



SUDAN

SUDAN STRATEGY SUPPORT PROGRAM WORKING PAPER 21

DECEMBER 2024

Income, Employment, Transfers, and Household Welfare Dynamics Before and During the Conflict in Sudan

Mosab Ahmed, Oliver K. Kirui, Alemayehu S. Taffesse, Mariam Raouf, Hala Abushama, and Khalid Siddig

CONTENTS

- Abstract iv
- 1) Introduction 1
- 2) Literature Review 3
- 3) Data and Methodology 5
 - 3.1 Data 5
 - 3.1.1 Sudan Labor Market Panel Survey 2022 5
 - 3.1.2 Sudan Rural Household Survey 2023..... 6
 - 3.1.3 Sudan Urban Household Survey 2024 6
 - 3.2 Analytical approach..... 7
 - 3.2.1 Effect of conflict on employment and changes in income..... 7
 - 3.2.2 Effect of remittances and assistance on food insecurity and food consumption ... 8
- 4) Results and Discussions 9
 - 4.1 Descriptive statistics of key variables 9
 - 4.2 Regression results and discussion.....11
 - 4.2.1 Effect of conflict on employment loss.....11
 - 4.2.2 Effect of assistance and remittances on food insecurity and food consumption ..15
- 5) Conclusion and Implications22
- References.....24
- About the Authors.....26
- Acknowledgments26

TABLES

Table 3.1 Summary of survey data used 5

Table 4.1 Descriptive statistics for key variables for households10

Table 4.2 Effect of conflict on employment loss for urban households, marginal effects, 2024
SUHS, logistic regression..... 12

Table 4.3 Effect of conflict on employment and changes in income for rural households, 2023
SRHS 14

Table 4.4 Effect of conflict on employment for all households, 2022 SLMPS 15

Table 4.5 Effect of assistance on the food insecurity and food consumption of urban
households, 2024 SUHS 17

Table 4.6 Effect of assistance on the food insecurity and food consumption of rural
households, SRHS (2023)..... 18

Table 4.7 Effect of assistance on the food insecurity of all households, SLMPS (2022)..... 19

Table 4.8 Effect of remittances on the food insecurity and food consumption of urban
households, SUHS (2024)..... 20

Table 4.9 Effect of remittances on the food insecurity and food consumption of rural
households, SRHS (2023)..... 21

Table 4.10 Effect of remittances on the food insecurity of all households, SLMPS (2022) 22

ABSTRACT

This study examines the impact in Sudan of conflict on employment and incomes and the effect of remittances and assistance received by a household on its food insecurity and food consumption. The analyses use data from the 2022 Sudan Labor Market Panel Survey (SLMPS), the 2023 Sudan Rural Household Survey (SRHS), and the 2024 Sudan Urban Household Survey (SUHS). Conflict is found to significantly increase the likelihood of employment and income loss, particularly among female-headed and displaced households. Receipt of remittances does not have a significant effect on the food security or food consumption of a household. In contrast, whether a household receives assistance is associated with higher food insecurity and lower food consumption, likely reflecting the targeting of assistance programs toward vulnerable households. However, due to the cross-sectional nature of the data, causal relationships cannot be established. The results highlight the need for targeted interventions to support the food security and welfare of households affected by the current conflict in Sudan, particularly through efforts to stabilize employment and incomes.

Keywords: Conflict impact, employment, income, food insecurity, remittances, assistance.

1) INTRODUCTION

Sudan has been embroiled in a high-intensity conflict between the Sudanese Armed Forces (SAF) and Rapid Support Forces (RSF) since April 2023, leading to widespread displacement and an escalating humanitarian crisis. While Sudan has experienced multiple conflicts in the past, the current crisis is unprecedented in both scale and impact due to its predominantly urban focus. Previous conflicts were largely concentrated in rural and peripheral regions. In contrast, this conflict has been centered on the capital, Khartoum—an economic hub that generates nearly one-third of the country's GDP. The conflict has caused severe disruption to vital infrastructure, services, and economic activities, compounding the hardship for households that depend on the capital's resources. The economic ripple effects of the conflict have been far-reaching across the country, with consequences that threaten both national stability and household welfare (Guo et al. 2023).

Sudan entered this conflict already burdened by a deeply fragile economy. Even before the outbreak of violence, the nation was grappling with widespread poverty, with the national headcount poverty rate standing at 61 percent. Rural areas faced even higher levels of deprivation, with 68 percent of the population living in poverty compared to 49 percent in urban centers (World Bank 2021). Khartoum and West Darfur, both of which now serve as epicenters of the current conflict, had acute levels of income inequality, with Gini coefficients surpassing the national average. The conflict has intensified these disparities, exacerbating the vulnerability of both urban and rural households. As the ongoing violence continues to disrupt livelihoods, the social and economic fabric of these regions is unraveling, deepening a dire humanitarian crisis.

The conflict has devastated economic activities, employment, and incomes across the entire country. As key economic centers, including Khartoum, Darfur, Kordofan, and many parts of the central region, remain engulfed in violence, agriculture, trade, manufacturing, and services have all been severely disrupted. Destruction of infrastructure, combined with the displacement of large portions of the population, has shrunk production and crippled market operations (Abushama et al. 2023; Kirui et al. 2023a; Guo et al. 2023). Agricultural activities, the principal livelihood for most rural households, have also been severely affected. The access of farming households to finance and essential inputs has been sharply restricted due to the conflict (Kirui et al. 2023b). This has reduced food production, which has exacerbated food insecurity for both rural and urban households (IFPRI & WFP 2024; IPC 2024).

Furthermore, widespread job losses have intensified unemployment, pushing many households into poverty (IFPRI & UNDP 2024a; IFPRI & UNDP 2024b). As a result, many families have become increasingly dependent on remittances and humanitarian aid to meet their basic needs (IFPRI & UNDP 2024a; IFPRI & UNDP 2024b). The conflict's economic toll has deepened the vulnerability of Sudanese households, threatening their long-term economic stability and welfare and complicating recovery efforts.

The International Monetary Fund estimated that Sudan's GDP shrank by 18.3 percent in 2023 due to the conflict. If the conflict ended in 2024, the IMF expected a modest 0.3 percent recovery (IMF 2023). However, the conflict continued through 2024, so a continued slide in the size of the national economy has likely occurred. This economic contraction has been accompanied by a sharp rise in unemployment—estimated to have increased from 32 percent of all workers in 2022 to 46 percent in 2023 as a direct result of the conflict.

Siddig et al. (2023) further highlighted that household incomes declined dramatically, with national income levels dropping nearly 50 percent by the end of 2023 relative to 2022. Urban households, especially in Khartoum, are disproportionately affected by the conflict, due to the destruction of urban housing and the loss of industrial jobs. Higher-income groups are shown to have experienced greater losses in the level of their incomes than lower-income households. Employment for trained workers—those with primary-level schooling or above—has been severely impacted. Labor income for such workers is estimated to have decreased by over 50 percent (Ahmed et al. 2024).

The IMF, in its updated October 2024 projections, estimates GDP declines of 18.3 percent in 2023 and an additional 20.3 percent in 2024, followed by potential recovery rates of 8.3 percent in 2025 and 13.5 percent in 2026 (IMF 2024). Similarly, updated statistics from the World Bank forecast significant contractions, with GDP shrinking by 20.1 percent in 2023 and 15.1 percent in 2024. The African Development Bank (AfDB) projects an even steeper contraction of 37.5 percent in 2023, followed by a slower decline of 5.9 percent in 2024 and marginal growth of 0.5 percent in 2025 (AfDB 2024). Sudan's Central Bureau of Statistics (CBS) reports a contraction of 29.4 percent in 2023 and 12.7 percent in 2024, with modest recoveries of 1.7 percent in 2025 and 3.0 percent in 2026 (CBS 2024). These projections emphasize the severe and prolonged economic toll of the conflict, underscoring the deep structural challenges Sudan faces, even as hopes for recovery in the medium term remain.

Remittances and transfers can play an important role in mitigating the economic impacts of conflict by providing a lifeline for affected households. In the face of income losses, falling employment, and rising prices, these financial inflows help stabilize household consumption and maintain access to essential goods and services, particularly food. For many families, such transfers, whether from family members abroad or humanitarian aid, act as a buffer that prevents them from slipping into extreme poverty and deep economic hardship.

By investigating how the conflict has impacted household earnings and employment patterns, the study provides insight into the ways the current conflict in Sudan has disrupted livelihoods. Moreover, exploring the role of remittances and transfers is critical in assessing how these external support mechanisms contribute to stabilizing household food consumption and food security and sustaining households during crises. By examining the differential impact of transfers across various household types, the study offers insights into whether and, if so, how vulnerable populations rely on these inflows to cushion themselves against the economic shocks brought about by the conflict. Policymakers and humanitarian organizations require such understanding to formulate interventions that can better support conflict-affected households and improve their resilience in the face of ongoing economic instability.

