Impact of Shortfall in Daily Wages on Food Insecurity Leading Towards Depression in Punjab's Urban Laborers During COVID-19

Rizwan Ahmed
University of Punjab Lahore
*** Correspondence**: rizwan.ahmed48s@gmail.com

Citation | Ahmed. R, "Impact of Shortfall in Daily Wages on Food Insecurity Leading Towards Depression in Punjab's Urban Laborers During COVID-19", MCCSS, Vol. 2, Issue. 1, pp. 44-54, Mar 2023
Received | Feb 14, 2023**; Revised |** Mar 08, 2023**; Accepted |** Mar 15, 2023; **Published |** Mar 24, 2023.

The research investigates the intricate relationship between the shortfall in daily wages, food insecurity, and its consequent impact on depression among urban laborers in Punjab amidst the COVID-19 crisis. This study aims to investigate the association between household food insecurity and the mental health status of urban informal sector laborers in five administrative divisions of Punjab, Pakistan, within the framework of the COVID-19 pandemic. The primary data was collected from a sample of 350 individuals who were both laborers and household heads involved in the urban informal sector in the Punjab region of Pakistan. The selection of administrative divisions for this study was conducted using a random sampling method. The data underwent analysis utilizing the logistic regression technique. The findings illuminate a significant correlation between the shortfall in daily wages and increased food insecurity among over 25% of urban laborers, often resulting in a twofold rise in food prices and heightened household debts. This financial strain substantially reduces purchasing power and poses challenges in meeting daily expenses for more than half of the respondents. Notably, this financial adversity correlates with reported difficulties in saving money among 40% of the surveyed laborers. The study also uncovers a concerning trend wherein a substantial portion of respondents refrain from accessing alternative income sources despite the economic hardships. Such financial duress, compounded by job insecurity and increased debts, signals a growing concern for the mental health of these laborers, with nearly 20% reporting job loss or furlough during the pandemic. The research underscores the pressing need for targeted interventions to address the cascading effects of reduced daily wages on food insecurity, subsequently impacting mental health and highlighting the vulnerability of Punjab's urban labor force amid the COVID-19 crisis.

Keywords: Daily Wages, Financial Adversity, Purchasing Power, Job Insecurity, Household Debt, Urban Laborers.

Introduction:

Navigating the intricate interplay between the COVID-19 pandemic and its profound repercussions on vulnerable populations within Punjab's urban landscape unveils a critical narrative. Among the multifaceted challenges faced, the nexus between food insecurity and the mental well-being of the urban labor force emerges as a focal point demanding urgent attention and comprehensive understanding. As the world grappled with the unprecedented disruptions brought forth by the pandemic, measures were hastily implemented to curb its spread. In the province of Punjab, interventions ranging from comprehensive to intelligent lockdowns were deployed with the intent to mitigate the impact of COVID-19. However, amidst these efforts lay unintended consequences, particularly within the urban informal sector.

Pakistan's populace grapples with severe malnutrition and food insecurity, affecting a staggering one-fourth of the population who struggle to meet basic dietary needs. The COVID-19 quarantine measures have exacerbated the already precarious food system, triggering unparalleled disruptions across supply chains. Beyond the direct health implications of the pandemic, stringent policies such as travel and trade restrictions, social distancing mandates, and the closure of formal and informal markets have precipitated a sharp economic downturn. The repercussions of these measures have disproportionately impacted the food-insecure population. Reduced activity in small food outlets and compromised market accessibility have severely hampered the ability to acquire sustenance. As disruptions in the food system push prices higher, simultaneous income loss erodes purchasing power, exacerbating the crisis of food and nutrition insecurity [1][2][3]

Amidst the upheaval of 2020, it became evident that individuals facing food insecurity bore the brunt of COVID-19's wide-reaching effects, laying bare the fragilities and vulnerabilities entrenched within the contemporary food system. While certain studies have delved into the interplay between health and economic policies, a notable gap persists in understanding the specific impact of COVID-19 on food insecurity in Pakistan. While extensive research exists on food security determinants globally, including studies in countries like Ethiopia, Ghana, Zimbabwe, Kenya, Brazil, and Nigeria, Pakistan has seen investigations into these determinants. However, these studies have yet to explore the direct influence of the pandemic on food insecurity within the country. The global ramifications of the COVID-19 pandemic have disproportionately impacted the economic and social landscapes of developing and least-developed nations. Among these, Pakistan stands as a poignant example, where the pandemic has profoundly affected the well-being and nutritional stability of its populace. The worldwide upheaval has underscored the vulnerabilities of human welfare and nutrition, magnifying the challenges faced by individuals within Pakistan and echoing a broader global concern for the health and stability of communities worldwide [4]. The ongoing COVID-19 pandemic has left an indelible mark on the lives of countless individuals across Pakistan. The reported surge in confirmed cases, reaching approximately 504,293 by January 11, 2021, starkly contrasts the mere two instances recorded on February 26, 2020, signifying a significant escalation. However, as measures were enacted to contain the spread of the virus, they inadvertently heightened concerns regarding the economy, food accessibility, and mental health. Within this scenario, the working class faced a disproportionately amplified impact, grappling with intensified anxieties exacerbated by the pandemic's restrictive measures [5][6][7].

