



**RESEARCH PAPER**

**Spatial Analysis of Food Insecurity and Poverty in Pakistan: Evidence from Household Cross-Sectional Data**

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**ABSTRACT**

This study examines the relationship between poverty and food insecurity in Pakistan using household level cross sectional data from 2018 to 2019. The analysis compares provincial and rural urban differences in food insecurity. Food insecurity remains a major socioeconomic challenge in Pakistan despite improvements in food production. Limited evidence exists on the relationship between poverty and household food access across provinces. The study uses a cross sectional quantitative design based on Household Integrated Economic Survey data for 24,809 households from Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan. Food insecurity is measured using eight access based indicators from the Food Insecurity Experience Scale. Ordinary Least Squares (OLS) estimation is applied using income, expenditure, and income expenditure ratio as poverty proxies. Poverty significantly increases food insecurity. Provincial and rural urban disparities remain significant, with higher food insecurity in Khyber Pakhtunkhwa and Balochistan. Food insecurity is mainly associated with limited food quality and access. Policies should improve household income stability, reduce food price pressures, and strengthen access to nutritious food.

**Keywords:** Food Security, Poverty, Pakistan, Household Income, Cross-sectional, OLS Regression, Khyber Pakhtunkhwa, Punjab, Sindh, Baluchistan

**Introduction**

The availability of sufficient food is the basic necessity of a living human being. Producing sufficient, safe, and healthy food remains a major challenge for governments and societies. The world's human population is growing steadily, and a major part of this population lives in big cities far from food supplies. Presently, around 820 million people in developing countries are partially or completely suffering from hunger, and the number is rising throughout the globe, especially in Africa and South Asia. Various researchers and policymakers highlighted the main determinants of food insecurity, including poverty, infrastructure, political instability, and natural hazards.

Around 2 billion people don't have enough food to eat, and among them, 26.4 per cent are food-insecure. No hunger and no poverty are the main targets of Pakistan's National Sustainable Development Goals (SDGs) (Government of Pakistan, 2019). More than 20 per cent of the population of Pakistan is facing malnutrition, and about 45 per cent of children under the age of five are stunted.

Food security is a situation in which all people in a society have physical, social, and economic access to sufficient, safe, and nutritious food to meet the needs of a healthy life. If a society does not have enough nutrition to meet its needs, there is food insecurity.

According to the World Health Organisation (WHO), there are four main pillars/components of food security: food availability, food access, food affordability,, and

food stability. Food stability refers to the ability to get food on time; it shows that anyone can get food at their desired time. Without these pillars, food is considered insecure. This reveals that food security is directly related to the production, conservation, and access to food.

Pakistan is an agricultural country. In the last few years, Pakistan has produced a large amount of wheat, which is distributed among different parts of the country. According to the Economic Survey of Pakistan, 2018-19, 36.9 per cent of Pakistan's population is still facing food insecurity.

Poverty is a situation in which an individual cannot afford the necessities of life. Poverty has shown a significant drop of about 34.5% in 2001-2002 and 23.9% in 2004 - 2005, about 10 per cent in the case of Pakistan. Poverty is also associated with different health and social indicators, i.e., safe drinking water, sanitation, education, health care, illiteracy, high rate of divorce, overpopulation, diseases like malaria,

There are numerous empirical studies examining the relationship between poverty and inflation. In the last few years, the inflation rate has risen from 100% to 400%. Which has broken the backbones of the poor people? The increase in the price of petrol, electricity, and gas has pushed up the prices of almost everything. Also, the government-imposed additional taxes deprive people of necessities. According to 15 years' worth of statistics, 28% of people live below the poverty line.

The World Bank (2018) measures poverty using the headcount ratio. Poverty is measured in the population based on the national poverty line. Poverty on the national poverty lines is estimated from household survey data collected from samples of domestic national representatives. National poverty lines are poverty indicators tailored to the specific economic and social conditions of countries.

This study will examine the main factors impacting food security and the link between food insecurity and poverty in Pakistan. According to the biological conditions of the human body, a sufficient amount of food is necessary for a healthy life. In Pakistan, food insecurity is becoming a major issue with every passing day, and this rising level of poverty in the society. This study has tried to highlight the problems associated with poverty and food insecurity in Pakistan. Food is an essential part of human life; without food, no one survives. According to a proverb, "A sound mind is in a sound body (Greek), and a sound body needs a proper diet. This study will use the HIES for 2018-19 for empirical analysis. This study has also conducted a comparative analysis across Pakistan's provinces to understand the true extent of poverty and food insecurity. There is hardly any study that examines the relationship between food security and poverty in Pakistan by using the HIES for 2018-19. This study is novel and is a valuable contribution to the relevant literature.

Many studies, both hypothetical and empirical, have been published to highlight the impact of poverty on food security. In light of various studies, the causes of food security have been discussed, and poverty is the major factor affecting it. Well, Pakistan has a disquieting situation because most of the population in Pakistan has lived below the poverty line for many years. In this study, we examined the poverty, expenditure, and income. Also checked the problem of food security among different provinces of Pakistan.

## **Literature Review**

Ali and Abdulai (2010) examined that new agricultural technology has a direct effect on reducing poverty. Cross-sectional data used for the Punjab province of Pakistan. The data were collected from different surveys of farmers. The stratified sampling technique was further used for the analysis. The questionnaire consists of inputs used, costs, yields, output prices, farm-level characteristics, and socioeconomic characteristics of households.

According to the results, new technologies have positive and significant impacts on poverty reduction, cotton yields, and household income. Some of the scholars who have worked on this subject include Sajjad et al. (2025), Ortega et al. (2025), Hameed et al. (2022), Kiran and Jabbar (2022), and Zhang et al. (2024).

Agboola and Balcilar (2012) applied the Logit regression methodology and showed the impact of food security on poverty from HIES data. The data were collected from primary sources through well-structured questionnaires. In this study, three variables were identified for food availability: household size, monthly share of food costs, and headache. Results showed that food utilisation negatively affects food insecurity.