This paper is structured as follows: The next section, section 2, provides a theoretically informed perspective on the impact of conflict on household welfare. Section 3 details the data sources and methodologies used to assess the conflict's impact on household earnings and employment and the role of transfers on household food security in Sudan. Section 4 applies econometric models to evaluate the conflict's effects on household income and employment, along with the mitigating role of remittances and other transfers on the food shocks households face. Drawing from the findings of the analyses, the final section presents policy recommendations to strengthen household resilience in conflict-affected regions.

2) LITERATURE REVIEW

Numerous studies indicate that protracted civil conflicts lead to both immediate and enduring adverse effects, especially concerning elevated unemployment rates, as many displaced persons lose their employment. Hamilton (2010) examined the influence of unemployment on civil conflict across 184 countries, focusing specifically on ethnically diverse nations, and found that increasing unemployment rates correlate with the emergence of civil conflicts. Kecmanovic (2013) evaluated the impacts of the Croatian war on unemployment, education, and income levels of men born in 1971, finding that conflict was inversely correlated with education, while positively correlated with unemployment rate and income.

Galdo (2013) examined the impact of armed wars during the childhood of workers on the Peruvian labor market, utilizing data from 1980 to 1995. The author found that the initial 36 months of life represented the most susceptible phase for exposure to civil war impacting later income for workers. Each standard deviation increases in exposure to conflict at this young age correlated to a 5 percent reduction in adult monthly earnings, a notable decline in the recruitment of female job seekers, and a 6 percent decrease in the likelihood of men securing employment in large corporations. Mboutchouang et al. (2020) found that exposure in childhood to conflict adversely affected the outcomes for those individuals in both elementary education and the job market over the long term. Specifically for Sierra Leone, the long-term consequences of war reduced labor market participation by 3 percent.

This finding was confirmed by Hameed et al. (2023), who incorporated other explanatory variables to evaluate the short- and long-term impacts of war on unemployment in Afghanistan. They established that civil conflict frequently results in elevated unemployment rates, both in the short and long term, stem. Civil conflict predominantly impacts the workforce and its active engagement in a distressed economy. Conflict disrupts the equilibrium of labor demand and supply in an economy, causing the supply (demand) curves to shift upward (downward), which leads to an oversupply of labor and a significantly elevated unemployment rate. The immediate effects of war-induced unemployment may be a reduction in per capita real income and overall consumption, both of which can be alleviated by effective interventions. The authors estimate that an increase in war expenditures, serving as a proxy for civil conflict, elevates the unemployment rate in both the short term and the long term, with unemployment rising over time (Hameed et al. 2023).

Di Maio and Sciabolazza (2023) examine the impact of individual-level war exposure on several labor market outcomes for Palestinians in the Gaza Strip. The study reveals that, although conflict exposure does not significantly affect overall employment status, it influences job transitions differently based on whether individuals are employed in the private or public sector. In the private sector, heightened exposure to conflict diminishes labor income and reduces working hours. Conversely, public sector personnel see no reduction in salary or working hours and may even receive salary increases. Moreover, heightened exposure to conflict correlates with diminished labor income, predominantly impacting private-sector employees. The loss in income is attributed to a reduction in hours worked rather than a decline in wages. Public sector employees, however, enjoy consistent labor income owing to slight wage increases despite some reduction in hours worked. The data analysis indicates that the adverse effects of conflict on labor market outcomes are propelled by conflict-induced alterations in workers' health, impacting labor supply, alongside alterations in local economic activity, which affects labor demand.

Research has underscored the necessity of formulating government strategies to alleviate the detrimental effects of civil conflicts on employment. Rabiile (2010) examined the impact of civil wars on unemployment rates in Mogadishu, Somalia, and found a significant correlation. The author then evaluated the efficacy of the Somali government's measures aimed at enhancing job development in a war-impacted economy. To mitigate unemployment in Mogadishu, policy modifications to promote foreign investment and to attract viable international enterprises were found to be crucial.

Various analytical approaches have been employed to assess the effect of civil wars on employment outcomes. For instance, Hamilton (2010) employed logit regression models, whereas Kecmanovic's (2013) study in Croatia chose a Difference in Difference (DiD) method to contrast findings from Croatia with those of Slovenia, which did not endure conflict. Mansoor (2021) utilized logit regression models to examine the impact of conflict and the youth bulge on overall labor market failure in Afghanistan. The author utilized secondary datasets obtained from a nationally representative household survey and enhanced the study variables with age, marital status, educational level, educational achievement, sector-specific employment, and perceptions of insecurity. Di Maio and Sciabolazza (2023), for their study in Gaza, integrated longitudinal employment data with geolocated conflict-related events, employing data from a socioeconomic and food security survey, which offered comprehensive details on individual and household characteristics alongside data on conflict and on Palestinian fatalities. Hameed et al. (2023), for their study of conflict and unemployment in Afghanistan, utilized a non-linear autoregressive distributed lags model and an asymmetric causation approach, with the unemployment rate as the dependent variable.

Remittances can be important for national economic stability during conflicts, serving as the primary source of foreign currency necessary for funding imports and balancing payments. The ACAPS Analysis Hub (2021) examined the influence of remittances on Yemen's economy, especially amid the ongoing conflict and the COVID-19 pandemic. Yemeni households have increasingly relied on remittances to navigate socioeconomic difficulties, including currency devaluation, inflation, loss of income, and escalating unemployment. The research found that remittances served as a vital income source for numerous Yemeni households, offering financial assistance that enables them to navigate economic challenges, such as food poverty and inflation. However, remittance flows to Yemen are susceptible to internal and external shocks, with differing effects noted depending on the location of Yemeni migrant workers.

Remittances also facilitate consumption stability in households and provide them with insurance against economic shocks. Fransen and Mazzucato (2014) examined the impact of remittances and household wealth post-conflict in Burundi. Affluent, highly educated urban households were more likely to receive remittances, especially from the extensive Burundian diaspora in Europe and North America. The remittances significantly impacted non-productive assets, notably enhancing household living conditions and food security, while exerting minimal influence on productive assets like asset ownership and education. For poor households in Burundi, the remittances were found to serve as a form of insurance, enabling urgent necessities, such as food and housing, to be addressed but failing to create long-term wealth.

However, Ghorpade (2017), in a study in Pakistan, found that prolonged exposure to intense violence diminishes both the probability of households obtaining remittances and the average

remittance value. A macro-micro gap was identified in Ghorpade’s analysis of data on remittances, revealing substantial discrepancy between macro-level data that demonstrate positive correlations between conflict and remittances, and micro-level evidence. This pattern suggests that conflict may diminish remittances at the household level. Moreover, the impact of remittances varied within economic categories—for instance, households in the lowest food consumption quintile were more likely to receive remittances during conflict, indicating that remittances escalate in reaction to significant economic distress. This finding does not rule out the importance of complementary policies by the government, because remittances alone cannot address all the economic challenges faced by households in conflict-affected areas. It would be wise for governments to complement remittance inflows with social protection programs, especially for the poorest households.

3) DATA AND METHODOLOGY

3.1 Data

This section describes the three primary datasets used to assess the effects of conflict on households’ employment and incomes and the role of transfers and remittances on the food security and welfare of households in Sudan during both the pre-conflict period and the current conflict. These are the 2022 Sudan Labor Market Panel Survey (SLMPS), the 2023 Sudan Rural Household Survey (SRHS), and the 2024 Sudan Urban Household Survey (SUHS) (Table 3.1). Each contributes unique data and permits the application of methodologies essential for quantitatively analyzing the impact of ongoing conflict on Sudanese households. Although survey differences prevent direct comparisons between the pre-conflict period with the 2022 SLMPS and during the conflict period with the 2023 SRHS and 2024 SUHS, each dataset provides insights for comprehensive analysis.

Table 3.1 Summary of survey data used

Survey	Sudan Labor Market Panel Survey (SLMPS)	Sudan Rural Household Survey (SRHS)	Sudan Urban Household Survey (SUHS)
Coverage	Nationwide	Rural areas nationwide	Urban centers nationwide
Conflict context	Low-level generalized conflict; before the start of intense SAF/RSF conflict in April 2023	During SAF/RSF conflict	During SAF/RSF conflict
Sample unit	Household and individual	Household	Household
Sample	4,878 households; 25,442 individuals	4,505 households	3,000 households
Urban / Rural	Both rural and urban	Rural	Urban
Data collection modality	In-person	Computer-assisted telephone interviewing	Computer-assisted telephone interviewing
Data collection period	June–September 2022	November 2023—January 2024	May–July 2024

Source: Authors’ compilation based on Krafft et al. (2023); Kirui et al (2024); IFPRI & UNDP (2024b)

3.1.1 Sudan Labor Market Panel Survey 2022

SLMPS aimed to capture dimensions of labor market dynamics in Sudan. Conducted by the Economic Research Forum in collaboration with Sudan’s Central Bureau of Statistics, SLMPS was the first nationally representative labor market survey conducted in Sudan since 2014. It sampled both households and individuals across the country with a focus on capturing employment, earnings, migration, and socioeconomic conditions. A key feature of the survey was its oversampling of vulnerable populations, including refugees and internally

displaced persons, which provides data for analyzing labor market disparities in fragile settings (Krafft et al., 2023).