Around 29.2% of individuals, or around one in three persons, experience a psychological issue at some stage over their lifespan. These disorders can present as symptoms of anxiety, depression, or somatic illness. The occurrence of depression is associated with considerable societal costs and major burdens on healthcare systems, mostly due to heightened utilization of healthcare resources and decreased productivity. Moreover, this phenomenon is linked to a decrease in the general state of welfare and impedes an individual's social, physical, and mental capacities [8].

The correlation between health and food security beyond the susceptibility of an individual's dietary intake. has established a noteworthy correlation between chronic stress and a multitude of enduring health ailments, including mental health illnesses and depression. Food insecurity has the capacity to exert adverse effects on mental well-being through various mechanisms [9]. If an individual is unable to get an adequate amount of food in the foreseeable future, this situation has the potential to elicit stress, which in turn could contribute to the emergence of feelings of despair and worry. Moreover, the procurement of nourishment by socially disapproved methods may trigger feelings of anger, culpability, regret, and powerlessness, which have been identified as being linked to manifestations of depression. The aforementioned issue possesses the capacity to amplify disparities not alone within familial units,

but also across the wider community, hence engendering diverse social conflicts that ultimately yield adverse consequences for mental welfare [10].

The economic downturn and closure of businesses resulting from the epidemic have resulted in increased levels of food poverty and depression in Pakistan, similar to the circumstances observed in other countries. Approximately 53 million individuals are living below the poverty threshold. With regard to the matter of food insecurity, there exists an estimation that a significant population, ranging from 40 to 62 million persons, is presently experiencing a state of food uncertainty [11]. Before the advent of the pandemic, individuals from diverse vulnerable populations, including daily wage workers, low-income households, market-dependent households, small-scale farmers, refugees, and female-headed households, were already encountering elevated levels of food insecurity and malnutrition. Nevertheless, it is plausible that these aforementioned populations are currently encountering heightened difficulties pertaining to the issue of food insecurity, consequently potentially yielding adverse consequences for their psychological welfare [12][13].

The primary objective of this study is to investigate the impact of food insecurity on mental well-being, particularly depression, in the context of the COVID-19 pandemic in Pakistan. Based on the existing research, it may be concluded that there is a discernible negative association between food insecurity and mental health [14]. Although there is a dearth of research examining the association between shortfall in daily earnings and food insecurity during the COVID-19 epidemic, it is important to highlight that no empirical investigation has been conducted to precisely evaluate the impact of food insecurity on depression in Pakistan. The main objective of this research initiative is to examine the potential correlation between household shortfall in daily earnings and food insecurity. Furthermore, the secondary aim of this study is to assess the results obtained from this examination [15].

Individuals demonstrate resilience when confronted with many factors that lead to the development of depression. The present study put out the hypothesis that persons who have household food insufficiency are more prone to experiencing feelings of sadness in comparison to those who have food security [16]. The ensuing sections of the paper are organized in the following manner. Section 2 presents a thorough examination of the pertinent scholarly works. Section 3 provides a comprehensive overview of the technique utilized in the present investigation. Section 4 of the report encompasses the dataset and variables employed for the purpose of analysis. The interpretation of the results is presented in Section 5. Lastly, the concluding part provides an in-depth analysis of the findings and presents recommendations for future governmental actions [17].

The second aspect of this study is doing an extensive examination of pertinent scholarly works to ensure a comprehensive comprehension of the subject matter. The extant body of literature consistently demonstrates a positive correlation between natural disasters and the heightened prevalence of depression and anxiety within households. The COVID-19 epidemic has had a profound effect on households, resulting in a socioeconomic upheaval typified by a decline in employment prospects and a concomitant decrease in income. The decline in purchasing power has had an impact on individuals' capacity to afford essential commodities, such as food products [18]. Additionally, it is important to acknowledge that there has been an increasing pattern of food insecurity since 2014, as indicated by the research carried out. Furthermore, it is anticipated that the persistent pandemic will intensify this concern, resulting in a subsequent decline in food security in the forthcoming period, as emphasized. Previous research has established a correlation between the escalation of food insecurity and the occurrence of mental health disorders, such as anxiety and depression, among households. Based on a study conducted a preliminary examination of the US economy indicated that persons who face food poverty had a 1.88-fold increased likelihood of developing depression and a 2.09-fold increased likelihood of developing anxiety [19].