Asghar (2012) found that the fundamental factor in the lack of efficiency is higher support for rice. According to the World Food Programme (WFP) and Pakistan's own government agencies, 30 million people were food insecure in Pakistan. The data were collected for 20 years, from 1990-91 to 2009-10. Linear regression techniques are used to find the results. Results showed that wheat yield and food production have a positive effect on support prices.

Bashir et al. (2012) found that the banking system has been instrumental in agricultural growth by offering competitive loans to fund agricultural enterprises and improve production. Data were collected at the household level. Data were analysed in two ways: first, household food security status, and second, binary logistic regression to identify the determinants of food security.

Oni and Fashogbon (2013) analysed the food shortage in Nigeria. They say the main issues of poverty and food insecurity are agro-ecological diversity and livelihoods. Cross-sectional data were used for further analysis. Hence, policymakers suggested that farming was the main source of food security, but all noted that the rural sectors of Nigeria had not. The researcher used data from the National Bureau of Statistics (NBS) for 2003\2004, based on a nationwide survey. In this study, 36 states of Nigeria were included. Data were collected from the Nigeria Living Standard of Survey (NLSS) (2004).

Ali and Khan (2013) examined the role of livestock ownership in ensuring rural households' food security in Pakistan. A cross-sectional data set was used to conduct the survey. Data were collected through a comprehensive questionnaire that included household and farm-level characteristics of the rice industry in Pakistan's Punjab. Poisson regression analysis was used to estimate the results. The main goal of this study is to eliminate the impact of livestock ownership on both poverty and food security.

Aslam and Rasool (2014) explained the determinants of food security in Pakistan. Three determinants of food security were used: food availability, accessibility, and absorption. There was a positive relationship between food consumption and food security, while infant mortality was negatively associated with food security. Primary data were collected through a questionnaire administered to 90 respondents. Furthermore, simple random sampling and OLS techniques were used to find the results. The results showed that there was a positive link between food consumption and food security, while some variables had negative links to food security, such as infant mortality and risk persons.

Malik et al., (2015) have analysed the impacts of different food items on poverty. Availability and accessibility were used as proxies for food security. The variables included in availability were wheat, rice, pulses, vegetables, milk, meat (beef, mutton, fish), sugar, edible oil, and other food items (tea, condiments, spices). Level of education (primary, middle, high) and employment (self-employed, farmer, employed) were included in accessibility.

Munir and Kiani (2016) analysed additional barrages to store water and supply it to areas with water shortages. In this study, the ARDL approach was applied to time-series data from 1990 to 2016, and the short- and long-run relationships were estimated. The results indicated that average temperature had a negative relationship with food security, whereas agriculture credit and fertiliser consumption had a positive relationship with it. The average temperature of a country is used as a proxy for climate change to analyse its effect on measures of food production.

Maan et al. (2016) examined the factors of food security. A multistage sampling technique was applied in this study. In this study, income, age, and education were used as explanatory variables. Data were taken from a questionnaire from 2009-14. In this study, descriptive statistics and inferential statistics techniques were applied. Results showed that the energy crisis negatively affects food security.

Ahmad and Ali (2016) examined safe drinking water and a proper amount of food as necessities of life. There was less cultivated land, and older agricultural methods led to lower productivity. Food availability is used as a proxy for food security. These include wheat, rice, and maize. Barley and sugar. Data were collected from the Economic Survey of Pakistan (2011-2012). The results obtained using Johanson's cointegration technique and the Error Correction Model (ECM). Results showed that population growth increased food insecurity in the short and long run. Haider and Zaidi (2017) examined the changes in household consumption patterns. Data have been collected from the Household Income Expenditure Survey over the period (2000- 01) to (2013-14). Food availability is used as a proxy variable for food security. Eleven food groups were used to measure food intake: wheat, rice, pulses, fresh fruits, vegetables, dairy, meats, oils, sugar, and other foods (tea, coffee, spices, condiments). The researcher used expenditure per capita and then total household expenditure divided by household size. The model has been used to obtain the results of the Quadratic Almost Ideal Demand System (QAIDS).

Oduniyi and Tekana (2020) used descriptive statistics to examine the determinants of farming household food security in South Africa. Data collected from the Household Integrated Economic Survey (HIES) 2018-19. A total of 346 respondents were surveyed. A stratified random sampling technique was applied in this study. Results showed that the rural household head has a significant impact on food security, while the household head has a negative and significant impact on food security. Ayyubi et al. (2024), Zubair et al. (2023), Anwar et al. (2024), Zubair et al. (2024), Iqbal et al. (2025), and Ahsan et al. (2024) have also worked on this topic.

## **Material and Methods**

### **Data Source**

The data used in this study are taken from the Household Integrated Economic Survey (HIES) 2018-19. HIES provides information on household income, consumption, expenditure, and socioeconomic conditions. The data are secondary and collected through a structured household questionnaire. It also provides information at provincial and rural-urban levels.

### **Sample and Data Description**

The study uses cross-sectional data from 24,809 households across all four provinces of Pakistan: Punjab, Sindh, Khyber Pakhtunkhwa, and Baluchistan. The sample includes both rural and urban households. The data contain information on household income, expenditure, and food-related conditions. The analysis is based on household-level observations. Table 1 indicates *Province-Wise Covered Household Area*

**Table 1**  
**Province-Wise Covered Household Area**

Province	Urban	Rural	Total
Punjab	3945	7836	11781
Sindh	2719	3497	6216
KPK	1450	3035	4485
Baluchistan	759	1568	2327
Total	8873	15936	24809

Source: Computed from HIES (2018-19)

### Variable Construction

Food security is used as the dependent variable and is constructed from eight HIES questions related to food access. Income and expenditure are used as proxy variables for poverty and are transformed to logarithms. Province is included as a categorical variable, and region is defined as urban and rural. The ratio of income to expenditure is also included in logarithmic form to capture household financial condition. Descriptions of the variables are given in Table 2.

