Factors associated with household food security in Somalia: ordered probit approach

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Abstract

Hunger can be defined as the uncomfortable or painful sensation caused by insufficient food consumption; It is the most severe form of food insecurity, implying that people do not have enough food to meet their basic needs. This study's general objective is to determine the factors associated with food insecurity in Somalia. An ordered probit model has been utilized using data from the 2020 Somali Health and Demographic Survey produced by the Somalia National Bureau of Statistics to find out which socioeconomic variables food insecurity in Somalia is correlated, which contains a sample of 16,360 households. The study employs the Household Hunger Scale (HHS) to measure food security. The ordered probit is used as an empirical model since the latent variable assumes gradations in order, with the dependent variable of HHS. According to the food security level, Somalia had 5.82% severe food insecurity and 19.28% moderate food insecurity. The results of the models showed that the education level of the household head, having electricity, being a member of the agricultural group, having livestock, and having a bank account decreases the probability of household food insecurity. The results imply an effort must be made at the level of national education, access to and policies supporting livestock development programs such as training farmers in animal husbandry, as well as policies increasing the availability of electricity and access to finance, which have the potential to enhance household food security.

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Introduction

Somalia was on the verge of being able to feed its population in the 1980s. Still, the destruction of infrastructure and institutions that followed caused a sharp decline in output, and food insecurity has been a persistent issue since 1991. The number of people experiencing food insecurity has grown as of 2022. This trend has been aggravated by severe hunger and malnutrition of 7.1 million people – 45% of the population, which has risen following four consecutive failed rainy seasons, while millions of households across the country are currently facing famine conditions where an estimated 213,000 people have experienced catastrophic food insecurity (IPC Phase 5) are confirmed. Furthermore, the worsening drought conditions put some areas in Somalia at an increased risk of unprecedented famine.[1]

Conflicts, severe weather, and economic shocks are the leading causes of acute food insecurity in Somalia, according to the Global Report on Food Crises in 2022. Conflicts often reduce civilian income sources and cause acute food insecurity; they also disrupt food systems and the market, increase food prices, and create problems in meeting needs such as water, fuel, and food. In central and southern Somalia, conflict fueled by inter-clan rivalry and attacks by Al-Shabaab and militia groups significantly contributed to acute food insecurity, affecting livelihoods and impeding economic growth. Between January and August 2021, 413,000 persons were uprooted by conflict, a 130% rise from the corresponding period in 2020. Conflict-related displacement decreased food production, particularly in the districts of Hiraan, Middle, and Lower Shabelle, and constrained the movement of livestock.[2]

The protracted conflicts hinder the economic activity of businesses, disrupt trade, and weaken the economy. It also prevents humanitarian aid and people's food access in some districts. Food insecurity can itself be the cause of violence and instability. Droughts, floods, and untimely precipitation are extreme weather events in Somalia. Weather-related events directly affect crops and livestock. The under-expected harvest affects food availability, raises food prices, and reduces job opportunities in agriculture. This situation reduces the income of the households who make their living from agriculture and affects their access to food, the

delayed Gu rainy season contributed to the Gu cereal output reduction of more than 60% compared to the average of 1995-2020. This was the third consecutive below-average harvest. Prices for essential foods were more than twice as expensive in December 2021 as they were in 2020.[2]

The main objective of this research is to identify socioeconomic and demographic characteristics that determine the level of food insecurity in Somalia. In other words, vulnerable groups in terms of food security are to be identified. The study's importance lies in its ability to inform policy-makers about various elements that may support food security. The study will add to the knowledge on household food insecurity, focusing on how selected factors affect food security. The preliminary hypothesis of this research is that rural households with less education will be more susceptible to food insecurity. The following section of the paper examines the literature on the factors affecting food security in general and Somalia in particular. The third section describes the methodology, data analysis techniques, and results. Finally, the paper ends with a conclusion and recommendations.