The matter of food insecurity is especially precarious in emerging countries. Based on the research conducted, it was ascertained that roughly. Based on the results obtained from a cross-sectional online survey, a noteworthy percentage of participants residing in Sao Paulo, Brazil, namely 50%, reported experiencing different levels of food insecurity, which encompassed mild to severe degrees. Moreover, a substantial majority of participants, precisely 89%, conveyed a feeling of discomfort with the accessibility and availability of food. did a study in Bangladesh wherein the same findings were observed. In particular, there was a notable rise in the frequency of moderate food insecurity, which escalated from 5.6 percent to 36.5 percent. Similarly, the prevalence of severe food insecurity had a significant increase, climbing from 2.7 percent to 15.3 percent [19].

The objective of this study is to analyze the fluctuations in household income levels in Bangladesh during the COVID-19 pandemic. The correlation between heightened food insecurity and adverse mental health outcomes has been extensively examined in the existing literature. Qualitative research findings indicate that households and individuals experiencing difficulties pertaining to food and financial insecurity may manifest symptoms commonly associated with stress disorders and anxiety [20]. Additionally, they may also experience emotions such as depression, hopelessness, remorse, and shame. The coexistence of COVID-19 amplifies additional difficulties, such as joblessness, limited social interaction, apprehension over the well-being of close acquaintances, and inadequate access to food. Additionally, it is important to acknowledge that there is evidence suggesting a correlation between a decrease in psychological well-being and an elevated risk of mortality and prolonged illness it has been shown that the COVID-19 pandemic has resulted in an increase in the prevalence of food insecurity [21]. The observed phenomenon can be ascribed to the adoption of social distancing protocols, the prevalence of joblessness, and the presence of economic volatility [22]. Moreover, this concept can be extended to similar situations that could potentially affect the issue of food security. conducted a study in the state of Vermont to assess the impact of food insecurity on health outcomes during the COVID-19 epidemic. An increase of 33% in the incidence of food insecurity has been shown in the aftermath of the COVID-19 epidemic. This sad situation has led to substantial disruptions in individuals' eating habits, causing them to reduce the frequency of their meals and, in certain instances, experience bouts of hunger [23]. As a result, the adverse impacts on individuals' well-being spanned a diverse array of concerns, including mental health illnesses, heightened blood pressure, signs of depression, and insufficient nutritional intake [24].

The influence of food insecurity on the mental well-being of women in Bangladesh during the COVID-19 pandemic. The results obtained from the descriptive analysis indicated a statistically significant association between food insecurity and mental health. During the COVID-19 pandemic, there was a notable increase of 58% in the occurrence of food insecurity in households, which was accompanied by a comparable rise of 3.1 points in stress levels. Conducted a study to investigate the effects of the COVID-19 pandemic on mental health, food insecurity, and income within the rural regions of Bangladesh [25]. The researchers conducted a comparative analysis of time series data generated during the pandemic with data collected two years prior to the onset of the COVID-19 outbreak. The findings of the study indicate that prior to the initiation of the COVID-19 pandemic, a proportion of 5.6% of households were confronted with moderate food insecurity, and 2.7% were through severe food insecurity. Nevertheless, there was a substantial rise in these proportions during the period of lockdown, with moderate food insecurity reaching 36.5% and severe food insecurity reaching 15.3%. Moreover, empirical studies have demonstrated a significant increase in the incidence of anxiety and depression symptoms following the enforcement of pandemic-induced lockdown measures [26].

An extensive review of 24 studies that investigated the psychological effects of quarantine. Their findings suggest that quarantines and lockdowns may lead to adverse

psychosomatic outcomes. The aforementioned outcomes involve emotions characterized by perplexity, dissatisfaction, and resentment, which can be ascribed to various determinants, including economic difficulties and insufficient availability of fundamental necessities like sustenance and hydration [27]. The enduring impacts of lockdown measures on mental well-being are deserving of attention. The study argues that it is crucial for authorities to ensure the supply of necessary resources during pandemics of this kind. A significant correlation exists between mental health and poor socioeconomic status, particularly in homes distinguished by informal employment and unemployment. Demonstrate that there is a somewhat higher frequency of maternal depression in low and middle-income countries [28]. Furthermore, a significant correlation has been observed between maternal depression and food insecurity, as demonstrated by the empirical investigations carried out. Moreover, it is important to acknowledge that there exists a favorable correlation between household income and homeownership with the mental well-being of those residing in the household. This aspect holds significant importance as it serves to alleviate the detrimental consequences of unfavorable changes in income, such as unemployment, heightened expenditures, and inflationary pressures [29].