### Model Specification

The relationship between food security and poverty is estimated using the following model:

Model 1

$$LFS_i = \alpha + \beta_1 PRO_i + \beta_2 REG_i + \beta_3 LHY_i + \mu_i \quad (1)$$

Model 2

$$LFS_i = \alpha + \beta_1 PRO_i + \beta_2 REG_i + \beta_3 LHE_i + \mu_i \quad (2)$$

Model 3

$$LFS_i = \alpha + \beta_1 PRO_i + \beta_2 REG_i + \beta_5 LYE_i + \mu_i \quad (3)$$

Where LFS represents food security, PRO is the province, REG is the region, LHE is the log of total expenditure, LHY is the log of total income, LYE is the log of the income-to-expenditure ratio, and  $\mu$  is the error term.

**Table 2**  
**Details of Variables**

Variable name	Symbol	Proxy / Measure	Brief definition	Data source
Food Security	LFS	Index from 8 HIES food access questions, log form	Measures household food access and insecurity conditions	HIES 2018-19
Province	PRO	Dummy variables for provinces	Captures provincial differences in food security	HIES 2018-19
Region	REG	Urban = 1, Rural = 0	Captures rural-urban differences in access and living conditions	HIES 2018-19
Total Expenditure	LHE	Log of household total expenditure	Proxy for poverty reflects consumption capacity	HIES 2018-19
Total Income	LHY	Log of household total income	Proxy for poverty, includes cash and in-kind income	HIES 2018-19
Income Expenditure Ratio	LYE	Log of income to expenditure ratio	Indicates the financial balance of the household; a higher value means a better condition	HIES 2018-19

### Estimation Technique

The study uses the Ordinary Least Squares (OLS) method to estimate the model. Descriptive statistics and correlation analysis are also used to examine the data. The estimation is conducted using statistical software on cross-sectional data. The coefficients are interpreted to analyse the relationship between food security and poverty.

## Results and Discussion

**Table 3**  
**Descriptive Analysis**

Variables	Observation	Mean	Std. Dev	Min	Max
PRO	24809	2.257	0.86	1	4
REG	24809	1.358	0.479	1	2
LFS	24809	0.681	0.515	0	4.595
LHY	24809	12.528	0.748	6.215	16.706
LHE	24809	12.545	0.599	8.581	15.522
LYE	24809	-0.27	0.484	-5.521	2.687

Table 3 reports descriptive statistics for all variables. The sample consists of 24,809 households. The mean value of log income is 12.528, and log expenditure is 12.545, whereas their deviations are 0.748 and 0.599. The mean of log food insecurity is 0.681, suggesting moderate variation across households. The mean of the log expenditure-to-income ratio is negative, indicating that, on average, expenditure is below income.

**Table 4**  
**Correlation Analysis**

Variables	PRO	REG	LFS	LHY	LHE	LYE
PRO	1.000					
REG	0.040	1.000				
LFS	0.102	0.074	1.000			
LHY	0.001	0.298	0.073	1.000		
LHE	-0.039	0.355	0.076	0.764	1.000	
LYE	0.050	0.032	0.021	0.623	-0.029	1.000

Table 4 shows the results of the estimated correlation matrix. The results show that the province has a weak, positive correlation with region, food insecurity, income, and the ratio, and a negative correlation with expenditure. The results show that the region has a positive correlation with food insecurity. Food insecurity has a positive correlation with income, expenditure, and ratio. According to the estimated results, income has a strong, positive correlation with expenditure and the ratio, while expenditure shows a negative correlation with the ratio.

### Percentage of Food Security Status Region-Wise

Figure 1 shows the percentage of food security status by region: 35.77% in urban areas and 64.23% in rural areas, indicating that rural areas have a higher food security status. The absolute numbers of respondents were 15936 in rural areas and 8873 in urban areas. The regional frequency table shows that rural areas are highly food-secure, while urban areas are less so.

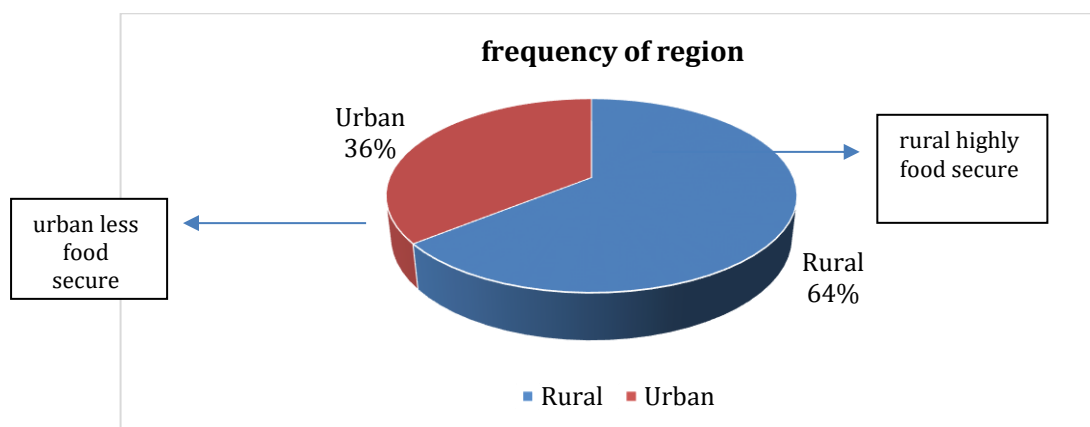


Figure 1: Food Security in Urban and Rural Regions

In this graph, the red box shows the urban area and the blue box shows the rural area. However, food security is higher in rural areas than in urban areas. Food security is about 64% in rural areas, while 36% in urban areas. It shows that rural areas are more food secure than urban areas.

### Percentage of Food Security Status Province-Wise

This research has investigated the food security at the provincial level. For this purpose, we have the data broken down by province. 4485 respondents from KPK, 11781 from Punjab, 6216 from Sindh, and 2327 from Balochistan. Their ratio, as a sample of each province relative to the total sample, is shown in Figure 2.

