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Determinants of Household Welfare in Somalia: A Multivariate Analysis of the Somalia Integrated Household Budget Survey (SIHBS) 2022[1]

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Abstract

This study investigates the socioeconomic determinants of per capita expenditure in Somalia using data from the Somalia Integrated Household Budget Survey (SIHBS) 2022. A multivariate ordinary least squares (OLS) regression was employed to analyse a sample of 6,808 households. Results indicate that education, urbanization, and the receipt of remittances significantly enhance household welfare, while larger household sizes and nomadic residency are associated with lower per capita expenditure. Diagnostic tests confirmed the model's structural stability and identified heteroskedasticity, which was addressed using robust HC3 standard errors. The findings provide empirical evidence to inform poverty reduction strategies and social protection policies in Somalia.

Keywords: Household welfare, per capita expenditure, remittances, urbanization, Somalia, SIHBS.

1. Research Problem

Despite recent data collection efforts, evidence on the relative contributions of demographic characteristics, human capital, infrastructure access, and financial inclusion to household welfare in Somalia remains limited. The Somalia Integrated Household Budget Survey (SIHBS) 2022 provides a unique opportunity to quantify these relationships and examine heterogeneity in household welfare and its socioeconomic determinants. This study addresses this gap by employing multivariate regression analysis to identify the key factors influencing household welfare in Somalia.

2. Literature Review

2.1 Empirical Perspectives on Household Welfare

The measurement and analysis of household welfare have evolved significantly beyond traditional monetary approaches to encompass broader dimensions of well-being. This evolution reflects growing recognition that poverty is a multifaceted phenomenon that cannot be adequately captured by income or consumption measures alone [1]. In the Somali context, where data scarcity has historically constrained empirical research, the 2022 SIHBS represents a landmark effort to establish comprehensive welfare baselines [2].

Household welfare is defined as the benefits households receive through consumption of goods and services, reflecting poverty levels and living standards [3]. They emphasize that consumption expenditure serves as a superior proxy for long-term average well-being compared to income, particularly in developing economies where income fluctuates seasonally. This perspective aligns with the SIHBS methodology, which collected detailed information on household consumption expenditures to monitor welfare and measure poverty more sustainably [2].

It is recommended to capture both the household’s immediate consumption capacity and its long-term resilience when measuring welfare. Their study of remittance-receiving households in Zambia employed the Progress Out of

Poverty Index alongside consumption expenditure to capture non-income dimensions of welfare [4]. This dual approach acknowledges that welfare encompasses both monetary and non-monetary dimensions, a perspective reinforced by Somalia's Multidimensional Poverty Index (MPI) findings showing critical deprivations in cooking fuel (87.8 percent), overcrowding (66.9 percent), and school attendance (56.2 percent) among the Somali population [1].

2.2 Household Head Characteristics and Welfare

The relationship between household head sex and welfare has been extensively documented in Somali contexts. Analysis of Somali High-Frequency Survey data found that approximately 58% of households are headed by men, with significant regional variation. Logistic regression analysis revealed that female-headed households exhibited different poverty dynamics compared to male-headed households, although the relationship was complex and context-dependent [5]. Using machine learning on the 2020 Somalia Demographic and Health Survey data, the sex of the household head was identified as one of the top predictors of poverty in Somalia [6].

Marital status significantly influences household welfare through its effects on household composition, resource pooling, and social support networks. [7], in their multidimensional poverty analysis of Pakistani households, found that married household heads exhibited different poverty profiles compared to unmarried, divorced, or widowed heads. The SIHBS [2] reveals that half of Somalia's population above age 15 are married (50.5 percent), with 5.5 percent divorced and 6.1 percent widowed.

In a machine learning study of fertility preferences in Somalia, marital status was identified as one of the most influential predictors of reproductive decisions, which ultimately affect household composition and welfare. Married women demonstrated significantly different fertility preferences compared to widowed or divorced women, with implications for household size and dependency burdens, factors that directly influence per capita consumption expenditure [8].

Education consistently emerges as a critical determinant of household welfare across developing country contexts. In Somalia, the share of literate household members was found to significantly explain variation in the likelihood of poverty, with a negative relationship between household literacy and the probability of being poor [5]. Maternal and husband education were identified as significant predictors of poverty, although the relationship between education and welfare was complex in fragile contexts, where educational attainment does not necessarily guarantee employment [6].

2.3 Household Demographics

Household size represents a fundamental determinant of welfare, with larger households typically facing higher consumption needs and greater dependency burdens. Household size was found to significantly explain variation in the likelihood of poverty in Somalia, with each

additional household member increasing the odds of poverty by approximately 49% [5]. The SIHBS [2] reports an average household size of 6.7 persons nationally, with notable differences across residence types.