Several studies in the existing literature have found a range of socio-demographic characteristics that function as determinants of depression within households. The variables under consideration encompass family type the study conducted investigated the association between specific variables, such as age and gender, and a particular phenomenon. In a similar vein, the role of gender in the aforementioned occurrence has been investigated. The global health crisis has resulted in substantial changes in the extent and complexity of food insecurity, potentially leading to long-lasting consequences for public health [30]. The presence of food insecurity has been identified as a factor that is positively correlated with an increased likelihood of experiencing various health issues, including severe depression. The effects of the recent pandemic on food insecurity in various countries have been widely acknowledged. However, there is still ongoing discussion regarding the specific impact of food insecurity in Pakistan. The predominant focus of scholarly inquiry has been on investigating alternate approaches to gathering survey data, including the use of telephone or internet platforms. Furthermore, scholarly investigations have prioritized the evaluation of impacts within a limited temporal scope. The aforementioned points will be examined in a recent study. The current study is notable for its emphasis on the acquisition of original data during the COVID-19 pandemic, thus effectively resolving the aforementioned challenges. The fundamental aim of this research endeavor is to comprehensively examine the impact of household food insecurity on depression. This will be achieved through the analysis of primary data obtained from five districts located in the Punjab region [31].

Methodology:

Theoretical Framework:

The study adopts the Health Production function framework, conceptualizing health as a function of various determinants, namely economic, social, and demographic factors. The model, emphasizes individuals' active contribution to their health amid various challenges.

Focus Variables:

The research concentrates on examining the relationship between shortfall in daily earnings and food insecurity during the COVID-19 pandemic. Food insecurity, characterized by limited access to nutritious food, emerges as a significant determinant impacting mental well-being. The study recognizes the potential consequences of food insecurity on mental health, including the emergence of mental disorders and increased disparities within communities.

Statistical Analysis:

To assess the correlation between depression and food insecurity, logistic regression analysis is employed. This statistical technique, specifically the Order logit (O-logit) analysis, is

chosen due to the categorical nature of the variables. Logistic regression aids in evaluating the likelihood of an event occurring, particularly in the context of examining the impact of food insecurity (categorical) on depression (categorical).

Data Collection:

A questionnaire survey is conducted to gather primary data from 350 households across five districts in Punjab: Sheikhupura, Lahore, Sialkot, Gujranwala, and Faisalabad. The research focuses on family heads within the informal sector aged 18 or older. The survey captures data related to depression, food insecurity, social, and demographic characteristics.

Variable Definition and Analysis:

The study meticulously defines, sources, and collects variables related to depression, food insecurity, social media linkages, economic factors (income, earning hand), and demographic variables (gender, marital status, family size, family type). This comprehensive approach aims to examine the association between depression and household food insecurity while incorporating social and demographic data.

The methodology emphasizes the investigation of depression as the dependent variable influenced by food insecurity, employing statistical tools to analyze their relationship within the broader context of economic, social, and demographic factors during the COVID-19 pandemic in Punjab's urban laborers.

Results and Discussion:

This study focuses on exploring depression as the dependent variable, evaluated using the Beck Depression Inventory (BDI), comprising 15 multiple-choice questions. The dependent variable examined here is food insecurity, measured using the Home Food Insecurity Access Scale (HFIAS), consisting of nine indicators. Higher scores on this scale denote increased levels of food insecurity. It segments households into categories ranging from food secure to severely food insecure, offering insights into the prevalence and temporal variations in food insecurity. Covariates, in this context, encompass economic, social, and demographic factors surveyed alongside the questionnaire. These include household income, earning capacity, gender of the household head, marital status, family size and type, and social media usage. These variables are vital as they could potentially influence the relationship between depression and household food poverty.