Literature Review

Food security measures & definitions

Food insecurity means the situation in which there is not enough access to safe and nutritious food to maintain an active life and to provide physical development. Food insecurity is divided into acute and chronic food insecurity. Acute food insecurity is the name given to food insecurity that is severe enough to threaten people's lives, livelihoods, or both, regardless of cause, context, or duration over a period of time.[2] These acute states are prone to change and can emerge in a population within a short period due to rapid changes or shocks that have a detrimental impact on the determinants of food insecurity and malnutrition.[3] Temporary food insecurity is people's short-term or temporary inability to meet their food needs due to crises.[2]

Chronic food insecurity is people's long-term or continuous inability to meet their nutritional energy needs. FAO defines this condition as malnutrition. In some periods of the year, people have to cut the quantity and quality of the food they consume due to financial inadequacy or lack of other resources, and uncertainties in their access to food indicate a moderate level of food insecurity. Lack of regular access to food reduces nutritional quality affects food consumption habits, and adversely affects nutrition, health, and wellness. On the other hand, people with severe food insecurity cannot eat for days, their food is depleted, and they feel hunger in its most severe form. Therefore, they face serious health risks.[4]

There are five popular techniques for evaluating food security: i) the FAO approach for calculating calories available per capita at the country level; ii) surveys of household income and spending; iii) dietary intake; iv) anthropometry; v) scales for measuring food insecurity based on experience. All the methods are derived from measurements of food insecurity. Hence, over the past two decades, significant advances have been made in the vital measurement of household food insecurity using experience-based scales reported by the affected individuals. There are also various experience scale-based methods discussed in Table 1.

Overview of the current food security situation in Somalia

The sharp increases in staple food prices, declining livestock prices, labor wages, and lower salable livestock holdings have significantly affected household purchasing power. In addition, among the other factors hindering food security in the country is the current domestic food production: underdeveloped markets, inadequate value addition, and a lack of access to quality inputs like seed fertilizers and animal vaccines.

In addition, Somalia's perennial food deficit situation in recent decades has been worsened by the effects of global food crisis developments, which have led to a sharp hike in food prices in international markets. A sharp increase in staple cereals and oil commodities is witnessed. The severity of acute food insecurity is anticipated to worsen and continue to elevate through 2022, owing to escalating staple food shortages resulting from ongoing conflicts and global supply shocks. If the war in Ukraine continues and trade partners restrict exporting food commodities, which typically bring 55% of household wheat consumption in Somalia, the country's food security situation will be dire. The effects of conflict and drought on local livelihoods have led to significant displacement in 2021, and drought-related removal has accelerated this since the end of the 2021 *Deyr* rains.

For decades, hunger and malnutrition and hunger were classified as extremely alarming in the country, and the last recorded famine country in the world led to hundreds of thousands of loss of lives in Somalia in 2011-2012. Consequently, the global hunger index (GHI) score of Somalia has not improved over many years, meaning that progress in the fight against food insecurity and malnutrition has been lacking.

The humanitarian crisis in Somalia is one of the world's most complicated and long-lasting ones. The population is vulnerable to various threats and shocks, the most significant of which are repeated droughts and floods, the frequency and severity of which have grown due to seasonal climate variability. In addition, economic shocks, insecurity, and inter-communal violence continue to limit livelihoods, trade, and market functioning, contributing to population displacements, a cycle of poverty, and susceptibility to food and nutrition insecurity. Furthermore, inadequate implementation of disaster risk management and mitigation strategies to address the effects of climate change and bolster the resilience of households and communities remains a key gap. At the local community level, there are weak governance structures, a lack of essential services, and financial, technical, and informational resources necessary to build resilience to food insecurity. As a result, every year, millions go hungry, requiring urgent actions to prevent food consumption gaps and acute malnutrition. Figure 1 indicates the population in crisis (IPC Phase 3 or above) over 2016-2021. It demonstrates that millions go hungry yearly, and the number of people in crisis is often higher during the *Deyr* (short rainy) season. With a score of 50.8, chronic food insecurity and malnutrition in Somalia, as measured by the GHI, is categorized as highly alarming. Economic shocks, including COVID-19, affect the food security of households and individuals in various ways.[2] Microeconomic factors such as rising food prices, reduced income sources, and decreased purchasing power directly affect the food security of households. There is a close relationship between acute food insecurity and macroeconomic shocks caused by factors such as high inflation, excessive depreciation of the country's currency, disruption of trade, high unemployment rates, loss of income, contraction in exports, decreased investments, and capital inflows. Increasing prices of essential grain products and oil affect food availability, prices, and incomes. In monitored marketplaces in Nugaal, Middle Juba, and Mudug regions in October 2021, a 200-litre water drum cost ranged from 45 to 172% higher than the five-year average.[2]

Empirical studies

The literature dealing with the determinants of food insecurity is relatively abundant. Its proliferation in recent years is linked to the global context characterized by persistent tensions in the markets for agricultural products, consequences of climate change, and on the other hand, the increase in food demand supported by still rapid population growth.

