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Self-Reported Food Insecurity and Objective Poverty Measures in Periods of Subsequent Shocks: What Do Subjective Indicators Capture?

The case of Mozambique 2014/15–2022

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Abstract

Accurate measurement and continuous tracking of household food security are central to the design and evaluation of poverty-focused development interventions. Food security is a core dimension of household poverty and vulnerability. Research on food security and poverty has traditionally relied on objective indicators such as household consumption, calorie availability, and multidimensional poverty indices. However, a growing body of literature highlights the value of subjective and self-reported measures of food insecurity, which may capture dimensions of deprivation and vulnerability not reflected in standard welfare metrics. This study examines self-reported food insecurity indicators in Mozambique and compares them with conventional welfare measures over the period 2014/15–2022, a decade marked by successive and compounding shocks. Using data from the 2014/15, 2019/20, and 2022 household budget surveys, the analysis shows that the determinants of self-reported food insecurity extend beyond household consumption levels, calorie availability, and multidimensional poverty status.

Moreover, for 2019/20 and 2022, the surveys include information on both objectively measured and self-reported shocks, as well as access to social assistance programmes. We find that, while objectively measured exposure to shocks is almost never associated with subjective food insecurity, self-reported exposure to shocks is more strongly correlated with these indicators. Also, receipt of social protection benefits neither appears to improve households' reported food security, nor does it mitigate the perceived impact of shocks. In terms of temporal patterns, trends in self-reported food insecurity closely mirror national consumption-based poverty estimates. Self-reported food security indicators deteriorate sharply between 2014/15 and 2019/20, followed by a moderate improvement between 2019/20 and 2022. This is consistent with the trajectory of consumption poverty over the same period. However, these patterns vary across sub-populations.

Overall, while the findings validate the direction of official poverty estimates, they offer a more nuanced understanding of households' experiences of food insecurity. They underscore the value of integrating subjective food insecurity indicators into poverty-monitoring systems to better capture the challenges faced by vulnerable households in low-income settings.

JEL classification: I31, I32, I39, O12, O55, Q18.

Keywords: Food insecurity, self-reported/objective poverty, shocks, Mozambique

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1 Introduction

Accurately measuring and tracking poverty, vulnerability, and food insecurity remain central challenges in developing countries and are essential for the design and evaluation of development interventions (Hjelm *et al*., 2016; Mahadevan and Hoang, 2016; Headey and Ecker, 2013; Harttgen and Seiler, 2023). Standard approaches typically rely on objective indicators—most notably household consumption aggregates, calorie intake, and multidimensional poverty indices. Consumption-based measures form the backbone of welfare and poverty analysis due to their close link to living standards and their relative ease of measurement compared with income, especially in low-income settings (Deaton, 2019; Deaton and Zaidi, 2002; Ravallion, 2016). Yet a substantial body of work highlights persistent limitations in these metrics (Gibson, 2006; Dercon and Krishnan, 2000; Dercon, 2004; Beegle *et al*., 2012; Haddad and Kanbur, 1990), motivating the development of complementary approaches—including advances in multidimensional poverty measurement (Alkire and Foster, 2011).

In parallel, the field of food security measurement has evolved rapidly. Food security is now widely recognised as a key dimension of household poverty and vulnerability, but its measurement presents significant challenges. Different analytical and measurement approaches often yield divergent classifications of which households are most food insecure, and the field has expanded beyond calorie-based and anthropometric indicators (Svedberg, 2000; Victora *et al*., 2008; Pinstrup-Andersen, 2009). Increasingly, it incorporates subjective and self-reported dimensions of food access (Pérez-Escamilla, 2012). Tools such as the Household Food Insecurity Access Scale (HFIAS) (Coates *et al*., 2007), the Coping Strategies Index (Maxwell *et al*., 1999; 2003), and the Food Insecurity Experience Scale (FIES) (FAO, 2014; 2016; FAO *et al*., 2017;2018; Cafiero *et al*., 2018; Saint Ville *et al*., 2019) have gained prominence for their ability to capture hidden aspects of food insecurity, including anxiety about food access, perceived inadequacy of diet, and behavioural responses to scarcity. Empirical studies show that these indicators correlate with – but do not fully overlap – objective measures of consumption or nutrition (Jones *et al*., 2013; Smith *et al*., 2017), suggesting that they capture additional dimensions of vulnerability not reflected in observed consumption.