The main aim of this research is to assess the connection between shortfall in daily earnings and food insecurity among individuals aged 22 and above in Sheikhupura, Lahore, Sialkot, Gujranwala, and Faisalabad districts. This study employed logit regression analysis, using both odds ratios and marginal effects to comprehensively understand the findings. The odds ratios help determine the direction of variables, while marginal effects clarify their magnitude. The Wald test was conducted to gauge the reliability of the covariates used in the investigation. The results indicated statistical significance, rejecting the null hypothesis at a 0.06% significance level, signifying the importance of these factors in the model. The research uncovered a statistically noteworthy association between food insecurity and the probability of experiencing moderate depression. Specifically, each incremental unit increase in food insecurity correlated with an 8.9% higher likelihood of encountering moderate depression. This relationship persisted even after considering the potential impact of other variables. The marginal effects analysis further revealed that a one-unit change in food insecurity was associated with a 0.6 percentage point increase in the prevalence of mild depression. These results align with previous studies indicating that heightened food insecurity corresponds to increased rates of depression among households.

Table 1 presents a comprehensive overview of household statistics. It emerged that households exhibited substantial concerns about the infectious disease, with nearly 4.9% reporting family members affected by COVID-19 and 2.8% reporting fatalities due to the virus. Accessing essential supplies posed challenges, with a significant proportion (79%) indicating

medium-to-high difficulty due to government policies responding to the pandemic. The study provided a notable representation of female household heads, constituting 12% of the total responses. Moreover, rural respondents contributed 43% of the survey responses, while urban participants accounted for 51%.

Table 1: Percentage Distribution of Household Characteristics and COVID-19 Concerns among 350 Survey Respondents.

Statistics	Percentage
Households concerned about COVID-19	
Infected family members	4.9%
Family members deceased	2.8%
Difficulty accessing essential supplies	
Medium-to-high difficulty	79%
Representation in the survey	
Female household heads	12%
Respondents by location	
Rural	43%
Urban	51%

The findings from the respondent data paint a stark picture of the profound effects of the COVID-19 pandemic on household finances. More than a quarter of households experienced a significant monthly income loss of around 18,000 PKR, while the majority, comprising over 63%, faced reduced incomes below 20,000 PKR per month. Employment losses surged, impacting over 62% of households, signifying a widespread impact on job security during the pandemic. The economic strain was further exacerbated by an alarming twofold increase in food prices, reported by a staggering 89% of households. Additionally, over half of the surveyed households grappled with a 5–10, point rise in debts, significantly reducing their purchasing power amid the pandemic's financial upheaval. Meeting daily expenses became an arduous task for more than half of the respondents, with approximately 52% facing challenges in this area since the outbreak of COVID-19. Moreover, nearly 40% reported a compromised ability to save money due to the pandemic's financial strain. Surprisingly, despite these financial hardships, a substantial portion, about 43%, refrained from resorting to alternative income sources. Financial assistance was sought by a mere 10% through social media channels, reflecting a limited exploration of external financial support. Concerns regarding future financial stability lingered, with one-fifth expressing worries about job security in the coming months.

Table 2: Summary of Household Challenges and Adaptations Based on Percentage of Affected Participants

Aspect	Percentage of Respondents
Impact on Household Income	
Monthly income loss	
Around 18,000 PKR	More than 25%
Below 20,000 PKR	Over 63%
Higher employment loss	Over 62%
Increase in Expenses	
Increase in food prices	89%
Increase in household debt	54% (5–10 points on the scale)
Challenges Faced	
Difficulty meeting daily expenses	Around 52%

Impact on saving money	Around 40%
Adaptation and Assistance	
Utilization of alternative income sources	Around 43%
Seeking financial assistance	10%
Job Stability and Financial Management	
Concerns about future job stability	Around 20%
Experienced job loss or furlough	Nearly 19%
Prioritized expenses due to income constraints	Over 52%
Debt and Financial Planning	
Increased debts due to the pandemic	Around 20%
Difficulty affording essential goods/services	Around 42%
Future Financial Outlook	
Confidence in financial improvement	Around 20%
Pandemic's influence on future plans/goals	Not specified

Job losses or furloughs affected almost 19% of the respondents, contributing to the financial distress experienced across households. Many households, accounting for over half of the sample, were compelled to prioritize certain expenses due to income constraints. Additionally, approximately 20% reported an increase in debts owing to the pandemic, with 42% struggling to afford essential goods and services. Looking ahead, only a fifth of the respondents expressed confidence in their financial situation improving in the near future. Although specific percentages weren't provided, the pandemic undeniably influenced financial plans or goals for a significant proportion of respondents, highlighting a lasting impact on their future financial outlook amidst these challenging times.