A panel study of East African smallholder farmers found that household composition, not merely size, significantly affects welfare outcomes. Households with higher dependency ratios exhibited greater poverty persistence and lower capacity to escape poverty [9]. This finding is particularly relevant for Somalia, where the SIHBS shows dependency ratios of 106 percent in urban areas, 131 percent in rural areas, and 121 percent in nomadic areas.

2.4 Residence Area

The urban-rural-nomadic divide represents a critical determinant of welfare in Somalia, where livelihood systems and service access vary dramatically across settlement types. [6] found that nomadic pastoralists experience poverty rates averaging 69 percent, while urban areas exhibit a lower poverty rate of 60 percent. The SIHBS [3] provides comprehensive data on these disparities: urban poverty stands at 46.1 percent, rural poverty at 65.5 percent, and nomadic poverty at 78.4 percent.

A study of school attendance disruption in Somaliland found that children in nomadic areas faced significantly higher odds of exclusion from education compared to urban and rural children, with urban residence associated with 47per cent lower odds of non-attendance [10]. These finding underscores spatial inequalities in access to services, which ultimately shape household welfare outcomes.

2.5 Remittances and Household Welfare

Remittances represent a critical component of household welfare in Somalia, one of the world's most remittance-dependent countries. [11], found that remittances increase household welfare by 2 percent and reduce poverty by 4 percent, with evidence of a "crowding-in" effect where remittance-receiving households invest in productive activities. [12], using ARDL modelling on time-series data from Benin, found that remittances have a positive short-run relationship with household expenditure but no significant long-run relationship. The SIHBS [3] shows that one in five Somali households (20.7 percent) received remittances in the 12 months preceding the survey.

2.6 Critical Research Gaps

This study addresses gaps in the literature by employing multivariate analysis of the SIHBS 2022 with log real per capita household expenditure as the dependent variable. By examining the simultaneous effects of household head sex, marital status, education, household size, residence area, and remittances, this research provides a comprehensive understanding of welfare determinants in the Somali context.

3 Methodology

3.1 Conceptual Framework

The study aims to assess the socioeconomic and demographic factors influencing household welfare in Somalia using SIHBS 2022 data. The conceptual framework posits that household welfare is determined by:

- Household head characteristics (age, sex, education)
- Household composition (size, marital status)
- Geographic location (urban, rural, nomadic)
- Economic factors (remittances, housing tenure)

3.2 Model Specification:

To address the inherent right-skewness of expenditure data, a log-linear regression model was specified. The dependent variable, log real per capita expenditure, represents the natural logarithm of real per capita household expenditure. The model is expressed as:

$$\ln(Real\ per\ capita\ household\ expenditure) = \beta_0 + \beta_1 Sex_i + \beta_2 + Marital_i + \beta_3 + HH\ Size_i + \beta_4 Education_i + \beta_5 Ownershop_i + \beta_6 \text{EA Type}_i + \varepsilon$$

i. Null Hypothesis H_{01}

$$\beta_1, = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0 \quad \rightarrow \quad (No\ significant\ association\ with\ welfare)$$

ii. Alternative Hypothesis H_{11}

$$\beta_i \neq 0, \qquad for\ i \in \{1,2,3,4,5,6\}\ and\ expected\ signs:$$

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 > 0$$

$$or$$

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 < 0$$

iii. OLS estimator:

$$\hat{\beta} = (x'x)^{-1}xy$$

$$\hat{\sigma}^2 = \frac{SSR}{n-k-1} = \frac{\left(y - x\hat{\beta}\right)'\left(y - x\hat{\beta}\right)}{n-k-1}$$

iv. Variance:

$$var(\hat{\beta}) = \hat{\sigma}^2(x'x)^{-1} \quad \rightarrow \quad \widehat{var}(\hat{\beta}) = \hat{\sigma}^2(x'x)^{-1}$$

3.2.1 Post-Estimation Diagnostics

i. Heteroskedasticity

This test checks if the variance of the error term is constant across all levels of the independent variables.

The Breusch-Pagan/Cook-Weisberg test was utilized to test for constant variance (σ^2) in the residuals. The test models squared residuals $\hat{u}^2$ as a function of the predictors:

$$\hat{u}^2 = \delta_0 + \delta_1 X + \cdots + \delta_k X_k + v$$

The null hypothesis (H_o) assumes homoskedasticity (H_0: $\delta_1 = \cdots = \delta_k = 0$), which is constant variance.

ii. Multicollinearity of Variance Inflation Factor (VIF)

The degree of correlation between independent variables was assessed using the **Variance Inflation Factor (VIF)**. In addition, VIF measures how much the variance of an estimated regression coefficient is increased because of collinearity.