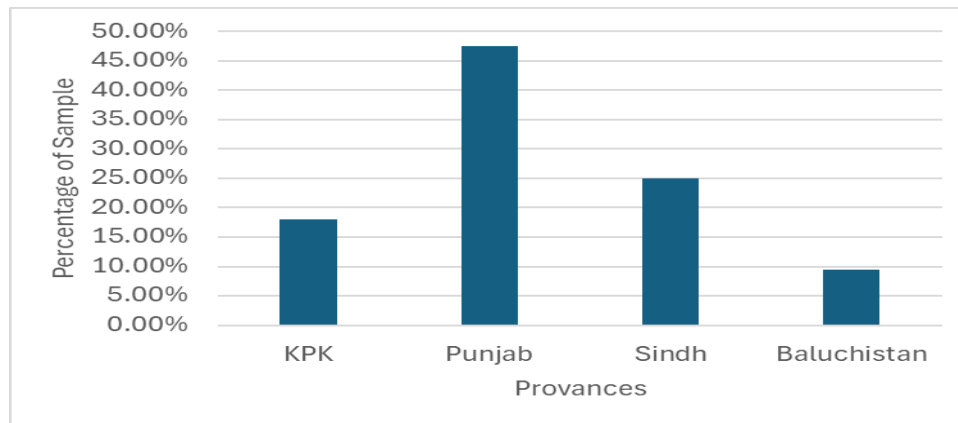


Figure 2: Percentage of Number of Respondents Province-wise

### Results and Discussion

This study examines household food access using eight standard Global Food Insecurity Experience Scale (FIES) questions across Pakistan. These questions capture different levels of constraint, from worry and reduced diet quality to severe conditions such as hunger and going without food. Together, they provide a structured measure of food insecurity over the past 12 months.

1. During the last 12 months, were you or others in your household worried about not having enough food due to lack of money or other resources?
2. During the last 12 months, did your household lack access to healthy and nutritious food due to financial constraints?
3. During the last 12 months, did your household consume a limited variety of foods due to a lack of financial resources?
4. During the last 12 months, did your household have to skip a meal due to lack of financial resources?
5. During the last 12 months, did your household eat less than it needed due to a lack of financial resources?
6. During the last 12 months, did your household run out of food due to a lack of financial resources?
7. During the last 12 months, did any household member feel hungry but did not eat due to lack of financial resources?
8. During the last 12 months, did any household member go without eating for a whole day due to lack of financial resources?

The results are shown in Table 5 with absolute value and in Table 6 as percentage.

**Table 5**  
**Food Insecurity Experience Scale, Summary of Responses**

Question (Indicator)	Yes (Freq)	No (Freq)	Don't Know (Freq)	Refuse (Freq)
Worried about not having enough food	4657	20005	82	65
Unable to access healthy and nutritious food	8169	17471	99	70
Limited variety of foods	7797	16799	120	93
Skipped a meal	2471	22012	200	126
Ate less than needed	3710	20701	255	143
Ran out of food	1706	22765	169	169
Hungry but did not eat	1681	22823	157	148
Went without food for a whole day	1209	23303	146	151

**Table 6**  
**Food Insecurity Experience Scale, Summary of Responses as Percentage**

Question (Indicator)	Yes (%)	No (%)	Don't Know (%)	Refuse (%)
Worried about not having enough food	18.77	80.64	0.33	0.26
Unable to access healthy and nutritious food	32.90	66.40	0.40	0.30
Limited variety of foods	31.43	67.71	0.48	0.37
Skipped a meal	9.96	88.73	0.81	0.51
Ate less than needed	14.95	83.44	1.03	0.58
Ran out of food	6.88	91.76	0.68	0.68
Hungry but did not eat	6.78	91.99	0.63	0.60
Went without food for a whole day	4.87	93.93	0.59	0.61

Constraints are strongest in diet quality. Around one-third of households report issues in Q2 and Q3. Intake problems are moderate. About 15-19 per cent report concern or reduced consumption in Q1 and Q5. Severe conditions are less common. Fewer than 7 per cent report running out of food, going hungry, or not eating for a full day in Q6 to Q8. Most responses are "No" across all questions, indicating that extreme food deprivation is not widespread, but high "No" responses do not, by default, imply food security. FIES requires aggregation of 'Yes' responses across items to classify households into severity levels. The observed high incidence of 'Yes' responses in diet quality indicators suggests the presence of moderate food insecurity rather than overall food security

### OLS Estimation Results for Food Insecurity

Table 7 represents the OLS regression model. In the regression, three models have been applied. Food insecurity is used as a dependent variable. In model 1, income is used as the independent variable; in model 2, it is substituted for expenditure, and in model 3, the ratio is analysed. OLS was selected for interpretability and consistency with previous studies. Results from the data are shown in Table 7.

**Table 7**  
**OLS Model Dependent Variable Log of Food Insecurity**

Variables	Model 1	Model 2	Model 3
Province	0.0600*** (0.00393)	0.0593*** (0.00378)	0.0592*** (0.00394)
Region	0.0575*** (0.00739)	0.0506*** (0.00724)	0.0757*** (0.00707)
LHY	0.0400*** (0.00475)		
LHE		0.0515*** (0.00579)	
LYE			0.0153** (0.00703)
Constant	-0.0339	-0.167**	0.444***

	(0.0581)	(0.0707)	(0.0134)
Observations	24809	24809	24809
R-squared	0.81	0.81	0.81

\* shows 10% significance level, \*\* shows 5% significance level, \*\*\* shows 1% significance level, the range of R-squared closer to 1 which shows overall OLS model concluded that this model is statistically fit.

Ordinary Least Squares (OLS) is used to assess the goodness-of-fit of the observations. In the OLS method, the range of R-squared is fixed at 0 to 1. An R-squared value closer to 1 indicates that the explanatory variables account for a larger proportion of variation in the dependent variable. The stars show the percentage; for example, 1 star shows 10%, 2 stars show 5%, and 3 stars show 1%. It is used to minimise the sum of squares of differences between the observed and predicted values of the explained variables. Then the estimated coefficients would provide the elasticities, since the model is in double-log form. In OLS, the estimated results show that in model 1, the p-value for province is 1% and the coefficient is 0.0600, indicating it is statistically significant ( $p < 0.05$ ). This is also true for models 2 and 3, which are also statistically significant.