SLMPS includes modules covering labor market transitions, employment history, non-agricultural enterprises, agricultural assets, shocks, and coping strategies, among others. It was designed to serve as a baseline for a longitudinal panel database. SLMPS 2022 was the first wave for the database. Further waves will allow for the tracking of changes in labor market outcomes. Fieldwork for the SLMPS 2022 was conducted between June and September 2022, following a delay due to political unrest and economic instability in Sudan. Despite these challenges, the survey was completed by September 2022, providing crucial pre-conflict labor market data (Krafft et al., 2023).

3.1.2 Sudan Rural Household Survey 2023

SRHS 2023 was conducted by the International Food Policy Research Institute (IFPRI), in collaboration with the United Nations Development Program (UNDP) and the World Food Programme (WFP). Respondents were interviewed between 09 November 2023 and 05 January 2024, about six months after the onset of the conflict in April 2023. This survey provided the first nationwide data on rural households following the eruption of conflict.

It utilized a sample of 4,504 households from whom data were collected using computer-assisted telephone interviewing methods to overcome the challenges of in-person data collection in conflict zones. Challenges such as network outages and non-responses were mitigated through extended survey periods and multiple call attempts. While reliance on a phone-based survey introduces some bias—particularly underrepresentation of low-income households without telephones—the survey provided insights into the rural population's welfare during the conflict (IFPRI and UNDP 2024a; Kirui et al. 2024a; Kirui et al. 2024b).

SRHS 2023 covered various themes critical to understanding the impact of the conflict on rural livelihoods, such as food security, coping mechanisms, income, employment, and market access. This survey represents the first round of a planned rural household panel survey, designed to provide information on the evolving socioeconomic conditions of rural communities over time. The second round of the SRHS was conducted in the fourth quarter of 2024.

3.1.3 Sudan Urban Household Survey 2024

SUHS 2024, conducted by IFPRI and UNDP, focused on urban households, capturing the effects of the conflict in urban areas. Respondents were interviewed between May and July 2024, just over one year after the onset of the conflict. Like SRHS 2023, the SUHS 2024 was administered using computer-assisted telephone interviewing methods. The survey sampled 3,000 households across Sudan's urban centers, ensuring both national and state-level coverage (IFPRI & UNDP 2024b).

SUHS 2024 utilized a sampling frame developed from phone databases compiled by WFP, IFPRI, and a data collection company. As with SRHS 2023, the reliance on a phone-based survey introduced some bias. Nonetheless, insights were obtained into the urban population's welfare during the conflict (IFPRI and UNDP 2024b). Analysis of the urban household survey data also addressed key issues like food insecurity, coping strategies, and the socioeconomic impact of conflict on households.

3.2 Analytical approach

This section outlines the econometric methods used to examine the effects of conflict exposure on employment and income changes and the effects of assistance to households and remittances on food security outcomes among Sudanese households. The analysis is based on cross-sectional data collected from SLMPS 2022, SRHS 2023, and SUHS 2024. These surveys provide a wide range of information on labor market outcomes, household demographics, income, and food security in Sudan before and after the outbreak of conflict.

Given the nature of the dependent variables used, two regression models were employed: logistic regression for binary outcomes and ordinary least squares (OLS) regression for continuous outcomes like household income and Food Consumption Scores (FCS) during the conflict. The models are tailored to capture the unique effects of conflict exposure, displacement, and receipt of transfers on key household outcomes.

3.2.1 Effect of conflict on employment and changes in income

Logit model for binary outcomes: Logistic regression models were used for binary outcome variables, such as employment loss. The dependent variable in each model takes a value of one if the event occurs (e.g., lost employment) and 0 otherwise. The general form of the logit model is:

$$Pr(Y_i = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 Conflict_i + X_i \beta + \mu_i)}} \quad (1)$$

where:

- ◆ Y_i represents the binary outcome for household i .
- ◆ $Conflict_i$ is a binary variable equal to one if the household was affected by conflict and is zero otherwise.
- ◆ X_i is a vector of a set of control variables to account for key household characteristics. These include:
 - ▷ *Moved* is a binary variable that equals one if the household relocated after the conflict started.
 - ▷ *Market access* is a binary variable, is coded one if the household was able to access the nearest market.
 - ▷ *Male-headed household*, another binary variable, equals one if a male heads the household.
 - ▷ *Age of household head* and its squared transformation (*Age-squared*) capture the effect of the household head's age on the household outcomes considered.
 - ▷ *Agricultural sector* is coded one if the household head or primary income earner works in the agricultural sector.
 - ▷ Educational attainment of the household head is represented through three categorical dummy variables of *Low education*, *Medium education*, and *High education* levels. These categories are based on the highest level of education reported completed by the head of household. "Low" refers to those who completed or partially completed

primary education. “Medium” includes those who completed or partially completed vocational training or secondary school. “High” encompasses those with an undergraduate diploma, bachelor’s degree, or other higher degree. The base category is household heads who reported receiving no formal education.

- ▷ *Adequate housing* is coded one if the household lives in an adequate house.
- ▷ *Household size* is the number of household members.
- ▷ Regional heterogeneity is considered in some models by controlling for the state of residency of the household before the conflict started.

This set of controls allows for a comprehensive analysis of how household and individual characteristics influence key income, employment, and food security outcomes in the context of Sudan's ongoing conflict.

Ordinary least squares (OLS) regression for continuous outcomes: To assess the impact of conflict exposure on continuous outcomes, such as changes in household income after conflict, ordinary least squares (OLS) regression was applied. The OLS model assumes a linear relationship between the independent variables and the dependent variable.

The model is specified as:

$$Income_i = \alpha + \beta_1 Conflict_i + X_i \beta_2 + \mu_i \quad (2)$$

Where $Income_i$ represents the changes in income level of the household i after the conflict. X_i is a vector of the same set of control variables used with the logistic regression.

3.2.2 Effect of remittances and assistance on food insecurity and food consumption

To assess the effect of assistance to the household and remittances on food insecurity and food consumption, we run two different models depending on the nature of the outcome variables.

Logit model for binary outcomes: Logistic regression models were used to model a binary indicator of household food insecurity. The general form of the logit model is:

$$Pr(Y_i = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 Assistance_i + \beta_2 Conflict_i + \beta_3 Conflict * Assistance_i + X_i \beta + \mu_i)}} \quad (3)$$

$$Pr(Y_i = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 Remittances_i + \beta_2 Conflict_i + \beta_3 Conflict * Remittances_i + X_i \beta + \mu_i)}} \quad (4)$$

where;

- ◆ Y_i represents the binary (0/1) outcome for the food insecurity experienced for household i . This is based on the Food Insecurity Experience Scale (FIES) score for the household. The variable takes a value of one if the household is food secure—reporting two or fewer experiences of food insecurity—and zero if the household is moderately or severely food insecure—reporting more than two experiences of food insecurity
- ◆ $Assistances_i$ is a binary variable equal to one if the household received assistance.
- ◆ $Remittances_i$ is a binary variable equal to one if the household received remittances.

- ◆ X_i is a vector of the same set of control variables used with the logistic regression on the effect of conflict on employment.

Ordinary least squares (OLS) regression for continuous outcomes Ordinary least squares (OLS) regression was applied to assess the effect of transfers and remittances on household Food Consumption Scores (FCS), which are continuous. The OLS model assumes a linear relationship between the independent variables and the dependent variable.

The model is specified as:

$$FCS_i = \alpha + \beta_1 Assistance_i + \beta_2 Conflict_i + \beta_3 Conflict * Assistance_i + X_i\beta_4 + \mu_i \quad (5)$$

$$FCS_i = \alpha + \beta_1 Remittances_i + \beta_2 Conflict_i + \beta_3 Conflict * Remittances_i + X_i\beta_4 + \mu_i \quad (6)$$

Where the FCS_i variable represents the food consumption score of the household i . X_i is a vector of the same set of control variables used with the logistic regression.

4) RESULTS AND DISCUSSIONS

4.1 Descriptive statistics of key variables

Analysis of data from the SLMPS, SRHS, and SUHS surveys highlights the significant socioeconomic impacts of the ongoing conflict in Sudan on both rural and urban households, particularly in terms of income, employment, and the impact of external support on their food security. However, it is important to note that these surveys are not fully comparable due to differences in data collection methods. SLMPS was a comprehensive face-to-face survey, whereas the SRHS and SUHS were conducted via phone interviews. SRHS and SUHS may not adequately capture the effects of the conflict on the most disadvantaged populations—the poor without telephones, who are likely to be more vulnerable (Kirui et al, 2024a). However, SRHS and SUHS include some retrospective data on the households for the period before the start of the current conflict to allow comparisons in household conditions before and during the conflict.

In terms of monthly per capita and household incomes, a clear decline is observed in both rural and urban areas after the start of the conflict in both nominal and real terms (Table 4.1). Rural households saw their per capita income drop from 20,643 SDG before the conflict to 14,936 SDG after the conflict—a 28 percent reduction. Similarly, urban per capita income decreased from 46,370 SDG to 41,222 SDG, marking an 11 percent decline. The trend is mirrored in total household income, with rural households experiencing a 25 percent reduction and those in urban areas showing a 10 percent drop. This sharp decline highlights the detrimental economic impact of the conflict, particularly in rural areas.