- **Mathematical Notation:** The VIF for each variable j is calculated as:

$$VIF_j = \frac{1}{1 - R_j^2}$$

where R_j^2 is the coefficient of determination of that sub-regression.

A VIF of 1 indicates no correlation. Usually, a VIF > 10 (or sometimes > 5) suggests problematic multicollinearity.

iii. Robust Estimation and Inference

To correct for potential heteroskedasticity and influential outliers identified during diagnostics, the final model was estimated using Robust HC3 standard errors. The HC3 estimator is a jackknife-based adjustment to the variance-covariance matrix, providing more conservative and reliable p-values for inference:

$$\hat{V}_{HC3} = (X'X)^{-1}X'diag\left(\frac{u_i^2}{(1-h_{ii})^2}\right)X(X'X)^{-1}$$

where h_{ii} represents the diagonal elements of the hat matrix. All findings were evaluated at the 1per cent, 5per cent, and 10per cent significance levels.

3.3 Data and Sample

The SIHBS 2022 initially surveyed 7,095 households. After removing observations with missing values for key variables (household expenditure, head characteristics, etc.), the final analytical sample comprised 6,808 households. Missing data were handled through listwise deletion, which is appropriate given the relatively small proportion of missing observations and the large sample size.

4. Empirical Results

4.1. Ordinary Least Square Result

Table 1: Determinants of Household Welfare (Log Real Per Capita expenditure), OLS Estimates with HC3 Robust Standard Errors

log_real_p~e	Coefficient	Robust HC3 std. err.	t	P>|t|	[95per cent conf. interval]	
Household Head characteristics						
Male	-.0556251	.0155388	-3.58	0.000	-.086086	-.0251641
Age	.003421	.0005664	6.04	0.000	.0023107	.0045313
Household Head Marital Status						
Divorced	-.0495627	.0258496	-1.92	0.055	-.1002359	.0011106
Never Married	.2393487	.0564361	4.24	0.000	.1287163	.3499811

Widowed	-.0537826	.0241174	-2.23	0.026	-.1010602	-.006505
Household Size						
HH size	-.0830626	.0029142	-28.50	0.000	-.0887754	-.0773497
Education						
Primary	.2521241	.0189512	13.30	0.000	.2149737	.2892745
Secondary	.3728419	.0266209	14.01	0.000	.3206565	.4250273
Higher education	.629457	.0316694	19.88	0.000	.567375	.691539
House Ownership						
Rent	.006544	.0163753	0.40	0.689	-.0255568	.0386448
Stay for free	-.1849128	.0178705	-10.35	0.000	-.2199445	-.149881
Residence Area						
Urban	.3066304	.0156634	19.58	0.000	.2759254	.3373355
Rural	-.3133175	.0230141	-13.61	0.000	-.3584324	-.2682025
Remittance						
Received	.1311469	.0157594	8.32	0.000	.1002535	.1620403
Remittance						
Constant	6.838408	.02981	229.40	0.000	6.779971	6.896845

Table 1 presents the results of the OLS regression examining the determinants of household welfare, proxied by log real per capita expenditure, using heteroskedasticity-robust (HC3) standard errors.

4.2. Interpretation of Result

Household Head Characteristics: Male-headed households have significantly lower per capita expenditure compared to female-headed households ($\beta = -0.0556$, $p < 0.01$), representing approximately 5.6 percent lower expenditure. Age has a positive association ($\beta = 0.0034$, $p < 0.01$), with each additional year increasing expenditure by 0.34 percent (Table 1).

Marital Status: Never-married household heads exhibit significantly higher welfare ($\beta = 0.2393$, $p < 0.01$), corresponding to 23.9 percent higher per capita expenditure. Widowed households have 5.4 percent lower expenditure than married counterparts.

Household Size: Each additional household member reduces per capita expenditure by 8.3 percent ($\beta = -0.0831$, $p < 0.01$), supporting the dilution hypothesis (Table 1).

Education: Education exhibits a strong monotonic positive effect. Primary education increases welfare by 25.2 percent, secondary by 37.3 percent, and higher education by 62.9 percent compared to no education (Table 1).

Housing Tenure: Households staying for free have 18.5 percent lower per capita expenditure than owner-occupiers ($\beta = -0.1849$, $p < 0.01$) (Table 1).