Food insecurity is a significant aspect of urban poverty; according to Boonyabancha,[5] urban households spend a substantial fraction of their income on food purchases more than rural households. They are, therefore, more vulnerable to price fluctuations and declining terms of trade. The food needs of a constantly changing urban population have consequences for rural production areas. While poverty is primarily a rural phenomenon, the economic systems of rural areas and urban centers are closely intertwined.

Kaba investigated the socioeconomic and demographic determinants of household food insecurity in Kinshasa city, the Democratic Republic of Congo, and developed a 16-question measure based on a summative scale to assess the state of household food security.[6] A household with a score from 0 to 7 was considered food secure, and 8 to 16 were supposed to be food insecure. The logistic regression analysis indicated that households head who had no education or completed primary and secondary school were respectively twice more likely to be food insecure than those with a university level or college. In addition, he also found that households whose primary source of income was small trades had a greater risk of being food insecure than households where the primary source of income was salary.

In the book Hunger and Public Action, Sen and Drèze discussed hunger for the first time from the perspective of the capabilities approach,[7] although they did not refer directly to the concept of food security (Burchi).[8] This approach emphasises the distinction between means and ends in relation to development. The greater end would be expanding possibilities for individuals to be and do things, from the most elementary, such as being adequately nourished, to the most complex, such as having self-esteem and

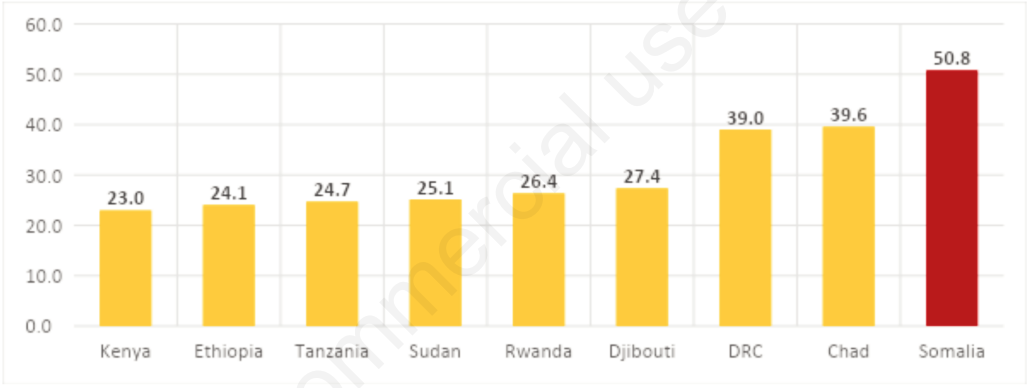

Figure 1. Global hunger index scores, 2021. Data for the global hunger index score for 2000 are from 1998-2002; for 2006, from 2004-2008; for 2012, from 2010-2014; and for 2021, from 2016-2020. Source: Global hunger index.

Table 1. Classification of experience-based food security measures.

Indicator	Original category	Original qualitative label	Converted binary classification
1. Coping strategies index	1	Food secure	Food secure
2. Reduced coping strategies index	2	Mildly food insecure	Food secure
3. Household food in-security and access scale	3	Moderately food insecure	Food insecure
	4	Severely food insecure	Food insecure
4. Household hunger scale	1	Little to no hunger	Food secure
	2	Moderate hunger	Food insecure
	3	Severe hunger	Food insecure
5. Food consumption score	1	Acceptable	Food secure
6. Household dietary diversity scale	2	Borderline	Food insecure
	3	Poor	Food insecure
7. Self-assessed measure of food security	1	Food secure	Food secure
	2	Slightly food insecure	Food secure
	3	Moderately food insecure	Food insecure
	4	Very food insecure	Food insecure
	5	Extremely food insecure	Food insecure

being happy. Thus, the possibility of escaping from hunger and the obstacles imposed by it is the central focus of the analysis, access to food per se is just the means.

Asenso-Okyere, based on a baseline survey in selected districts in Ethiopia,[9] identified that the most important determinant of food insecurity is the household head's educational level, the farmland's size, and the availability of assets and security. Nkomoki *et al.*[10] use the food consumption score and the household hunger scale to examine food security in southern Zambia. The findings from the food consumption score (FCS) and Household hunger scale (HHS) models show that the likelihood of household food and nutrition security is increased by higher levels of education for household heads, rising livestock earnings, secure land tenure, enlarging land size, and group membership.