Table 4.1 Descriptive statistics for key variables for households

Variable	SLMPS 2022			SRHS 2023			SUHS 2024		
	Rural	Urban	Difference	Pre-conflict	Conflict period	Difference	Pre-conflict	Conflict period	Difference
<i>Food Security (% of households)</i>									
Food Secure	45.97	54.25	-8.28***	-	27.44	-	-	20.72	-
Moderately Food Insecure	12.35	13.69	-1.34	-	39.62	-	-	33.33	-
Severely Food Insecure	41.68	32.06	9.62***	-	32.94	-	-	45.95	-
Food Consumption Score			-	-	50.98	-	-	68.88	-
Employment loss			-	-	15.10	-	-	16.53	-
Monthly per capita income ⁺ , nominal SDG	5,653	14,190	-8,537***	20,643	14,936	5,707***	46,370	41,222	5,148***
Monthly household income ⁺ , nominal SDG	23,014	51,578	-28,564***	17,130	127,661	43,637***	340,382	305,830	34,552***
Monthly per capita income, real SDG (2022)	100.0	100.0	-	365.2	264.2	-	326.8	290.5	-
Monthly household income, real SDG (2022)	100.0	100.0	-	744.3	554.7	-	659.9	593.0	-
Received remittances, %	10	9	0.0	-	-	-	-	-	-
Remittances as main income source, %	-	-	-	1	4	0.0***	3	14	-0.1***
Received any transfers, %	16	14	0.0	13	23	-0.1***	8	23	-0.2***
Affected by conflict, %	2	1	0.0		27	-		50	-
Affected by SAF/ RSF conflict, %	-	-	-		11	-		14	-
Lost employment, %	-	-	-		15	-		16	-
Moved due to ongoing conflict, %	-	-	-		24	-		36	-

Source: Authors' calculation based on SLMPS (2022), SRHS (2023) and SUHS (2024).

Significance of differences: *p<0.10, **p<0.05, ***p<0.01.

+ The income variable should be interpreted with caution because of the high preponderance of households reporting zero incomes in the two CATI surveys.

The conflict has resulted in the increased reliance of households on external assistance (transfers) and remittances. In rural areas, the percentage of households relying on remittances as their main source of income increased from 1 percent before the conflict to 4 percent during the conflict. In contrast, in urban areas this reliance surged from 3 to 14 percent of households. Similarly, the share of households receiving transfers increased notably after the conflict. In rural areas, this jumped from 13 to 23 percent, and in urban areas, from 8 to 23 percent. Furthermore, cash transfers in urban areas grew from 7 percent before the conflict to 18 percent after, indicating a shift toward external assistance as households grapple with economic challenges. These figures underscore the critical role that remittances and transfers have played in supporting households during the conflict. Such support has become an increasingly important source of income for households across Sudan.

However, the effects of the conflict in broad terms have been felt more severely in urban areas. Fifty percent of urban households reported that they were affected by the conflict, compared to 27 percent of rural households. Additionally, 36 percent of urban households reported having moved their residence due to the conflict, further reflecting the displacement caused by the ongoing fighting. The SAF/RSF conflict alone affected 11 percent of rural households and 14 percent of urban households, highlighting the widespread disruption associated with the current conflict across both rural and urban areas.

The ongoing conflict has resulted in significant income losses, increased unemployment, and a greater reliance on remittances and external transfers in both rural and urban areas.

However, the limitations of the data collection method—particularly the use of phone surveys during the conflict period, which likely excludes from the datasets more disadvantaged households without phone access—suggest that the actual impact of the conflict on the most vulnerable populations may be even greater than what the data captures. Urban areas, in particular, appear to be more heavily affected by displacement and income disruptions, underscoring the critical need for external support to mitigate the socioeconomic fallout caused by the conflict for urban households.

4.2 Regression results and discussion

4.2.1 Effect of conflict on employment loss

Table 4.2 presents the results of the logistic regression models assessing the relationship between conflict and employment loss for urban households. The models report marginal effects to provide interpretable measures of how conflict and other factors influence the probability of employment loss.

- ◆ Model 1 provides a simple specification, including only the effect of conflict on employment loss. The results indicate that being affected by conflict increases the probability of employment loss by 12.7 percentage points. This finding highlights the significant impact of the conflict on employment stability for urban households.
- ◆ Model 2 introduces two additional variables: a binary variable indicating whether the household moved and an interaction term between conflict and household movement. The results show that both conflict and movement independently increase the likelihood of employment loss. Interestingly, the interaction term between conflict and movement reveals a mitigating effect that reduces the probability of employment loss.
- ◆ Model 3 incorporates a set of control variables, including access to markets, the sex and age of the household head, whether employment was in the agricultural sector, educational attainment level of the household head, housing adequacy, and household size. Despite controlling for these factors, the effect of conflict on employment loss remains positive and statistically significant, reinforcing the robustness of this relationship.
- ◆ Model 4 incorporates state-level fixed effects to account for unobserved heterogeneity across states that might influence employment loss. Conflict continues to have a positive and significant effect on the probability of urban households experiencing loss in employment, underscoring its pervasive impact across diverse contexts.
- ◆ Model 5 clusters the standard errors at the locality level to address potential intra-cluster correlations in the household survey data. The positive and significant effect of conflict on employment loss persists, suggesting that localized factors do not drive the relationship, and the results are robust to clustering adjustments.
- ◆ Model 6 narrows the focus to the ongoing SAF/RSF conflict by replacing the generalized conflict variable with a conflict variable specific to this ongoing intense conflict. This model includes control variables and state-level fixed effects. The results indicate a positive and significant effect of the SAF/RSF conflict on employment loss, highlighting the specific disruption caused by this conflict.

- ◆ Model 7 further adjusts for locality-level clustering of standard errors while using the SAF/RSF conflict variable. Even with this adjustment, the positive and significant relationship between conflict and employment loss remains.

Table 4.2 Effect of conflict on employment loss for urban households, marginal effects, 2024 SUHS, logistic regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All conflict	0.127***	0.131***	0.119***	0.076***	0.076***		
	(0.0139)	(0.0193)	(0.0183)	(0.0188)	(0.0233)		
SAF / RSF conflict						0.059***	0.059***
						(0.0160)	(0.0140)
Moved		0.132***	0.097***	0.099***	0.099***	0.072***	0.072***
		(0.0229)	(0.0217)	(0.0212)	(0.0229)	(0.0191)	(0.0189)
Conflict * Moved		-0.055*	-0.047*	-0.008	-0.008	0.051***	0.051**
		(0.0282)	(0.0268)	(0.0263)	(0.0327)	(0.0194)	(0.0223)
Market access			-0.138***	-0.108***	-0.108***	-0.105***	-0.105***
			(0.0149)	(0.0148)	(0.0144)	(0.0149)	(0.0155)
Male-headed HH			-0.144***	-0.137***	-0.137***	-0.145***	-0.145***
			(0.0326)	(0.0311)	(0.0374)	(0.0315)	(0.0385)
Age of HH head			-0.002	-0.000	-0.000	-5.94e-05	-5.94e-05
			(0.0035)	(0.0034)	(0.0033)	(0.0034)	(0.0033)
Age-squared			7.01e-05*	5.08e-05	5.08e-05	4.65e-05	4.65e-05
			(3.60e-05)	(3.45e-05)	(3.39e-05)	(3.44e-05)	(3.39e-05)
Agricultural sector			-0.048**	-0.030	-0.030	-0.034	-0.034
			(0.0239)	(0.0231)	(0.0261)	(0.0230)	(0.0270)
Low education			0.017	-0.002	-0.002	-0.007	-0.007
			(0.0251)	(0.0275)	(0.0269)	(0.0275)	(0.0271)
Medium education			0.031	0.010	0.010	0.008	0.008
			(0.0216)	(0.0242)	(0.0250)	(0.0245)	(0.0258)
High education			0.099***	0.061**	0.061**	0.058**	0.058**
			(0.0232)	(0.0257)	(0.0253)	(0.0259)	(0.0253)
Adequate housing			-0.017	-0.052***	-0.052***	-0.055***	-0.055***
			(0.0132)	(0.0135)	(0.0093)	(0.0134)	(0.0091)
Household size			-0.003	-0.0005	-0.0005	7.89e-05	7.89e-05
			(0.0016)	(0.0015)	(0.0017)	(0.0015)	(0.0017)
States fixed effect	No	No	No	Yes	Yes	Yes	Yes
Cluster fixed effect	No	No	No	No	Locality	No	Locality
LR Chi-squared	86.6	140.3	358.2	500.3	752.3	497.0	770.0
Prob > Chi-squared	0.0000						
Pseudo R-squared	0.0322	0.0521	0.1331	0.1859	0.1859	0.1847	0.1847

Sources: Authors' calculation based on SUHS (2024).