The p-value for the region in model 1 is also less than 0.05, indicating statistical significance at the 1% level, so the model is well-fitted. According to the estimated results of the OLS regression models 2 and 3 for the region, the p-values are less than 0.05, indicating significance at the 1% level. As well as in model 1, the estimated result of income is also significant at the 1% level because the p-value is .004 and the coefficient is .0400. But the estimated results of the ratio show that the p-value is .007 and the coefficient is .015, which shows the ratio is significant at 5% level. The overall result shows that all p-values are less than 0.05, indicating that all regression models are significant. 24809 observations used in the regression analysis. Province-Wise Average Food Security Situation in Pakistan

In this study, food security has also been estimated at the provincial level. First, we have data on provinces separately. In the above analysis, we calculate the food security overall in Pakistan. Now we have to investigate province-wise. According to the analysis, Khyber Pakhtunkhwa is highly food-insecure, Punjab is highly food-secure, Sindh is less food-secure, and Baluchistan is also highly food-insecure.

### Province-Wise Food Security Situation in Khyber Pakhtunkhwa

Food security has three pillars: food availability, food accessibility, and food absorption, and this study focuses on food accessibility. Access to food is the second pillar of food security. The table below presents the results of all questionnaire questions related to food security conditions in Khyber Pakhtunkhwa. 4485 people responded from Khyber Pakhtunkhwa. According to the percentage of each question, most people have answered "NO". The percentage of "NO" responses is high across all questions, indicating that KPK province has a moderate level of food insecurity. Interpretation of Table 8 is given below:

**Table 8**  
**Percentage of Food Security in Khyber Pakhtunkhwa**

KPK	Yes	No	Don't Know	Refuse
1. Worried about not having enough food to eat	16.5%	83.2%	.2%	.1%
2. Unable to eat healthy and nutritious food	45.6%	54.0%	.2%	.1%
3. Ate only a few kinds of food	40.5%	59.1%	.4%	.0%
4. Had to skip a meal	5.9%	93.9%	.2%	.0%
5. Ate less than you thought you ate	15.4%	83.7%	.8%	.1%
6. The household ran out of food	5.3%	94.3%	.3%	.1%
7. Hungry but didn't eat	4.7%	95.0%	.2%	.1%
8. Went without eating for a whole day	2.6%	97.1%	.2%	.1%

Cross-sectional survey data from the Household Integrated Economic in the above table used the eight questions as variables; furthermore, the frequency was measured

separately in SPSS software for all provinces of Pakistan. In the first column, the survey questions used the variable 'people worried about not having enough food to eat'. According to the estimates, 4485 people in Khyber Pakhtunkhwa would answer the questions. The frequency calculated for KPK is similar to that in which 16.5% of people answered yes and 83.2% answered no. The answer of 2% was don't know and 1% refused the question. Furthermore, people are unable to eat healthy, nutritious food. 45.6% say yes, 54.0% say no, .2% say don't know,, and .1% refuse the question. And the third question, used as a variable, asks whether people ate only a few kinds of food, and the frequency setting is that 40.5% of people have, in their opinion, Yes, 59.1% No, 4% don't know, and 0% refuse.

In the other question, people had to skip a meal: 5.9% say yes, 93.9% say no, 0.2% don't know, and 0.0% refuse the question. However, the question is whether people ate less than they thought they ate. The question is: the KPK people say 15.4% yes, 83.7% no, 0.8% don't know, and 0.1% refuse it. Then, in the question, the household ran out of food, 5.3% said yes, 94.3% said no, .3% don't know, and .1% refused. According to the results, the question "Are people hungry but didn't eat?" shows that 4.7% answered yes, 95.0% answered no, 0.2% don't know, and 0.1% refused the question. In the last question of the questionnaire, people went without eating for a whole day. Then 2.6% said yes, 97.1% no, 0.2% said don't know, and 0.1% refused the question, according to the above estimates.

### Province-Wise Food Security Situation in Punjab

Food security has three pillars: food availability, food accessibility, and food absorption, and this study focuses on food accessibility. Access to food is the second pillar of food security. The table below presents the results of all questionnaire questions related to food security conditions in Punjab. 11781 people responded from Punjab. According to the percentage of each question, most people have answered "NO". The percentage value of "NO" is high across all questions, indicating that Punjab province is less food insecure than KPK. Table 9 shows the percentage of Food Security in Punjab.

**Table 9**  
**Percentage of Food Security in Punjab**

Punjab	Yes	No	Don't Know	Refuse
1. Worried about not having enough food	18.1%	81.5%	.3%	.1%
2. Unable to eat healthy and nutritious food	23.3%	76.2%	.4%	.1%
3. Ate only a few kinds of food	22.5%	77.0%	.4%	.1%
4. Had to skip a meal	12.0%	87.6%	.3%	.1%
5. Ate less than you thought you ate	12.6%	86.8%	.4%	.2%
6. The household ran out of food	8.0%	91.5%	.4%	.2%
7. Hungry but didn't eat	6.8%	92.6%	.4%	.1%
8. Went without eating for a whole day	6.0%	93.4%	.4%	.2%

Cross-sectional survey data from the Household Integrated Economic; the eight questions have been used as variables in Table 9. Furthermore, in the above table, the frequency was measured separately in SPSS for all provinces of Pakistan. In the first column, the survey questions used the variable ' people worried about not having enough food to eat'. According to the estimates, 11781 people in Punjab would answer the questions. The frequency calculated for Punjab is as follows: 18.1% answered yes and 81.5% answered no. The answer of 3% was don't know and 1% refused the question. Furthermore, people are unable to eat healthy, nutritious food, and 23.3% say yes, 76.2% say no, .4% say don't know, and .1% refuse the question. And the third question used as a variable is whether people ate only a few kinds of food, and the frequency setting in this variable is: 22.5% say Yes, 77.0% say No, .4% don't know, and .1% refuse.