Cabral investigated whether the location of residence (rural *vs.* urban) affected the factors causing food insecurity in Senegal.[11] He accomplished this by estimating a binomial logit model using information from the Household Survey and finding that the key determinants of food insecurity in one zone do not significantly influence the other. However, some information on the FCS is lost when using the logit and probit model to explain food insecurity.[12] They suggested performing a regression on the correlates of the logarithm of caloric intake to make up for this loss of information to identify the causes of food insecurity in Burundi. According to Zoyem *et al.*,[12] the regression's binary treatment of the consumption score caused information loss.

Other works, such as those by Smith *et al.*, Agboola and Balcilar, and Maitra and Rao, show that poverty, defined as a situation of lack of income and assets, is related to the incidence of food insecurity.[13-15] Additionally, they note that activities to supplement income had a beneficial effect on food well-being in Mexico, according to Attanasio *et al.*, Ecuador, according to Hidrobo *et al.*, and Canada, according to Ionescu-Ittu *et al.*[16-18]

This study completes the literature devoted to analysing the determinants of food insecurity. Studies on this theme applied to Somali Health and Demographic Survey (SHDS) data are almost nonexistent. This may lead to other studies specifying the urban and rural, as well as the gender dimension.

Data Source and empirical methodology

Data Source and description of variables

The data for this study are taken from the SHDS produced by the Somalia National Bureau of Statistics in 2020.[19] It focuses on a sample of 16,360 households obtained through a three-stage stratified cluster sample design in rural and urban strata, while a two-stage stratified cluster sample design was used for the nomadic stratum. The study's data is representative of the whole country for a total of 55 sampling strata; each region was stratified into urban, rural, and nomadic areas. The SHDS of 2020 is the most up-to-date national survey, presenting the variables of interest to the study. To analyse the determinants of household food insecurity in Somalia, Table 2 lists the demographic and socioeconomic factors that the study used while analysing the food insecurity level among Somali households. The summary statistics of household heads show that the households are largely headed by males (66%) and have an average age of 44 years; 70% are illiterate (have no formal education), and 80% are married. Regarding household characteristics, 71% live in urban areas with an average household size of 6.5 persons per household. Only 55% utilise

Table 2. Descriptive statistics.

Variable	Description	Mean (n=7214)
Food security indicators		
Household hunger scale	Little to no hunger (0-1), moderate hunger (2-3), severe hunger (4-6)	1.309 (0.472)
Household head characteristics		
Gender	Sex of household head (Male=1)	0.665 (0.472)
Age	Age of household head	44.29 (15.44)
Education level	0=none, 1=Some Primary, 2=Completed Primary, 3=Some Secondary, 4=Completed Secondary, 5=Higher Education, 6=Don't Know	1.028 (1.833)
Marital status	1=Married, 2=Divorced, 3=Abandoned, 4=Widowed, 5=Never Married	1.474 (1.043)
Household characteristics		
TotalHH		6.502 (3.026)
Residence		1.716 (0.451)
Electricity		0.569 (0.495)
Mobile		0.785 (0.411)
Sick		0.202 (0.401)
Water		0.341 (0.474)
AgriGrop		0.980 (0.140)
Cookfuel		5.305 (8.887)
ToiletotherHH		0.604 (0.489)
Lostlivestock		0.183 (0.386)
AgriLand		0.136 (0.343)
Livestock		0.316 (0.465)
Bank		0.046 (0.210)

The mean values are stated with the standard deviation in parentheses.

electricity, and 34% have access to water from a water source, respectively. Less than 4% of the household's members have bank accounts, and the household's access to credit is deficient. However, 78.5% of members own mobile phones.

According to the SHDS, only 32% of households own livestock, but roughly 20% lost livestock the previous year. In terms of health, 21% of households have a member been sick in the last month. Regarding the land tenure system, 13% of the respondents own the land they use for agricultural production.

Empirical methodology

Multivariate analysis was performed using an ordinal logistic regression model, with household food insecurity levels as the dependent variables. Household food insecurity levels were estimated using the HHS consisting of 3 below questions with a reference period of the past four weeks, classifying households into no hunger, light hunger, moderate hunger, and severe hunger.