Discussion

The study delves into the intricate relationship between multiple socioeconomic factors and levels of food security among individuals in specific districts. It reveals a nuanced connection between income and depression, suggesting a positive correlation, although without statistical significance. This echoes prior research indicating that beyond meeting basic needs, higher income doesn't significantly enhance emotional well-being. Gender analysis hints at a minor decrease in moderate depression likelihood among males, yet the findings lack statistical strength. Interestingly, the study highlights potential gender-related traits contributing to higher depression rates among females, emphasizing compassion and empathy. Marital status and family structure emerge as influential factors, indicating increased depression likelihood among married individuals and those in joint families. Moreover, larger family sizes during the pandemic correlate with higher depression rates, potentially due to amplified financial strain and increased exposure risks. Social media engagement, typically associated with higher depressive symptoms, raises intriguing questions. Sensitivity analysis reaffirms the robust link between shortfall in daily earnings and food insecurity, irrespective of other contributing elements. Moreover, heightened expenditures and a greater number of dependent family members are notably linked to increased depression levels. On a positive note, communication technology seems to aid mental well-being amid the pandemic, offering a bridge against isolation and stress. These findings illuminate the multifaceted landscape of depression, intertwining income, family dynamics, and external circumstances, underlining their intricate influence on mental health outcomes.

The positive impact of communication technology on mental well-being is evident as it enables emotional expression, mutual support, access to assistance, and the sharing of strategies to navigate uncertain times. Surprisingly, the study reveals a statistically significant relationship between housing region and depression. Residing in more spacious dwellings might paradoxically lead to heightened loneliness during periods of isolation compared to smaller

accommodations. Furthermore, a district-level sensitivity analysis, detailed in the provided table, was conducted to delve deeper into these dynamics. The research consistently establishes a statistically significant positive correlation between a shortfall in daily earnings and food insecurity across all districts. The odds ratios, indicating a positive marginal effect, reinforce this connection. Particularly, Gujranwala stands out for its notable link between household shortfall in daily earnings and food insecurity. The district's higher incidence of food insecurity stems from its classification as a socioeconomically disadvantaged area, characterized by relative poverty and deprivation. Additionally, Bahawalpur's predominantly arid terrain, comprising mainly desert areas, contributes to a greater prevalence of food-insecure households compared to other districts.

Conclusion

In summary, this research aimed to uncover the link between depression and food insecurity amidst the COVID-19 crisis in Pakistan. Focusing on laboring-class households vulnerable to food poverty, the study collected data from 500 representative households across five districts in Punjab. The findings revealed a strong, statistically significant association between depression and food insecurity, emphasizing an 8% increase in depression probability due to heightened food insecurity during the pandemic. These results stress the critical role of ensuring adequate food availability for psychological well-being. Examining social and demographic factors, the study highlighted intriguing correlations. Higher-income was paradoxically linked to increased depression, aligning with research indicating that beyond meeting essential needs, increased income doesn't significantly impact emotional well-being. Gender disparities surfaced, with females showing higher susceptibility to depression during the pandemic, possibly influenced by caregiving roles. Married individuals and those in joint families exhibited higher vulnerability to depression, whereas larger family sizes correlated with elevated depression levels, while more earners in a family seemed to lower depression risk. Incorporating these factors enriched the understanding of depression dynamics. The study's sensitivity analysis reinforced the robustness of the food insecurity-depression link, even when considering various influencing variables. However, the study's main limitation lies in its analytical framework, hindering conclusive inference about the causal relationship between depression and food insecurity. Uncertainty persists regarding whether depression impacts food security or vice versa. Despite this limitation, the significant impact of food insecurity on depression underscores the urgent need for public health initiatives to ensure access to nutritious food for vulnerable populations. Prioritizing interventions aimed at bolstering food security remains imperative for enhancing overall well-being and quality of life.

References:

[1] M. A. Jutt and N. Aslam, "Contemporary Trends in Food Production: The Influence of Artificial Intelligence in Intelligent Food Manufacturing Facilities," *Front. Comput. Spat. Intell.*, vol. 4, no. 1, pp. 68–82, Mar. 2026, Accessed: Oct. 02, 2026. [Online]. Available: https://journal.xdgen.com/index.php/FCSI/article/view/493

[2] A. Baqi, Q. Shabbir Rana, R. Rizwan Javed, H. Haroon Ahmad, and H. H. A Raja Rizwan Javed, "Challenges to Food Development in Global Perspectives," *Int. J. Agric. Sustain. Dev.*, vol. 3, no. 1, pp. 8–13, Feb. 2021, Accessed: Oct. 15, 2026. [Online]. Available: https://journal.xdgen.com/index.php/ijasd/article/view/161

[3] A. Jabbar, A. Mauzzam, S. Zia, and A. H. Kazi, "Smog, Heatwaves, and the Feminized Face of Climate Distress: Psychological, Geographical, and Engineering Perspectives of Women's Vulnerability in Central Punjab," *Int. J. Innov. Sci. Technol.*, vol. 7, no. 9, pp. 356–368, 2025, Accessed: Sep. 10, 2026. [Online]. Available: https://ideas.repec.org/a/abq/ijist1/v7y2025i9p356-368.html

[4] A. M. Hamelin, J. P. Habicht, and M. Beaudry, "Food insecurity: Consequences for the household and broader social implications," *J. Nutr.*, vol. 129, no. 2 SUPPL., 1999, doi:

10.1093/JN/129.2.525S.