Note: Observations: 3,000 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Overall, the findings consistently demonstrate that conflict, whether generalized or specific to the SAF/RSF context, significantly increases the probability of employment loss. These results hold across various model specifications, control sets, and clustering adjustments, suggesting a profound and persistent impact of conflict on employment dynamics.

Beyond conflict, several variables consistently emerge as significant predictors of employment loss across the models.

- ◆ Improved market access significantly reduces the probability of employment loss, as households with better access to markets are less likely to experience employment disruptions.
- ◆ The sex of the household head also plays a significant role, with male-headed households being less likely to experience employment loss compared to female-headed households. This finding suggests that female-headed households may be more vulnerable to the disruptive effects of conflict, likely due to pre-existing structural inequalities in labor market participation and employment security.
- ◆ Interestingly, households where the head has a high level of education are more likely to experience employment loss compared to those with no education. This counterintuitive result may be explained by greater reliance on formal employment among more educated households.
- ◆ Finally, adequate housing emerges as a protective factor, with households living in adequate housing being less likely to experience employment loss. This finding underscores the stabilizing role of housing in mitigating economic shocks, as housing adequacy is often associated with better access to resources and opportunities.

Together, these results demonstrate that, while conflict remains a major driver of employment loss, structural factors, such as market access, sex and educational level of the household head, and housing conditions, also play critical roles.

Table 4.33 presents results from analyses of the effect of the conflict on employment using the 2023 SRHS dataset for rural households. This dataset, collected six months after the start of the SAF/RSF conflict, reflects the immediate economic impact of the conflict. The findings show that conflict significantly increases the likelihood of employment loss for rural households in most specifications.

Table 4.3 Effect of conflict on employment and changes in income for rural households, 2023 SRHS

	(1)	(2)	(3)	(4)
	Employment loss (logistic)			
All conflict	0.0453*** (0.0139)	0.0453** (0.0213)		
SAF / RSF conflict			0.0186 (0.0153)	0.0186 (0.0267)
Moved	0.0697*** (0.0146)	0.0697*** (0.0211)	0.0596*** (0.0142)	0.0596*** (0.0206)
Conflict * Moved	-0.00189 (0.0221)	-0.00189 (0.0317)	0.0352* (0.0186)	0.0352 (0.0264)
Market access	-0.054*** (0.0110)	-0.054*** (0.0151)	-0.056*** (0.0110)	-0.056*** (0.0152)
Male-headed HH	-0.024* (0.0139)	-0.024* (0.0128)	-0.024* (0.0139)	-0.024* (0.0128)
Age of HH head	0.0048** (0.0022)	0.0048 (0.0033)	0.0048** (0.0023)	0.0048 (0.0033)
Age-squared	-4.72e-05* (2.70e-05)	-4.72e-05 (3.88e-05)	-4.81e-05* (2.71e-05)	-4.81e-05 (3.92e-05)
HH head responded	0.016 (0.0145)	0.016 (0.0200)	0.016 (0.0145)	0.016 (0.0198)
Agricultural sector	-0.033*** (0.0125)	-0.033* (0.0172)	-0.034*** (0.0125)	-0.034** (0.0170)
Low education	0.028* (0.0165)	0.028 (0.0213)	0.027 (0.0165)	0.027 (0.0210)
Medium education	0.065*** (0.0175)	0.065*** (0.0171)	0.065*** (0.0175)	0.065*** (0.0173)
High education	0.126*** (0.0218)	0.126*** (0.0217)	0.128*** (0.0220)	0.128*** (0.0210)
Adequate housing	0.002 (0.0118)	0.002 (0.0121)	0.002 (0.0118)	0.002 (0.0127)
Household size	0.000 (0.0009)	0.000 (0.0010)	0.000 (0.0009)	0.000 (0.0011)
Constant				
State fixed effect	Yes	Yes	Yes	Yes
Cluster fixed effect	No	Locality	No	Locality
LR Chi-squared	464.08	668.75	455.16	699.20
Prob > Chi-squared	0.0000	0.0000	0.0000	0.0000
Pseudo R-squared	0.1219	0.1219	0.1196	0.1196
F				
Prob > F				
R-squared				
Adj R-squared				
Observations	4,485	4,485	4,485	4,485

Sources: Authors' calculation based on SRHS (2023).

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4.4 shows the results from the analysis of the 2022 SLMPS dataset for both rural and urban households from before the SAF/RSF conflict. The dataset captures the influence of low-intensity conflicts rather than the ongoing acute SAF/RSF conflict. As a result, conflict does not exhibit a significant effect on either employment loss or income in these models. This divergence underscores the limited scope and lower severity of earlier conflicts compared to the widespread and intense disruptions caused by the SAF/RSF conflict.

Table 4.4 Effect of conflict on employment for all households, 2022 SLMPS

	(1)	(2)
	Employment loss (logistic)	
Conflict	0.024 (0.0933)	0.024 (0.120)
Moved	-0.041*** (0.0153)	-0.041** (0.020)
Conflict * Moved	0.230** (0.107)	0.230* (0.133)
Market access	-0.032** (0.0158)	-0.032 (0.029)
Male-headed household	0.031** (0.0148)	0.031** (0.015)
Age of household head	0.004* (0.0021)	0.004* (0.002)
Age-squared	-2.66e-05 (1.97e-05)	-2.66e-05 (2.06e-05)
Agricultural sector	-0.135*** (0.0192)	-0.135*** (0.023)
Low education	-0.017 (0.0143)	-0.017 (0.015)
Medium education	-0.053** (0.0210)	-0.053** (0.022)
High education	-0.026 (0.0256)	-0.026 (0.030)
Adequate housing	-0.024 (0.0149)	-0.024 (0.017)
Household size	0.001 (0.0026)	0.001 (0.002)
Urban household	-0.010 (0.0135)	-0.010 (0.014)
State fixed effect	Yes	Yes
Cluster fixed effect	No	Locality
LR Chi-squared	1207.36	957.13
Prob > Chi-squared	0.0000	0.0000
Pseudo R-squared	0.2186	0.2186

Sources: Authors' calculation based on SLMPS (2022).

Note: Observations: 4,582 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.2.2 Effect of assistance and remittances on food insecurity and food consumption

This section presents the results from the analysis of the effects of assistance (transfers) and remittances on household food security, as measured by Food Insecurity Experience Scale (FIES) scores, and food consumption, as measured by Food Consumption Scores (FCS).

Receiving assistance and food security outcomes. The three household survey datasets are again used separately for these analyses. Food security, a binary (0/1) variable based on the FIES score for the household, is modeled using logistic regression. Food consumption is measured through the FCS, which ranges from 0 to 120, with higher scores indicating greater food consumption. Household FCS scores can only be computed for the SUHS and SRHS datasets, so no analysis of food consumption is done using the 2022 SLMPS dataset.

Table 4.5 is based on an analysis of households from the urban 2024 SUHS dataset. The results show no significant direct effect of assistance on the food security or FCS of urban households. The interaction between assistance and market access is negative. Assistance

does not significantly interact with conflict or movement, highlighting challenges in leveraging assistance to address the adverse effects of the ongoing SAF/RSF conflict on the food security of urban households.

Table 4.6 is based on analysis of all households from the rural 2023 SURHS dataset. The analysis reveals a slight negative association between assistance and the food security of rural households. However, this may reflect targeting through which assistance programs are directed toward households that are already food insecure. Assistance appears more effective for displaced rural households, as indicated by the significant positive interaction between assistance and movement. On the other hand, the interaction between assistance and market access shows mixed effects, with some evidence of reduced FCS in areas with better market access, suggesting potential inefficiencies in delivery mechanisms.

Table 4.7 is based on analysis of all households in 2022 using the SLMPS dataset, which was collected during the current conflict began. The results similarly show a negative association between assistance and food security. The interaction terms involving assistance, conflict, and movement are insignificant, indicating the limited capacity of assistance programs to address food insecurity in the low-intensity conflict context prevalent across Sudan in 2022. As with the analysis of SRHS, the negative association might reflect the targeting of assistance to households already experiencing food insecurity rather than a direct causal effect.

Across the datasets, assistance shows a limited direct impact on the food security and food consumption of Sudanese households. The effectiveness of assistance varies depending on household circumstances and regional contexts. The observed associations between assistance and food insecurity likely reflect the prioritization of assistance for the most vulnerable households. This targeting complicates causal interpretations.