- Q1. In the past 4 weeks (30 days), was there ever no food to eat of any kind in your house because of lack of resources to get food?
- Q2. In the past 4 weeks (30 days), did you or any household member go to sleep at night hungry because there was not enough food?
- Q3. In the past 4 weeks (30 days), did you or any household member go a whole day and night without eating anything because there was not enough food?

The HHS indicator is ordered into three categories, namely, little to no hunger, moderate hunger, and severe hunger. Explanatory variables were chosen based on findings from other studies. Given the specificity of the dependent variable (HHS) that will be used in this paper, an appropriate model for estimation refers to the ordered probit. This is a multinomial model in which the dependent variable assumes values that establish a certain ordering of the data, not linearly, but in order to rank the possible results. The ordered probit model is an extension of the probit model and is also expressed in terms of a latent variable, say, FS*

$$FS_i^* = f(X_{i,}u_{i,}) \quad (1)$$

In the case of the HHS, the proxy we used as a measurement of food security, there are three categories, so the range of FS* values is divided into three ranges, each one corresponding to a category of the reported food security, which depends on X_I a vector of explanatory variables of this food status of the household, and on μ_i, which are factors random effects that food security.

For a brief explanation of the ordered probit model, consider a general model with a discrete dependent variable that takes as a result of ordered multinomial values, y = 1, 2..., J

The model can be expressed as:

$$y_i^* = x_i'\beta + u_i, \quad i = 1, 2, \ldots n \quad (2)$$

$\mu_i \sim N(0,1)$, where β is a K x 1 vector, and y* is unobservable, it is possible to notice:

$$y = 1 \quad if\ y^* \le \mu_i \quad (3)$$

$$y = 2 \quad if\ \mu_i < y^* \le \mu_{j-1} \quad (4)$$

$$y = j \quad if\ \mu_{j-1} < y^* \quad (5)$$

The threshold values (μ) correspond to the cut-points at which the individual moves from one reported food category to another.

For example, in the case of this work, the HHS variable assumes 3 different values (1, 2, and 3) and, therefore, has two cut-points. Given the assumption that the error term is normally distributed, we arrive at the following conditional probabilities:

$$P(y = 1) = \phi(\mu_i - x\beta) \quad (6)$$

$$P(y = 2) = \phi(\mu_{j-i} - x\beta) - \phi(\mu_j - x\beta) \quad (7)$$

$$P(y = j) = 1 - \phi(\mu_j - x\beta) \quad (8)$$

where ϕ is the standard normal distribution function, in the case of j=1, we have a probit model. Parameters μ and β are unknown that can be estimated by maximum likelihood. For each i, the log-likelihood function is:

$$l_i = [y_i = 0]\log(\phi(\mu_i - x_i\beta)]\ \phi(\mu_1 - x_i\beta) + [y_i = -x_i\beta) - \phi(\mu_1 - x_i\beta) + [y_i = j]\log \quad (9)$$

The variables were divided into household head characteristics and household characteristics. The variables' multicollinearity was examined, and there were no multicollinearity problems as the variance inflation factor (VIF) values were lower than 2. The data analysis was done using STATA 17 software.

Results and Discussion

Table 3 shows that 75% of Somali households were food secure or light hungry in the 2019 SHDS. However, approximately

Table 3. Tabulation of household hunger categories.

Household hunger categories	Household hunger score	Freq.	%	Cum.
No or light hunger	0-1	5403	74.90	74.90
Moderate hunger	2-3	1391	19.28	94.18
Severe hunger	4-6	420	5.82	100.00
Total		7214	100.00	

25% of households faced some type of food insecurity, more frequently 19% in moderate and 6% in severe food insecurity situations. Overall, the model is significant, and the results of the Wald test show that at the 5% threshold, the coefficients are significant and align with the theoretical predictions. The marginal effects are interpreted based on their sign and category. An estimated positive coefficient for a category implies an increase in that variable raises the probability of being in that category. In contrast, a negative coefficient denotes a decrease in the probability of being in that category. Table 4 presents the coefficients of the ordered probit model and the marginal effects. It is observed that the education level of the household head, having electricity and a mobile phone, being a member of the agricultural group, having livestock, and having a bank account decreases households' food insecurity. In other words, all increase the probability of the household being reported as having Little to No Hunger and reduce the probability in the other categories of severe and moderate hunger.

According to research results of the HHS model, household heads who were more educated were 0.6% less likely to be in the severe hunger category, 0.15% in the moderate hunger category,

Table 4. Results of the ordered probit model.