[5] M. T. Niles, F. Bertmann, E. H. Belarmino, T. Wentworth, E. Biehl, and R. Neff, "The early food insecurity impacts of covid-19," *Nutrients*, vol. 12, no. 7, pp. 1–23, Jul. 2020, doi: 10.3390/NU12072096.

[6] W. Khan and F. Naveed, "Integrating Remote Sensing and Spatial Artificial Intelligence for Climate Risk Assessment in Pakistan: A Data-Driven Spatiotemporal Analysis," *Front. Comput. Spat. Intell.*, vol. 3, no. 4, pp. 165–178, Oct. 2025, Accessed: Oct. 01, 2026. [Online]. Available: https://journal.xdgen.com/index.php/FCSI/article/view/414

[7] Shazia Hussain, "Advancing Plant Health Management: Challenges, Strategies, and Implications for Global Agriculture," *Int. J. Agric. Sustain. Dev.*, vol. 6, no. 2, pp. 73–89, 2024, doi: https://journal.xdgen.com/index.php/ijasd/article/view/216.

[8] F. Agüero, M. N. Adell, A. Pérez Giménez, M. J. López Medina, and X. Garcia Continente, "Adoption of preventive measures during and after the 2009 influenza A (H1N1) virus pandemic peak in Spain," *Prev. Med. (Baltim).*, vol. 53, no. 3, pp. 203–206, Sep. 2011, doi: 10.1016/J.YPMED.2011.06.018.

[9] V. Erokhin and T. Gao, "Impacts of COVID-19 on trade and economic aspects of food security: Evidence from 45 developing countries," *Int. J. Environ. Res. Public Health*, vol. 17, no. 16, pp. 1–28, Aug. 2020, doi: 10.3390/IJERPH17165775.

[10] S. M. Shrestha, B. L. Joshi, S. Shrestha, and K. G. Maharajan, "Cavographic study of an early stage of obstruction of the hepatic portion of the inferior vena cava," *J. Gastroenterol. Hepatol.*, vol. 15, no. 2, pp. 202–210, 2000, doi: 10.1046/J.1440-1746.2000.02043.X.

[11] U. Wernery and P. C. Y. Woo, "Middle East respiratory syndrome: making the case for surveillance of transboundary coronaviruses in the Middle East," *Rev. Sci. Tech.*, vol. 38, no. 1, pp. 61–69, May 2019, doi: 10.20506/RST.38.1.2941.

[12] T. Klieštik, K. Kočišová, and M. Mišanková, "Logit and Probit Model used for Prediction of Financial Health of Company," *Procedia Econ. Financ.*, vol. 23, pp. 850–855, 2015, doi: 10.1016/S2212-5671(15)00485-2.

[13] N. ul Ain, "Redefining the Role of the Nation-State: A Comparative Analysis of Liberal and Socialist Economic Systems in the Wake of COVID-19," *Magna Cart. Contemp. Soc. Sci.*, vol. 1, no. 4, pp. 190–197, Dec. 2022, [Online]. Available: https://journal.50sea.com/index.php/MC/article/view/633

[14] S. R. Kodish *et al.*, "A qualitative study to understand how Ebola Virus Disease affected nutrition in Sierra Leone-A food value-chain framework for improving future response strategies," *PLoS Negl. Trop. Dis.*, vol. 13, no. 9, 2019, doi: 10.1371/JOURNAL.PNTD.0007645.

[15] A. Swindale and P. Bilinsky, "Development of a universally applicable household food insecurity measurement tool: Process, current status, and outstanding issues," *J. Nutr.*, vol. 136, no. 5, 2006, doi: 10.1093/JN/136.5.1449S.

[16] R. Zurayk, "Pandemic and Food Security: A View from the Global South," *J. Agric. Food Syst. Community Dev.*, pp. 1–5, Apr. 2020, doi: 10.5304/JAFSCD.2020.093.014.

[17] H. K. Seligman, A. B. Bindman, E. Vittinghoff, A. M. Kanaya, and M. B. Kushel, "Food insecurity is associated with diabetes mellitus: Results from the National Health Examination and Nutrition Examination Survey (NHANES) 1999-2002," *J. Gen. Intern. Med.*, vol. 22, no. 7, pp. 1018–1023, Jul. 2007, doi: 10.1007/S11606-007-0192-6.