Table 4.5 Effect of assistance on the food insecurity and food consumption of urban households, 2024 SUHS

	(1)	(2)	(3)	(4)
	Food secure (logistic)		Food Consumption Score (linear)	
Assistance	0.002 (0.0370)	0.002 (0.0403)	0.859 (1.547)	0.859 (1.966)
All conflict	-0.149*** (0.0193)	-0.149*** (0.0181)	-5.632*** (0.897)	-5.632*** (1.264)
Conflict * Assistance	-0.016 (0.0392)	-0.016 (0.0637)	1.303 (1.679)	1.303 (2.245)
Moved	0.039* (0.0214)	0.039** (0.0198)	0.303 (0.949)	0.303 (1.061)
Moved * Assistance	-0.075* (0.0415)	-0.075** (0.0374)	-0.123 (1.766)	-0.123 (2.283)
Market Access	0.145*** (0.0277)	0.145*** (0.0263)	11.350*** (1.196)	11.350*** (1.152)
Market Access * Assistance	-0.114*** (0.0334)	-0.114*** (0.0326)	-3.344** (1.472)	-3.344** (1.477)
Male-headed household	-0.006 (0.0370)	-0.006 (0.0347)	1.314 (1.611)	1.314 (1.876)
Age of household head	-0.013*** (0.0048)	-0.013*** (0.0040)	-0.365* (0.213)	-0.365* (0.204)
Age-squared	0.000*** (5.02e-05)	0.000*** (4.14e-05)	0.003 (0.002)	0.003 (0.002)
Agricultural sector	0.007 (0.0259)	0.007 (0.0233)	1.784 (1.137)	1.784 (1.210)
Low education	-0.074* (0.0381)	-0.073** (0.0354)	1.615 (1.643)	1.615 (1.642)
Medium education	-0.036 (0.0338)	-0.036 (0.0310)	4.262*** (1.451)	4.262*** (1.401)
High education	-0.026 (0.0357)	-0.026 (0.0404)	3.444** (1.538)	3.444** (1.546)
Adequate housing	0.205*** (0.0166)	0.205*** (0.0191)	8.504*** (0.810)	8.504*** (0.894)
Household size	-0.011*** (0.0022)	-0.011*** (0.0021)	-0.227** (0.091)	-0.227* (0.121)
Constant			57.530*** (5.386)	57.530*** (5.762)
State fixed effects	Yes	Yes	Yes	Yes
Cluster fixed effects	No	Locality	No	Locality
LR Chi-squared	510.50	734.04	-	-
Prob > Chi-squared	0.0000	0.0000	0.0000	0.0000
Pseudo R-squared	0.1241	0.1241	-	-
F	-	-	16.69	35.91
Prob > F	-	-	0.0000	0.0000
R-squared	-	-	0.1566	0.1566
Adj. R-squared	-	-	0.1472	-

Sources: Authors' calculation based on SUHS (2024).

Note: Observations: 3,000 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4.6 Effect of assistance on the food insecurity and food consumption of rural households, SRHS (2023)

	(1)	(2)	(3)	(4)
	Food secure (logistic)		Food Consumption Score (linear)	
Assistance	-0.119*** (0.0406)	-0.119*** (0.0418)	-1.713 (1.616)	-1.713 (1.670)
All Conflict	-0.108*** (0.0188)	-0.108*** (0.0174)	-2.921*** (0.819)	-2.921*** (0.725)
Conflict * Assistance	-0.010 (0.0363)	-0.010 (0.0267)	1.684 (1.544)	1.684 (1.325)
Moved	-0.031 (0.0188)	-0.031 (0.0220)	1.703** (0.867)	1.703 (1.070)
Moved * Assistance	0.101*** (0.0352)	0.101*** (0.0341)	-3.199** (1.595)	-3.199* (1.637)
Market Access	0.085*** (0.0177)	0.085*** (0.0194)	6.788*** (0.793)	6.788*** (1.125)
Market Access * Assistance	0.051 (0.0418)	0.051 (0.0464)	3.429** (1.660)	3.429** (1.680)
Male-headed household	0.060*** (0.0174)	0.060*** (0.0177)	4.856*** (0.810)	4.856*** (0.784)
Age of household head	-0.006** (0.0026)	-0.006** (0.0026)	0.193 (0.124)	0.193 (0.132)
Age-squared	7.56e-05** (3.03e-05)	7.56e-05** (2.99e-05)	-0.003* (0.001)	-0.003* (0.0015)
HH head responded	-0.005 (0.0186)	-0.005 (0.0175)	-5.333*** (0.855)	-5.333*** (0.793)
Agricultural sector	0.080*** (0.0139)	0.080*** (0.0134)	1.571** (0.660)	1.571** (0.694)
Low education	0.026 (0.0213)	0.026 (0.0197)	-0.097 (0.999)	-0.097 (0.975)
Medium education	0.038* (0.0225)	0.038* (0.0224)	5.869*** (1.056)	5.869*** (1.132)
High education	0.083*** (0.0272)	0.083*** (0.0290)	6.583*** (1.245)	6.583*** (1.210)
Adequate housing	0.130*** (0.0148)	0.130*** (0.0151)	7.543*** (0.740)	7.543*** (0.860)
Household size	-0.006*** (0.0012)	-0.006*** (0.0013)	-0.018 (0.050)	-0.018 (0.048)
Constant			33.880*** (2.796)	33.880*** (3.081)
State fixed effects	Yes	Yes	Yes	Yes
Cluster fixed effects	No	Locality	No	Locality
LR Chi-squared	425.81	698.67	-	-
Prob > Chi-squared	0.0000	0.0000	-	-
Pseudo R-squared	0.0813	0.0813	-	-
F	-	-	21.97	45.53
Prob > F	-	-	0.0000	0.0000
R-squared	-	-	0.1437	0.1437
Adj. R-squared	-	-	0.1372	-

Sources: Authors' calculation based on SRHS (2023).

Note: Observations: 4,485 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4.7 Effect of assistance on the food insecurity of all households, SLMPS (2022)

	(1)	(2)
	Food secure (logistic)	
Assistance	-0.072*** (0.0198)	-0.072*** (0.0214)
Conflict	0.078 (0.1170)	0.078 (0.1270)
Conflict * Assistance	-0.035 (0.1280)	-0.035 (0.1170)
Moved	-0.054*** (0.0168)	-0.054* (0.0292)
Moved Assistance	-0.045 (0.1310)	-0.045 (0.1210)
Market Access	-0.116*** (0.0165)	-0.116*** (0.0269)
Market Access * Assistance	0.001 (0.1160)	0.001 (0.1750)
Male-headed household	0.034* (0.0176)	0.034 (0.0217)
Age of household head	0.000 (0.0024)	0.000 (0.0026)
Age-squared	6.38e-06 (2.31e-05)	6.38e-06 (2.57e-05)
Agricultural sector	-0.006 (0.0199)	-0.006 (0.0282)
Low education	0.078*** (0.0166)	0.078*** (0.0192)
Medium education	0.135*** (0.0249)	0.135*** (0.0277)
High education	0.232*** (0.0268)	0.232*** (0.0315)
Adequate housing	0.052*** (0.0170)	0.052** (0.0252)
Household size	-0.013*** (0.0029)	-0.013*** (0.0033)
Urban	0.025 (0.0154)	0.025 (0.0208)
State fixed effects	Yes	Yes
Cluster fixed effects	No	Locality
Chi-squared	819.77	702.07
Prob > Chi-squared	0.0000	0.0000
Pseudo R-squared	0.1314	0.1314

Sources: Authors' calculation based on SLMPS (2022).

Note: Observations: 4,582 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Remittances and food security outcomes. The findings on the association between receipt of remittances and household food security for the 2024 SUHS, presented in Table 4.8, the 2023 SRHS, presented in Table 4.9, and the 2022 SLMPS, presented in Table 4.10, consistently show an insignificant effect of remittances on food security outcomes. This is evident in both logistic and linear models across the different datasets. Notably, for the 2024 SUHS and 2023 SRHS, the surveys capture only households that rely on remittances as their primary income source, potentially excluding those who receive remittances as a secondary source. The 2022 SLMPS dataset, which includes all households, also shows that remittances have no significant impact on food security. This suggests that remittances alone may not substantially mitigate food insecurity under current conditions.

Table 4.8 Effect of remittances on the food insecurity and food consumption of urban households, SUHS (2024)

	(1)	(2)	(3)	(4)
	Food secure (logistic)		Food Consumption Score (linear)	
Remittances	-0.417 (0.3330)	-0.417 (0.2700)	-0.874 (2.991)	-0.874 (2.777)
All conflict	-0.769*** (0.0933)	-0.769*** (0.0818)	-5.426*** (0.865)	-5.426*** (1.042)
Conflict * Remittances	-0.011 (0.238)	-0.011 (0.1700)	0.382 (2.204)	0.382 (1.435)
Moved	0.029 (0.0990)	0.029 (0.0970)	-0.275 (0.905)	-0.275 (1.010)
Moved * Remittances	0.350 (0.2410)	0.350 (0.2390)	4.313* (2.213)	4.313** (1.912)
Market Access	0.569*** (0.1400)	0.569*** (0.1380)	11.200*** (1.226)	11.200*** (1.251)
Market* Remittances	0.010 (0.3130)	0.010 (0.2150)	-4.788* (2.738)	-4.788* (2.455)
Male-headed household	-0.022 (0.1770)	-0.022 (0.1640)	1.174 (1.619)	1.174 (1.942)
Age of household head	-0.060*** (0.0230)	-0.060*** (0.0207)	-0.345 (0.213)	-0.345 (0.210)
Age-squared	0.001*** (0.0002)	0.001*** (0.0002)	0.003 (0.002)	0.003 (0.002)
Agricultural sector	0.018 (0.1250)	0.018 (0.1130)	1.700 (1.137)	1.700 (1.189)
Low education	-0.356* (0.1840)	-0.356** (0.1720)	1.708 (1.643)	1.708 (1.640)
Medium education	-0.164 (0.1620)	-0.164 (0.1460)	4.445*** (1.450)	4.445*** (1.427)
High education	-0.010 (0.1710)	-0.096 (0.1930)	3.721** (1.539)	3.721** (1.565)
Adequate housing	1.035*** (0.0866)	1.035*** (0.0959)	8.672*** (0.806)	8.672*** (0.853)
Household size	-0.047*** (0.0108)	-0.047*** (0.0102)	-0.216** (0.091)	-0.216* (0.123)
Constant	0.824 (0.5860)	0.824 (0.5590)	57.280*** (5.419)	57.280*** (5.917)
State fixed effects	Yes	Yes	Yes	Yes
Cluster	No	Locality	No	Locality
Chi-squared	466.32	583.35	-	-
Prob > Chi-squared	0.0000	0.0000	-	-
Pseudo R2	0.1134	0.1134	-	-
F	-	-	16.85	53.91
Prob > F	-	-	0.0000	0.0000
R-squared	-	-	0.1579	0.1579
Adj. R-squared	-	-	0.1485	-

Sources: Authors' calculation based on SUHS (2024).