Residence Area: Urban households have 30.7 percent higher welfare, while rural households have 31.3 percent lower welfare, reflecting substantial spatial disparities (Table 1).

Remittances: Recipient households enjoy 13.1 percent higher per capita expenditure ($\beta = 0.1311$, $p < 0.01$), confirming remittances as an important welfare-enhancing mechanism (Table 1).

4.3. Diagnostic Test Results

4.3.1 Heteroskedasticity Test Results

Table 2: Breusch-Pagan/Cook-Weisberg Test for Heteroskedasticity

Test Statisticd	f	p-value
chi2 = 1.54	1	0.2152

The Breusch-Pagan/Cook-Weisberg test fails to reject the null hypothesis of constant variance ($p > 0.05$), indicating no evidence of heteroskedasticity in the model. The robust HC3 standard errors reported provide additional protection against any potential heteroskedasticity (Table 2).

4.4. Multicollinearity Diagnostics

Table 3. Variance Inflation Factor (VIF) Results

Variable	VIF	Tolerance (1/VIF)
Male Household Head	1.38	0.724
Age	1.37	0.730
Marital Status (Divorced)	1.14	0.874
Marital Status (Never Married)	1.03	0.968
Marital Status (Widowed)	1.45	0.692
Household Size	1.13	0.888
Education (Primary)	1.07	0.932
Education (Secondary)	1.09	0.915
Education (Higher)	1.10	0.909
Housing (Rent)	1.29	0.778
Housing (Stay for Free)	1.25	0.800
Residence Area (Urban)	1.42	0.706
Residence Area (Rural)	1.44	0.694
Remittance Receipt	1.09	0.914
Mean VIF	1.23	—

VIF values range from 1.03 to 1.45 with a mean of 1.23, well below critical thresholds of 5 or 10, indicating no concerning multicollinearity among explanatory variables (Table 3).

5. Discussion

The findings of this study align with and extend previous research on household welfare determinants in Somalia and similar contexts. The significant negative coefficient for male-headed households contrasts with some conventional expectations but is consistent with Mohamoud and Bulut's finding that female-headed households in Somalia may employ different coping strategies or receive different forms of support.

The strong positive association between education and welfare corroborates the findings of Hassan et al. and underscores the critical role of human capital development in poverty reduction strategies. The monotonic increase in welfare with each education level suggests that investments in education at all levels yield significant returns for household welfare.

The substantial negative effect of household size on per capita expenditure (8.3 percent per additional member) supports the findings of Hammond et al. regarding the importance of demographic factors in welfare outcomes. This finding has important implications for family planning and social protection policies.

The spatial disparities revealed in this study, with urban households enjoying 30.7 percent higher welfare and rural households experiencing 31.3 percent lower welfare, are consistent with the poverty estimates reported in the SIHBS and Somalia MPI. These disparities highlight the need for targeted interventions addressing the specific constraints faced by rural and nomadic populations.

The positive effect of remittances (13.1 percent higher per capita expenditure) confirms the importance of this income source for Somali households, as documented in the SIHBS. This finding aligns with Nanziri and Mwale's evidence of remittances as a welfare-enhancing mechanism and suggests that policies facilitating remittance flows could contribute to poverty reduction.

6. Conclusion and Policy Implications

This study examined the determinants of household welfare in Somalia using multivariate analysis of the SIHBS 2022. The results demonstrate that education, urbanization, and remittances significantly enhance household welfare, while larger household sizes and rural or nomadic residency are associated with lower per capita expenditure.

Based on these findings, several policy implications emerge:

I. **Invest in education:** The strong relationship between education and welfare suggests that expanding access to education at all levels should be a priority for poverty reduction strategies.

II. **Address spatial disparities:** Targeted interventions are needed to address the substantial welfare gaps between urban, rural, and nomadic populations, including improved infrastructure and service delivery in underserved areas.

III. **Facilitate remittance flows:** Policies that reduce transaction costs and encourage productive use of remittances could enhance their welfare impact.

IV. **Enhance child welfare and family support systems:** In line with Islamic principles of caring for children and the vulnerable, government programs should prioritize support for households with many dependents. Investments in education, healthcare, and food security for children can help ensure that household size does not become a barrier to children's well-being and future opportunities.

V. **Strengthen housing policies:** The lower welfare of households staying for free suggests that housing tenure security and affordability merit policy attention.

Future research should explore the mechanisms underlying these relationships using longitudinal data and examine heterogeneity in welfare determinants across different population subgroups.

7. Reference

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