In the other question, people had to skip a meal: 12.0% say yes, 87.6% say no, 0.3% don't know, and 0.1% refuse the question. However, the question "people ate less than they thought they ate" is the question. The Punjab people say 12.6% yes, 86.8% no, .4% don't know, and .2% refuse it. Then, in the question, the household ran out of food: 8.0% said yes,

91.5% said no, 0.4% don't know, and 0.2% refused. According to the estimated results, the question "Are people hungry but didn't eat?" shows that 6.8% answered yes, 92.6% answered no, 0.4% didn't know, and 0.1% refused the question. In the last question of the questionnaire, people went without eating for a whole day. Then 6.0% said yes, 93.4% no, .4% said don't know, and .2% refused the question, according to the above estimates.

**Province-Wise Food Security Situation in Sindh**

Access to food is the second pillar of food security. The table below presents the results of all questionnaire questions related to food security conditions in Sindh. 6216 people responded from Sindh. According to the percentage of each question, most people have answered "NO". The percentage of "NO" responses is high across all questions, indicating that Sindh province is less food-secure than Punjab. The figure shows the province-wise food security situation in Sindh

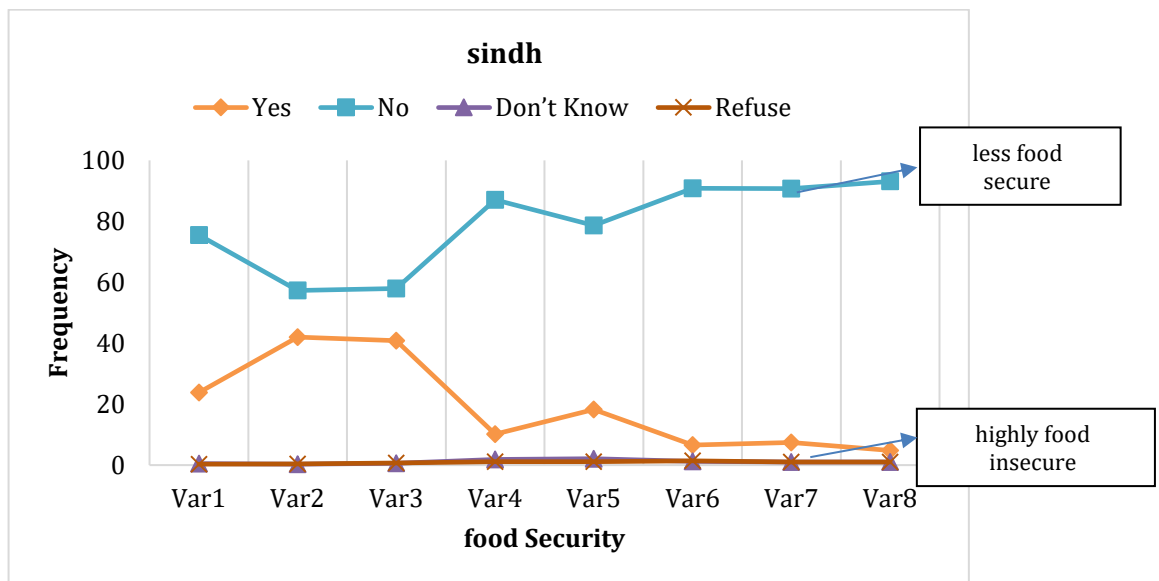


Figure 3: Province-Wise Food Security Situation in Sindh

In the Figure 3, the x-axis shows the food security situation in Sindh, and the y-axis shows frequency. The green line shows the frequency of yes, the blue line shows the frequency of no, the yellow line shows the frequency of don't know, and the dark green line shows the frequency of those who refuse the question. The blue line starts from 75.5%, then it decreases and reach 57.3%, then at variable three, which shows that about the people ate only a few kinds, and the 57.9% people say no, then the frequency of no increases, and 87.0% people say no, which is the highest percentage of the variable like people skip a meal and 10.1% people say yes. It means that people eat less but don't skip meals. The graph shows how many people answered no, yes, don't know, and refused; similarly, the rest of the line reflects the opinions of the people. This graph shows the food security situation in Sindh.

Then 78.6% say no to the variable that people are told not to eat, 18.2% say yes, 2.1% say don't know, and 1.1% refuse the question. Then, according to the graph, the people say the line increases to 90.8%, which shows that households ran out of food; 90.8% say no, and 6.6% say yes. Then variable seven which tells that people hungry but can't eat and 90.0% people say no they can't hungry and 7.4% people say yes and 1.0% don't know and 1.0% people refuse the question then it the last variable that people spend whole day without eating and 93.1% people say no, 4.8% people say yes and 1.0% people don't know and 1.0% refuse the question in the above paragraph.

### Province-Wise Food Security Situation in Baluchistan

Access to food is the second pillar of food security. The table below presents the results of all questions related to food security in Baluchistan. 2327 people responded from Baluchistan. According to the percentage of each question, most people have answered “NO”. The percentage value of “NO” is high across all questions, indicating that Baluchistan province is food insecure. Figure 4 shows the province-wise food security situation in Baluchistan