[18] C. Y. Park and H. A. Eicher-Miller, "Iron Deficiency Is Associated with Food Insecurity inPregnant Females in the United States: National Health and Nutrition Examination Survey 1999-2010," *J. Acad. Nutr. Diet.*, vol. 114, no. 12, pp. 1967–1973, Dec. 2014, doi: 10.1016/J.JAND.2014.04.025.

[19] L. McIntyre, J. V. A. Williams, D. H. Lavorato, and S. Patten, "Depression and suicide ideation in late adolescence and early adulthood are an outcome of child hunger," *J. Affect. Disord.*, vol. 150, no. 1, pp. 123–129, Aug. 2013, doi: 10.1016/J.JAD.2012.11.029.

[20] J. T. Cook *et al.*, "Child food insecurity increases risks posed by household food insecurity to young children's health," *J. Nutr.*, vol. 136, no. 4, pp. 1073–1076, 2006, doi: 10.1093/JN/136.4.1073.

[21] S. Bakalis *et al.*, "Perspectives from CO+RE: How COVID-19 changed our food systems and food security paradigms," *Curr. Res. Food Sci.*, vol. 3, pp. 166–172, Nov. 2020, doi: 10.1016/J.CRFS.2020.05.003.

[22] Abdullah *et al.*, "Factors affecting household food security in rural northern hinterland of Pakistan," *J. Saudi Soc. Agric. Sci.*, vol. 18, no. 2, pp. 201–210, Apr. 2019, doi: 10.1016/J.JSSAS.2017.05.003.

[23] P. I. Tata Ngome, C. Shackleton, A. Degrande, E. J. Nossi, and F. Ngome, "Assessing household food insecurity experience in the context of deforestation in Cameroon," *Food Policy*, vol. 84, pp. 57–65, Apr. 2019, doi: 10.1016/J.FOODPOL.2019.02.003.

[24] H. Kidane, Z. G. Alemu, and G. Kundhlande, "Causes of household food insecurity in koredegaga peasant association, oromiya zone, Ethiopia," *Agrekon*, vol. 44, no. 4, pp. 543–560, Dec. 2005, doi: 10.1080/03031853.2005.9523727.

[25] W. Tian, L. Cai, D. Thissen, and T. Xin, "Numerical Differentiation Methods for Computing Error Covariance Matrices in Item Response Theory Modeling: An Evaluation and a New Proposal," *Educ. Psychol. Meas.*, vol. 73, no. 3, pp. 412–439, Jun. 2013, doi: 10.1177/0013164412465875.

[26] G. Gebreyesus *et al.*, "Short communication: Multi-trait estimation of genetic parameters for milk protein composition in the Danish Holstein," *J. Dairy Sci.*, vol. 99, no. 4, pp. 2863–2866, Apr. 2016, doi: 10.3168/JDS.2015-10501.

[27] M. M. Hamed and B. M. Al-Eideh, "An exploratory analysis of traffic accidents and vehicle ownership decisions using a random parameters logit model with heterogeneity in means," *Anal. Methods Accid. Res.*, vol. 25, Mar. 2020, doi: 10.1016/J.AMAR.2020.100116.

[28] S. L. Coates, L. T. Butler, and D. C. Berry, "Implicit memory and consumer choice: The mediating role of brand familiarity," *Appl. Cogn. Psychol.*, vol. 20, no. 8, pp. 1101–1116, Dec. 2006, doi: 10.1002/ACP.1262.

[29] A. Ali, M. Ahmed, and N. Hassan, "Socioeconomic impact of COVID-19 pandemic: Evidence from rural mountain community in Pakistan," *J. Public Aff.*, vol. 21, no. 4, Nov. 2021, doi: 10.1002/PA.2355.

[30] N. Mango, B. Zamasiya, C. Makate, K. Nyikahadzoi, and S. Siziba, "Factors influencing household food security among smallholder farmers in the Mudzi district of Zimbabwe," *Dev. South. Afr.*, vol. 31, no. 4, pp. 625–640, 2014, doi: 10.1080/0376835X.2014.911694.

[31] M. Leach, N. Nisbett, L. Cabral, J. Harris, N. Hossain, and J. Thompson, "Food politics and development," *World Dev.*, vol. 134, Oct. 2020, doi: 10.1016/J.WORLDDEV.2020.105024.



Copyright © by authors and 50Sea. This work is licensed under Creative Commons Attribution 4.0 International License.