Note: Observations: 3,000 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4.9 Effect of remittances on the food insecurity and food consumption of rural households, SRHS (2023)

	(1)	(2)	(3)	(4)
	Food secure (logistic)		Food Consumption Score (linear)	
Remittances	-0.117 (0.0886)	-0.117 (0.1010)	-2.625 (3.553)	-2.625 (3.420)
All Conflict	-0.113*** (0.0165)	-0.113*** (0.0144)	-2.533*** (0.719)	-2.533*** (0.697)
Conflict * Remittances	0.001 (0.0788)	0.001 (0.0568)	0.478 (3.361)	0.478 (2.055)
Moved	-0.012 (0.0167)	-0.012 (0.0180)	0.945 (0.768)	0.945 (1.089)
Moved * Remittances	0.130* (0.0725)	0.130** (0.0585)	-0.365 (3.320)	-0.365 (1.918)
Market Access	0.093*** (0.0164)	0.093*** (0.0183)	7.417*** (0.718)	7.417*** (0.962)
Market Access * Remittances	0.039 (0.0873)	0.039 (0.0935)	2.604 (3.525)	2.604 (3.405)
Male-headed household	0.061*** (0.0174)	0.061*** (0.0180)	4.814*** (0.812)	4.814*** (0.788)
Age of household head	-0.005** (0.0026)	-0.005** (0.0026)	0.193 (0.124)	0.193 (0.130)
Age-squared	7.28e-05** (3.02e-05)	7.28e-05** (3.05e-05)	-0.003* (0.001)	-0.003* (0.001)
Household head responded	-0.006 (0.0186)	-0.006 (0.0174)	-5.284*** (0.855)	-5.284*** (0.781)
Agricultural sector	0.081*** (0.0139)	0.081*** (0.0133)	1.507** (0.661)	1.507** (0.692)
Low education	0.030 (0.0212)	0.030 (0.0197)	-0.171 (0.998)	-0.171 (0.972)
Medium education	0.038* (0.0224)	0.038* (0.0224)	5.866*** (1.057)	5.866*** (1.127)
High education	0.081*** (0.0271)	0.081*** (0.0292)	6.598*** (1.245)	6.598*** (1.210)
Adequate housing	0.130*** (0.0148)	0.130*** (0.0153)	7.608*** (0.741)	7.608*** (0.879)
Household size	-0.005*** (0.0012)	-0.006*** (0.0013)	-0.019 (0.050)	-0.019 (0.048)
Constant			33.800*** (2.765)	33.800*** (2.957)
State fixed effects	Yes	Yes	Yes	Yes
Cluster fixed effects	No	Locality	No	Locality
LR Chi-squared	410.54	554.05	-	-
Prob > Chi-squared	0.0000	0.0000	-	-
Pseudo R-squared	0.0783	0.0783	-	-
F	-	-	21.68	44.83
Prob > F	-	-	0.0000	0.0000
R-squared	-	-	0.1421	0.1421
Adj. R-squared	-	-	0.1356	-

Sources: Authors' calculation based on SRHS (2023).

Note: Observations: 4,485 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4.10 Effect of remittances on the food insecurity of all households, SLMPS (2022)

	(1)	(2)
	Food secure (logistic)	
Remittances	0.151 (0.162)	0.151 (0.185)
Conflict	0.352 (0.515)	0.352 (0.481)
Conflict * Remittances	0.407 (1.342)	0.407 (1.391)
Moved	-0.309*** (0.085)	-0.309** (0.155)
Moved * Remittances	0.008 (0.231)	0.008 (0.241)
Market Access	-0.564*** (0.086)	-0.564*** (0.129)
Market Access * Remittances	-0.135 (0.241)	-0.135 (0.248)
Conflict * Moved	-0.282 (0.609)	-0.282 (0.537)
Male-headed household	0.215** (0.087)	0.215** (0.103)
Age of household head	0.002 (0.012)	0.002 (0.013)
Age-squared	2.24e-05 (0.000)	2.24e-05 (0.000125)
Agricultural sector	-0.020 (0.097)	-0.020 (0.137)
Low education	0.355*** (0.079)	0.355*** (0.091)
Medium education	0.640*** (0.124)	0.640*** (0.140)
High education	1.157*** (0.153)	1.157*** (0.175)
Adequate housing	0.272*** (0.083)	0.272** (0.125)
Household size	-0.064*** (0.014)	-0.064*** (0.016)
Urban household	0.140* (0.075)	0.140 (0.101)
Constant	-0.354 (0.310)	-0.354 (0.386)
State fixed effects	Yes	Yes
Cluster fixed effects	No	Locality
Chi-squared	807.47	840.53
Pseudo R2	0.1295	0.1295
Observations	4,582	4,582

Sources: Authors' calculation based on SLMPS (2022).

Note: Observations: 4,582 households. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5) CONCLUSION AND IMPLICATIONS

This study investigates the effects of conflict on employment and household incomes and the effects of remittances and assistance received by households on food insecurity and food consumption in Sudan. The analyses use household-level data from the 2022 Sudan Labor Market Panel Survey (SLMPS), the 2023 Sudan Rural Household Survey (SRHS), and the 2024 Sudan Urban Household Survey (SUHS). The findings offer critical insights into how

conflict and economic shocks affect Sudanese households, although important caveats remain regarding the causal interpretation of these effects.

All analyses show that conflict significantly increases the likelihood of employment loss, particularly in urban areas where the current conflict's intensity has been highest. Female-headed households and displaced households are especially vulnerable to job loss, underscoring the gender and displacement-related dimensions of conflict's economic impact.

The findings on remittances show no significant effect on household food security status or food consumption levels. These results suggest that, while remittances may provide a critical source of income for households, they do not directly translate into improved food security outcomes. In contrast, receiving assistance is consistently associated with higher food insecurity and lower food consumption. However, this does not imply that assistance worsens food security. Rather, this result likely reflects the targeting of assistance programs, which prioritize households that are already food insecure.

The study is subject to important limitations. The datasets used are not directly comparable due to differences in sampling and data collection methods. The SUHS and SRHS are nationally representative only for households with access to phones, potentially excluding vulnerable populations that do not own telephones. In contrast, the SLMPS survey is a comprehensive, face-to-face survey, offering more inclusive data. Additionally, reverse causality complicates interpretations, as assistance and remittances are often targeted toward food-insecure households, making it difficult to establish causal relationships.

Despite these limitations, the findings provide important insights for policymakers. The consistent impact of conflict on employment and income highlights the urgent need for interventions that support job creation and income stability in conflict-affected regions. Enhancing community-based targeting and improving delivery infrastructure could address these gaps. Investing in market access and livelihood opportunities is essential to mitigate the adverse impacts of conflict, particularly in rural areas where household economic resilience is particularly weak. Policymakers should also adopt integrated strategies that combine financial transfers, food assistance, and livelihood programs to address both immediate and structural drivers of food insecurity.