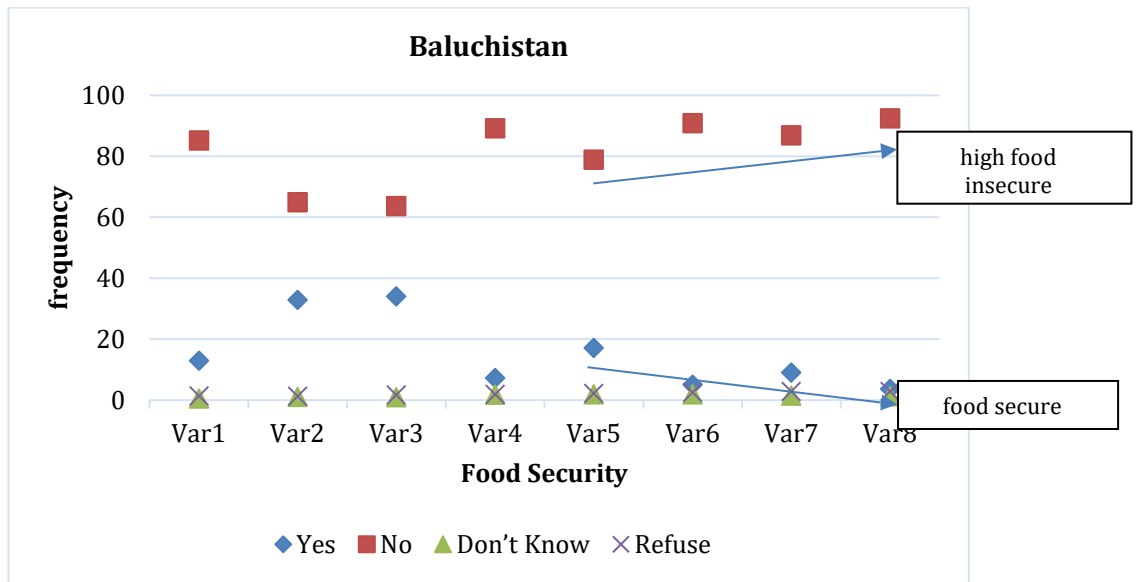


Figure 4: Province-Wise Food Security Situation in Baluchistan

In the Figure 4, the x-axis shows the food security situation in Baluchistan, and the y-axis shows frequency. The blue line represents the frequency of yes, the red line shows the frequency of no, the grey line shows the frequency of don't know, and the yellow line shows the frequency of those who refuse the question. The red line starts from 85.2%, then it decreases and reach 64.9%, then at variable three, which shows that people ate only a few kinds, and the 63.6% people say no, then the frequency of no increases, and 89.2% people say no, which is the highest percentage of the variable, like people skip a meal and 7.2% people say yes.

It means that people eat less but don't skip meals. The graph shows how many people answered no, yes, don't know, and refused; similarly, the rest of the line reflects the opinions of the people. This graph shows the food security situation in Baluchistan. Then 78.9% say no to the variable that people are told not to eat, 17.1% say yes, 1.8% say don't know, and 2.2% refuse the question. Then, according to the graph, the people say no line increases and reaches 90.8%, which shows that households ran out of food; 90.8% say no and 5.0% say yes. Then variable seven which tells that people hungry but can't eat and 86.8% people say no they can't hungry and 9.0% people say yes and 1.4% don't know and 2.8% people refuse the question then it the last variable that people spend whole day without eating and 92.4% people say no, 3.6% people say yes and 1.2% people don't know and 2.8% refuse the question in the above paragraph.

### Average Food Security Situation Province-wise

We have to investigate the food security at the provincial level. For this purpose, we have the data province-wise, as we told you to get it for all the provinces separately. This is very important to discuss food security province-wise because each province has its own resources and problems. It can be easily seen in Table 10 that the empirical results for the

division of households into food-secure and food-insecure. This table presents the combined results of the questionnaire across all provinces (Khyber Pakhtunkhwa, Punjab, Sindh, and Baluchistan). According to the percentage of each question, most people have answered “NO”. The percentage of “NO” responses is high across all questions and provinces, indicating that all provinces have a moderate level of food insecurity. Table 4.18 shows the percentage of food security in provinces.

**Table 10**  
**Percentage of food security in provinces**

Provinces	Yes	No	Don't know	Refuse
KPK	17.0%	82.5%	.3%	.07
Punjab	13.6%	85.8%	.3%	.1
Sindh	19.5%	78.9%	1.1	.9
Baluchistan	15.2%	81.4%	1.2	2.2

Table 10 presents the estimated results for the average food security situation in KPK, Punjab, Sindh, and Baluchistan. According to the above table, the estimated results show that the food security situation in all the provinces is mostly unknown to people when asked. Even though most people refuse to answer the question about food security in all the provinces of KPK, Punjab, Sindh, and Baluchistan. According to the above estimates in KPK, 82.5% say no, 17.0% say yes, 0.3% don't know, and 0.07% refuse it. Then in the case of Punjab, the percentage of Punjab the 13.6% people in the yes category, 85.8% people lie in the no category, .3 don't know, and .1 refuse it. Then in Sindh, 19.5% say yes, 78.9% say no, and 1.1% don't know whether they eat healthy or nutritious food. Estimated results show that 81.4% of people say no, 15.2% say yes, 1.2% don't know, and 2.2% refuse it. Figure 5 shows the average food security situation province-wise.