Variables	Coefficient	Household hunger scale		
		Severe hunger	Moderate hunger	Little to No hunger
Household head characteristics				
Gender	0.0849 (0.0735)	0.00434 (0.00376)	0.00927 (0.00802)	-0.0136 (0.0118)
Age	0.000268 (0.00196)	1.37e-05 (9.99e-05)	2.92e-05 (0.000213)	-4.29e-05 (0.000313)
Education level	-0.122*** (0.0198)	-0.00621*** (0.00104)	-0.0133*** (0.00215)	0.0195*** (0.00316)
Marital status	0.0937*** (0.0327)	0.00479*** (0.00168)	0.0102*** (0.00357)	-0.0150*** (0.00523)
Household characteristics				
TotalHH	0.0392*** (0.0102)	0.00200*** (0.000529)	0.00428*** (0.00112)	-0.00628*** (0.00164)
Residence	0.573*** (0.0716)	0.0293*** (0.00382)	0.0626*** (0.00776)	-0.0919*** (0.0113)
Electricity	-1.104*** (0.0679)	-0.0564*** (0.00413)	-0.121*** (0.00710)	0.177*** (0.0103)
Mobile	-0.169** (0.0686)	-0.00864** (0.00352)	-0.0185** (0.00748)	0.0271** (0.0110)
Sick	0.597*** (0.0666)	0.0305*** (0.00359)	0.0652*** (0.00719)	-0.0957*** (0.0105)
Water	0.575*** (0.0593)	0.0294*** (0.00324)	0.0628*** (0.00638)	-0.0922*** (0.00931)
AgriGrop	-0.504*** (0.174)	-0.0258*** (0.00896)	-0.0550*** (0.0190)	0.0808*** (0.0279)
Cookfuel	-0.00375 (0.00354)	-0.000192 (0.000181)	-0.000410 (0.000386)	0.000601 (0.000567)
ToiletotherHH	-0.514*** (0.0600)	-0.0263*** (0.00324)	-0.0561*** (0.00648)	0.0824*** (0.00948)
Lostlivestock	0.528*** (0.0766)	0.0270*** (0.00404)	0.0577*** (0.00831)	-0.0846*** (0.0122)
AgriLand	0.0842 (0.0799)	0.00430 (0.00409)	0.00920 (0.00873)	-0.0135 (0.0128)
Livestock	-0.175** (0.0713)	-0.00893** (0.00366)	-0.0191** (0.00778)	0.0280** (0.0114)
Bank	-0.617*** (0.201)	-0.0315*** (0.0104)	-0.0674*** (0.0220)	0.0990*** (0.0322)
/cut1	1.371*** (0.245)			
/cut2	3.255*** (0.250)			
No of observations	7,214	7,214	7,214	7,214
Prob>chi^2	0.0000			
Pseudo R^2	0.1060			

***p<0.05; ***p<0.01. The average marginal effects are reported, and the standard errors are shown with parentheses.*

Table 5. Correlation matric.

Correlation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Gender	1															
HHage	-0.089***	1														
educ	0.243***	-0.144***	1													
Marital	-0.511***	0.229***	-0.143***	1												
TotalHH	0.127***	0.105***	0.0571***	-0.16***	1											
Residence	0.0251*	-0.0395***	0.107***	-0.0128	0.129***	1										
Electricity	-0.00527	-0.00663	0.218***	0.00219	0.175***	0.407***	1									
Mobile	0.0285*	-0.0440***	0.0952***	-0.0174	0.0750***	0.120***	0.144***	1								
Sick	-0.00882	0.0197	0.0114	0.00176	0.0930***	0.0487***	-0.0206	0.0449***	1							
Water	0.000740	-0.0258*	-0.0313**	-0.0214	0.0261*	0.0152	-0.106***	0.0336**	0.130***	1						
AgriGrop	-0.0320**	0.0177	0.0400***	0.0116	0.0168	0.0355**	0.1000***	-0.0071	0.00006	-0.035**	1					
Cookfuel	0.0161	0.0246*	0.00441	0.112***	-0.131***	-0.0119	-0.0279*	-0.040***	-0.0056	-0.0226	-0.0272*	1				
ToiletotherH	-0.0185	0.0727***	0.0965***	0.00127	0.190***	0.0531***	0.228***	0.0652***	-0.037**	-0.123***	0.0383**	0.00663	1			
Lostlivestok	-0.0537***	0.0994***	-0.113***	0.0302*	0.00270	-0.231***	-0.266***	-0.0199	0.107***	0.148***	-0.040***	-0.00337	-0.113***	1		
AgriLand	0.0818***	0.0382**	-0.0466***	-0.0279*	-0.00342	-0.117***	-0.201***	0.0191	0.039***	0.0492***	-0.119***	-0.0114	-0.080***	0.169***	1	
Livestock	-0.0411***	0.154***	-0.121***	0.0320**	0.0708***	-0.312***	-0.252***	0.00105	0.0281*	0.0603***	-0.0203	-0.033**	-0.0286*	0.429***	0.191***	1
Bank	0.0361**	-0.0228	0.212***	-0.036**	0.0415***	0.102***	0.160***	0.075***	-0.0055	0.0128	0.0314**	0.0185	0.0734***	-0.0615***	-0.0376**	-0.088***