REFERENCES

- Abushama, H., D. Resnick, K. Siddig, and O.K. Kirui. 2023. *Political and Economic Drivers of Sudan's Armed Conflict: Implications for the Agri-food System*. Sudan Strategy Support Program Working Paper 15. Khartoum, Sudan: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.136946>.
- ACAPS Analysis Hub. 2021. *The Impact of Remittances on Yemen's Economy*. Thematic report. Geneva: ACAPS. https://www.acaps.org/fileadmin/Data_Product/Main_media/20211015_acaps_yemen_analysis_hub_impact_of_remittances_on_yemens_economy.pdf
- AfDB (African Development Bank). 2024. Country Focus Report 2024 - Sudan - Driving Sudan's Transformation the Reform of the Global Financial Architecture. <https://www.afdb.org/en/documents/country-focus-report-2024-sudan-driving-sudans-transformation-reform-global-financial-architecture>
- Ahmed, M.O.M., M. Raouf, and K. Siddig. 2024. "What Economic and Poverty Implications Would Sudan's Conflict Have If It Continues Until the End of 2024?" SSSP Working Paper 20. Washington, DC: International Food Policy Research Institute. <https://hdl.handle.net/10568/168102>.
- CBS (Central Bureau of Statistics, Sudan). 2024. "National Accounts Report 2023 – 2028". September 2024.
- Di Maio, M., and V.L. Sciabolazza. 2023. "Conflict Exposure and Labour Market Outcomes: Evidence from Longitudinal Data for the Gaza Strip." *Labour Economics*, 85: 102439. <https://doi.org/10.1016/j.labeco.2023.102439>.
- Fransen, S., and V. Mazzucato. 2014. "Remittances and Household Wealth after Conflict: A Case Study on Urban Burundi." *World Development*, 60: 57–68. <https://doi.org/10.1016/j.worlddev.2014.03.018>
- Galdo, J. 2013. "The Long-Run Labor-Market Consequences of Civil War: Evidence from the Shining Path in Peru." *Economic Development and Cultural Change*, 61 (4): 789–823. <https://doi.org/10.1086/670379>
- Ghorpade, Y. 2017. "Extending a Lifeline or Cutting Losses? The Effects of Conflict on Household Receipts of Remittances in Pakistan." *World Development*, 99: 230–252. <https://doi.org/10.1016/j.worlddev.2017.05.024>
- Guo, Z., Abushama, H., Siddig, K., Kirui, O. K., Abay, K., & You, L. 2023. Monitoring Indicators of Economic Activities in Sudan Amidst Ongoing Conflict Using Satellite Data. *Defence and Peace Economics*, 35(8), 992–1008. <https://doi.org/10.1080/10242694.2023.2290474>
- Hameed, M.A., M.M. Rahman, and R. Khanam. 2023. Analyzing the Consequences of Long-Run Civil War on Unemployment Rate: Empirical Evidence from Afghanistan. *Sustainability*, 15 (8): 7012. <https://doi.org/10.3390/su15087012>.
- Hamilton, D.R. 2010. *Opportunity to Rebel: The Effects of Unemployment Coupled with Ethnic Divided on the Onset of Civil Conflict*. MA Thesis. Atlanta: Georgia State University. <https://doi.org/10.57709/1396192>
- IFPRI and UNDP (International Food Policy Research Institute and United Nations Development Programme). 2024a. *Livelihoods in Sudan amid Armed Conflict: Evidence from a National Rural Household Survey*. Washington, DC and New York: IFPRI and UNDP. <https://hdl.handle.net/10568/140797>.
- IFPRI and UNDP (International Food Policy Research Institute and United Nations Development Programme). 2024b. *The Socio-economic Impact of Armed Conflict on Sudanese Urban Households*. Washington, DC and New York: IFPRI and UNDP. <https://www.undp.org/sudan/publications/socioeconomic-impact-armed-conflict-sudanese-urban-households>
- IMF (International Monetary Fund). 2023. *World Economic Outlook Data Portal*. April 2023 and October 2023 updates. Washington DC: IMF. <https://www.imf.org/en/Publications/WEO/weo-database/>.
- IMF (International Monetary Fund). 2024. *World Economic Outlook Data Portal*. October 2024. Washington DC: IMF. <https://www.imf.org/en/Publications/WEO/weo-database/2024/October>.
- IPC (Integrated Food Security Phase Classification). 2024. *Sudan: IPC Acute Food Insecurity Analysis: June 2024 - February 2025*. IPC Alert: Sudan. Rome: IPC Global Support Unit. https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Sudan_Acute_Food_Insecurity_Jun2024_Feb2025_Report.pdf.
- Kecmanovic, M. 2013. "The Short-run Effects of the Croatian War on Education, Employment, and Earnings." *Journal of Conflict Resolution*, 57 (6): 991–1010. <https://doi.org/10.1177/0022002712454268>
- Kirui, O.K., K. Siddig, H. Abushama, and A.S. Taffesse. 2023a. *Armed Conflict and Business Operations in Sudan: Survey Evidence from Agri-Food Processing Firms*. Sudan Strategy Support Program Working Paper 11. Khartoum, Sudan: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.136835>.
- Kirui, O.K., K. Siddig, M. Ahmed, H. Abushama, and A.S. Taffesse. 2023b. *Impact of the Ongoing Conflict on Smallholder Farmers in Sudan: Evidence from a Nationwide Survey*. Sudan Strategy Support Program Working Paper 17. Khartoum, Sudan: International Food Policy Research Institute (IFPRI). [ebruary.ifpri.org/utills/getfile/collection/p15738coll2/id/137064/file/137277.pdf](https://hdl.handle.net/10568/140797).
- Kirui, O.K., M. Ahmed, K. Siddig, A.S. Taffesse, H. Abushama, P.A. Dorosh, S. Krishnaswamy, C. Monetta, A. Clough, A. Gualteri, and A. Leaduma. 2024a. *Food Security and Social Assistance in Sudan During Armed Conflict: Evidence from the First Round of the Sudan Rural Household Survey (November 2023–January 2024)*. A joint report by the International Food Policy Research Institute (IFPRI) and the World Food Programme (WFP). Washington, DC: IFPRI. <https://hdl.handle.net/10568/145388>
- Kirui, O.K.; M. Ahmed, A.S. Taffesse, H. Abushama, and K. Siddig. 2024b. *Sudan Rural Household Survey 2023: Sampling and Implementation Procedures for the First Round*. Sudan SSP Working Paper 18. Washington, DC: International Food Policy Research Institute. <https://hdl.handle.net/10568/141598>

- Krafft, C., R. Assaad, and R. Cheung. 2024. *Introducing the Sudan Labor Market Panel Survey 2022*. HiCN Working Paper no. 406. Berlin: Households in Conflict Network. <https://hicn.org/working-paper/406/>.
- Mboutchouang, V. de P., J. Davalos, J.F. Sandy, I. Mahoi, and J.K. Chetachi. 2020. *Civil War and Labor-Market Outcomes in Sierra Leone*. PEP Working Paper 2020–09. Nairobi: Partnership for Economic Policy (PEP). <https://portal.pep-net.org/document/download/34660>
- Rabiile, M.F. 2010. *Civil War and Unemployment in Mogadishu, Somalia*. MSc Thesis. Kampala: Kampala International University. <https://irbackend.kiu.ac.ug/server/api/core/bitstreams/aedf12f-0a32-48f6-bff4-d3fc48521638/content>
- Siddig, K.; M. Raouf, and M.O.M. Ahmed. 2023. *The Economy-wide Impact of Sudan's Ongoing Conflict: Implications on Economic Activity, Agrifood System and Poverty*. Sudan SSP Working Paper 12. Khartoum: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.136843>.
- World Bank. 2021. *Republic of Sudan—Joint IDA-IMF Staff Advisory Note on the Poverty Reduction Strategy Paper (2021-2023)*. Washington, DC; World Bank. <https://documents1.worldbank.org/curated/en/545101625104854489/pdf/Sudan-Joint-IDA-IMF-Staff-Advisory-Note-on-the-Poverty-Reduction-Strategy-Paper-2021-2023.pdf>.

ABOUT THE AUTHORS

Mosab Ahmed is a Senior Research Assistant in the Development Strategy and Governance (DSG) Unit of the International Food Policy Research Institute (IFPRI), based temporarily in Cairo, Egypt. **Oliver K. Kirui** is a Research Fellow in the DSG Unit of IFPRI, based temporarily in Nairobi, Kenya. **Alemayehu S. Taffesse** is a Senior Research Fellow and Program Leader in IFPRI's DSG Unit, based in Addis Ababa, Ethiopia. **Mariam Raouf** is a Senior Research Associate in IFPRI's DSG Unit, based in Cairo. **Hala Abushama** is a Research Assistant in IFPRI's DSG Unit, based temporarily in Cairo. **Khalid Siddig** is Senior Research Fellow in IFPRI's DSG Unit and the Leader of IFPRI's Sudan Strategy Support Program, based temporarily in Nairobi and an Associate Professor at the University of Khartoum.

ACKNOWLEDGMENTS

This research was conducted as part of the CGIAR Research Initiative on Fragility, Conflict, and Migration (FCM). We extend our gratitude to all the funders who made this work possible through their generous contributions to the CGIAR Trust Fund (<https://www.cgiar.org/funders/>). Funding for SSSP is graciously provided by the United States Agency for International Development (USAID).

The Sudan Strategy Support Program (SSSP) is managed by the International Food Policy Research Institute (IFPRI) and is financially supported by the United States Agency for International Development (USAID). This publication has been prepared as an output of SSSP and has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and are not necessarily representative of or endorsed by IFPRI.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

A world free of hunger and malnutrition

IFPRI is a CGIAR Research Center

IFPRI Sudan, Arab Organization for Agricultural Development (AOAD), 7th Amarat Street | P.O. Box 474 – 11111 | Khartoum, Sudan

email: ifpri-sudan@cgiar.org | <https://sudan.ifpri.info/>

© 2024, copyright remains with the author(s). All rights reserved.