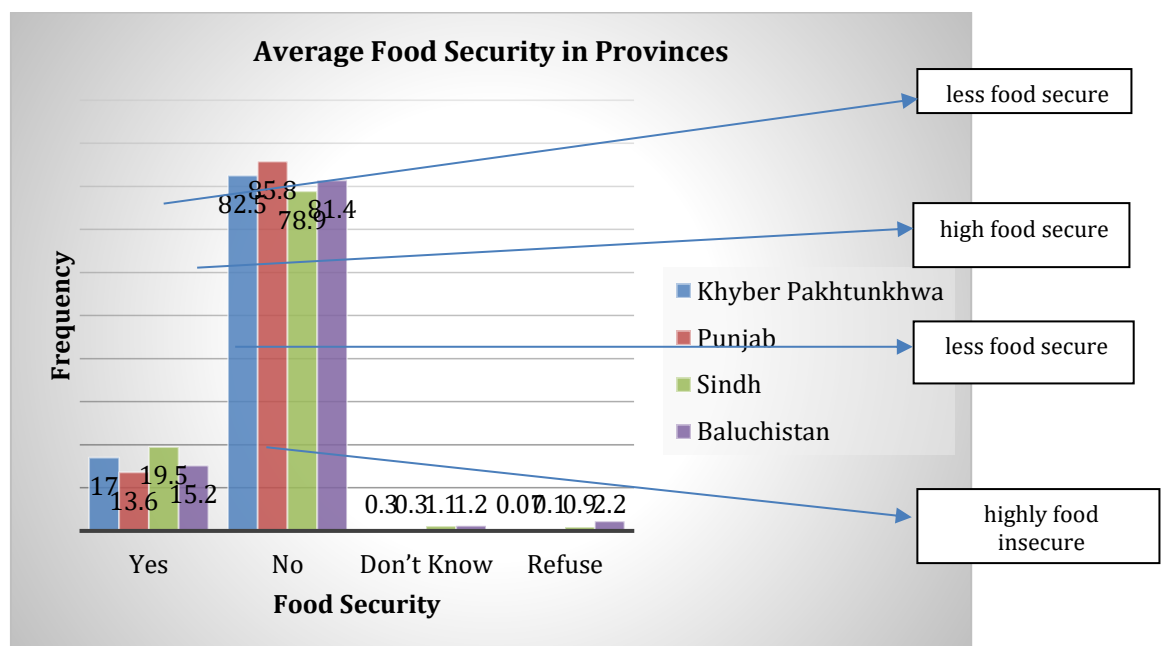


Figure 5: Average Food Security Situation Province-Wise

In the above graph, the x-axis shows the food security situation in Khyber Pakhtunkhwa, and the y-axis shows frequency. The blue line represents the food security situation in Khyber Pakhtunkhwa, the orange line shows the food security situation in Punjab, the grey line shows the food security situation in Sindh, and the yellow line shows the food security situation in Baluchistan, according to the above graph. According to the above graph, the estimated results show that the food security situation in all the provinces is mostly unknown to people when asked. Even though most people refuse to answer the question about food security in all the provinces of KPK, Punjab, Sindh, and Baluchistan.

## **Conclusion**

The main purpose of this study is to examine the nexus between food security and poverty in Pakistan. To analyse the cross-sectional data that have been used from HIES 2018-19. Based on the objectives, there is a strong relationship between food security and poverty. Firstly, to investigate the food security region-wise. For this purpose, data have been used region-wise in this study. The results show that rural areas are highly food-secure, while urban areas are less so, because people in rural areas eat fresh food and fewer people live below the poverty line.

Secondly, to investigate the food security at the provincial level. For this purpose, province-wise data have been used in this study. Well, 4485 respondents from Khyber Pakhtunkhwa, 11781 from Punjab, 6216 from Sindh, and 2327 from Baluchistan. This is very important to discuss food security province-wise because each province has its own resources and problems. The province-wise results show that Khyber Pakhtunkhwa is food insecure, Punjab is highly food secure, Sindh is more food secure than Khyber Pakhtunkhwa, and Baluchistan is highly food insecure due to limited access to food, a lack of education, and limited awareness of food recycling. According to the results, Punjab is highly food secure because many people are aware of recycling food, education, and food.

Thirdly, to investigate the food security situation for each questionnaire item, data were obtained from the survey. Survey questionnaire comprises on people don't have accessibility of enough food, healthy and nutritious food, ate few foods, skip a meal, to ate less, accessibility of ran out of food, accessibility to eat food and survive hungry whole day and results shows that, food highly insecure due to lack of money and other resources additionally, it is seen that a huge extent of total households suffered from severe shortage of food items.

From the above results and OLS regression discussion, the R-squared is closer to 1, indicating that the variables explain a greater share of the variation. Overall, the OLS model concluded that it is statistically significant. The OLS model results show a positive and significant relationship between food security and poverty. Total expenditure and total income were used as proxies of poverty in this study. The correlation matrix indicated that monthly expenditure was negatively correlated with household goods insecurity. In this study, food security has also been estimated at the provincial level. In the above analysis, food security data from Pakistan has been used overall. Now, to investigate the food insecurity province-wise. Food security has three pillars: food availability, food accessibility, and food absorption, and this study focuses on food accessibility. Access to food is the second pillar of food security. KPK province is highly food insecure. The poverty rate is high in KPK. This is the main reason for food insecurity. Furthermore, a food security check in the Punjab shows that it is highly food secure compared to the other provinces. Results of the Sindh province explore that Sindh is less food secure. Results reveal that food is highly insecure in Baluchistan because of the limited accessibility of food, a lack of education, a lack of awareness, and a lack of agricultural land.

In the last, a combined result of the provinces highlights that Khyber Pakhtunkhwa is highly food insecure, Punjab is highly food secure, Sindh is less food secure, and Baluchistan is highly food insecure. In Baluchistan, food security is mostly insecure; it needs to implement a better cultivation plan and enhance educational knowledge to reduce food insecurity. If people spend an appropriate amount on food items out of their total expenditure in this method, does that mean they ensure food? Moreover, they did not care about education and health; if they consumed these, they were food secure. By and large, the findings of the current survey indicate that early broadcasting of food insecurity and the poor condition of poverty, and their relation to food security in the case of Pakistan. If poverty rises, one of its effects is definitely food security. Hotels and restaurants are also a major source of food insecurity, according to a report. If we use this food waste properly,

food security increases and poverty decreases. Correspondingly, rural areas are less food-insecure, while urban areas are more food-insecure. Punjab is highly food-secure, while Baluchistan is highly food-insecure.

### **Recommendation**

The following recommendations are made from the research:

Poverty and food insecurity move together in Pakistan, and the results of this study show that improving one requires action on the other. Policy should focus on strengthening food access at the household level through stable incomes, affordable food prices, and reliable supply chains. When households can meet basic food needs, pressures on health, employment, and education also ease. This reduces the broader social costs linked with poverty.

Population pressure adds to food demand and strains household resources. Practical steps include expanding access to family planning services, improving female education, and increasing awareness at the community level. These measures help households manage size and spending, which supports better nutrition outcomes.

Given Pakistan's agricultural base, reducing food loss and waste is a direct and feasible intervention. Awareness campaigns, better storage, and community-level redistribution systems can improve food availability for low-income groups. This approach uses existing production more efficiently without requiring large increases in output.

Food security is also tied to basic rights. Ensuring consistent access to safe and nutritious food, along with improvements in income opportunities, supports dignity and social stability. Policies that target both poverty reduction and food access together are more effective than isolated actions.

This study uses secondary data because of time limits, but future work can move closer to real household conditions by collecting primary data. Direct field surveys allow researchers to capture how families actually manage food shortages, adjust diets, and cope with income constraints. This adds detail that large datasets often miss and helps produce results that reflect lived realities more clearly.

There is also room to expand the scope of this research beyond Pakistan. Comparing the Household Integrated Economic Survey with similar surveys from other developing countries can show how food insecurity and poverty differ across regions. Such comparisons can reveal which policies work better in practice and why. This approach would make the findings more useful for designing effective and context-specific policy responses.

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