**p<0.05; **p<0.01; ***p< 0.001*

and 2% were more likely to be in the little-to-no hunger category of HHS than their less educated counterparts. In other words, education significantly influenced the probability of having experienced food insecurity in the last 12 months. According to a number of studies, people with less formal education are more likely to face food insecurity than those with a higher level of education.[20-23] The negative correlation between hunger prevalence and educational level can be explained by the inverse relationship between education and socioeconomic status (Table 5).[24]

On the other hand, being married, having a large family size, being in a rural area, having a sick person for the last month, having water unavailability at the water sources, and not owning agricultural land all decrease the food security of households. In other words, it increases the probability of the household being reported as having severe and moderate hunger and reduces the likelihood in the little to no hunger categories. The results suggest that households in rural regions are less food insecure than their urban counterparts, which validates the thesis hypotheses and previous research that food insecurity is a rural concern.

Also, the findings indicated that households with married heads had a 0.4% and 0.1% higher probability of being in the severe and moderate hunger categories. In comparison, 0.15% had more chance of being in the little to no hunger category.

Access to sufficient food is a fundamental human right.[25] Notable efforts should be made to reduce hunger in Somalia; the results of this study show how food insecurity is a relevant problem. Using self-reported data from the SHDS in 2018, the percentage of people who have often not had enough food in the last 12 months was estimated at 26%. Hunger is considered the most severe form of food insecurity.[26] However, it should be noted that the percentage of people who report no or little hunger (food security) having experienced food does not correspond to food security since it does not consider the food quality.

Conclusions

This article analyzed the socioeconomic factors as the determinants of food security for a household in Somalia using microdata from the 2019 SHDS and through the estimation of an ordered probit model. Food security was measured by the HHS indicators. The findings revealed that the education level of the household head, having livestock, having electricity and a mobile phone, being a member of the agricultural group, and having a bank account increases households' food security.

Based on the results, it is concluded that special attention should be given to the people who live in rural areas, who are more likely to live in food-insecure households. The greater the number of people residing in a household, the greater the probability of having food insecurity.

Education is fundamental to changing the family condition and increasing the probability of the household having food security. Thus, public policies that increase human capital are strategic to improve the situation of people.

Strengthening livestock ownership and access to finance should be a top priority because a higher proportion of households keep animals, and less than 4% of households have access to credit. We anticipate that livestock development initiatives, such as advancement in animal husbandry concerning environmental shocks and animal diseases, will increase livestock productivity and food security. Machili found a positive relationship between financial inclusion and food security;[27] increasing financial litera-

cy and expanding access to targeted financial services within the country, particularly for the poor and vulnerable population, would improve incomes and welfare. Our results show that agricultural group membership has a beneficial effect on food security. Therefore, government and non-governmental organizations should promote the current informal and formal groups, mainly through community mobilizing. It is one thing to establish the determinants of food insecurity for households, and another is to know how these households manage to cope with this situation. What are the strategies developed on the one hand by food-secure households to counter food insecurity and on the other hand by those who suffer from it?

The paper has a few limitations that need to be considered. Firstly, the study does not take into account the impact of conflict, climate change, and political instability on food security in Somalia, which are significant issues in the country. Secondly, the study solely relies on the HHS to measure food security, which may not be comprehensive enough. Thirdly, it only investigates the factors that are associated with food insecurity in Somalia, without examining the impact that food insecurity has on the health and well-being of individuals. Although the study provides valuable insights into the factors influencing food insecurity in Somalia, it is important to be aware of these limitations when interpreting the results.

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