitals and a lower likelihood of going to private ones. Factors limiting public health facility use include cost, dissatisfaction with service standards, and transportation challenges.

Education duration significantly influences people's decisions to use modern medical care, as highly educated individuals are more efficient at producing health and are better prepared to identify healthy lifestyle choices. However, a relatively low percentage of healthcare usage can be attributed to low education levels, with over 75% of participants having no formal education or rudimentary education. Low earnings, often due to poor educational attainment, also contribute to this low level of healthcare usage, as many respondents have low monthly incomes, which may hinder their ability to find well-paying employment. When the need for healthcare emerges, low earnings make it harder to fund its usage, which validates the results of Shaikh and Hatcher (2005) in Pakistan.

Modern medical care usage is more prevalent in families receiving social protection, possibly due to a brief income increase for help program members, enabling them to spend more on medical expenses.

5.3.   Conclusion

This study highlights the importance of boosting healthcare use for individuals and groups facing food insecurity due to decreased use of outpatient treatment. Strategies include increasing healthcare utilization in areas with high food poverty, improving infrastructure and transportation accessibility in rural regions, and lowering healthcare costs. Older individuals with food insecurity are more likely to utilize healthcare services, as evidenced by increased doctor visits, inpatient hospital stays, and emergency visits. Addressing food insecurity and improving healthcare access is crucial for addressing the challenges faced by these groups.

Food insecurity in Pakistanis is linked to higher hospitalization rates and healthcare spending, with lower frequency of outpatient care in those with pre-existing diet-related comorbidities. Food-insecure individuals have poor dietary quality and are more likely to have low primary care usage. Food insecurity has become more common due to job loss and income fluctuations, affecting access to preventive care. Primary care offices, hospitals, and mental health treatment facilities should coordinate referrals and programs for food insecurity and other health-related social needs to improve the health of lower-income populations. This study uses cross-sectional and secondary data from national household surveys, with restrictions. It excludes individuals experiencing health concerns after the month before the survey. Addressing food insecurity in healthcare can reduce barriers to care, reduce health disparities, and improve the delivery of high-quality healthcare.

Recommendations

1. Government organizations and policymakers should concentrate on fixing socioeconomic determinants of health inadequacies and the effects they have on health status and healthcare utilization.

2. There should be an increase in the use of healthcare for those and groups who are food insecure since they demonstrated a lower use of modern healthcare, particularly outpatient care.

3. The use of healthcare in rural regions needs to be increased, and this can be achieved by focusing on the affordability of treatment while also taking the infrastructure and accessibility of transportation options into account.

4. Government should make policies of targeted subsidies because of social protection i.e. BISP because households getting BISP increase the chances of the utilization of in-patient and out-patient care.

5. Supplying food-insecure people with certain chronic illnesses with a wholesome and dependable source of food may help in improving their health, reduce hospital visits, and related costs, and perhaps result in reducing the burden from overall the health system.

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