This insight aligns with a broader literature examining the relationship between subjective and objective welfare indicators. Early work shows that self-reported assessments of economic wellbeing respond systematically to income, prices, and household characteristics, indicating that such measures contain meaningful information beyond reporting error (Ravallion and Lokshin, 2001; Frey and Stutzer, 2002). In the context of poverty measurement, Pradhan and Ravallion (2000) demonstrate that qualitative perceptions of consumption adequacy are closely related to expenditure, yet substantial variation in perceived deprivation remains even after accounting for objective consumption. Other studies confirm that subjective poverty measures are robust in low-income settings

and capture dimensions of welfare distinct from standard monetary indicators (Ravallion and Lokshin, 2002).

A closely related literature examines self-reported food insecurity, which captures households' anxiety, behavioural adjustments, and perceived lack of access to food. These measures correlate with consumption poverty and calorie availability, while also revealing substantial mismatches between objective and subjective indicators of food deprivation (Coates *et al*., 2007; De Weerdt *et al*., 2016). Such divergences are often interpreted as reflecting dimensions of vulnerability and instability not captured by static consumption measures (Headey and Ecker, 2013; Cafiero *et al*., 2018). Households may report food insecurity despite appearing non-poor in consumption terms, or conversely may not report food insecurity despite low measured consumption. Explanations include exposure to uninsured shocks (Kamanou and Morduch, 2002; Chaudhuri *et al*., 2002; Dercon, 2004), liquidity constraints (Fafchamps, 2003), social networks and informal insurance (Udry, 1994), and psychological dimensions of poverty such as stress, aspirations, and expectations (Banerjee and Duflo, 2011; Haushofer and Fehr, 2014; Genicot and Ray, 2017). Relative deprivation and social comparison also play a role, as perceptions of poverty depend on reference groups and relative economic position rather than absolute living standards alone (Runciman, 1966; Clark and Oswald, 1996; Ferrer-i-Carbonell, 2005). In some cases, subjective indicators have been shown to predict future poverty transitions, child nutritional outcomes, and household resilience to shocks (Christiaensen and Subbarao, 2005; Frongillo *et al*., 2017), underscoring their potential value as early-warning tools and targeting instruments. Together, these perspectives suggest that subjective hardship reflects broader vulnerability, forward-looking insecurity, social context, and heterogeneous needs, helping explain why households with similar consumption levels may report quite different experiences of deprivation.

Mozambique provides a particularly relevant context for examining these issues. Over the past decade, the country has faced a series of cumulative and overlapping shocks – including cyclones, floods, droughts, conflict-related displacement, unprecedented price surges, economic crises, and the COVID-19 pandemic – that have pushed many households into poverty and affected food security and child malnutrition. National poverty assessments document significant fluctuations in consumption-based poverty during this period, with an increase between 2014/15 and 2019/20 followed by partial recovery in 2022 (Arndt *et al*., 2012; 2017; Mahdi *et al*., 2018; 2019; World Bank, 2020; 2021; 2023a; 2023b; Salvucci and Tarp, 2024a, 2024b; DEEF, 2016; DNPED, forthcoming; GdM, 2024). Yet little is known about how these trends align with households' own perceptions of food adequacy and security, leaving an important gap regarding the relationship between subjective and objective welfare indicators in contexts of cumulative stress.

This paper contributes to these debates by providing a systematic analysis of self-reported food insecurity indicators in Mozambique – specifically the number of meals consumed, perceived adequacy of the diet, and the number of months in which households experienced

food problems due to lack of resources – and comparing them with consumption-based poverty, calorie intake, and multidimensional poverty indices over the period 2014/15–2022. By analysing how subjective and objective indicators align or diverge during a decade marked by successive shocks, the study contributes to the literature on poverty and food security measurement and on household vulnerability in developing-country contexts. It highlights the value of integrating subjective indicators into poverty-monitoring systems and provides new evidence on how households experience and report food insecurity in settings characterised by widespread poverty, malnutrition, food shortages, and vulnerability.

The remainder of the paper is structured as follows. Section 2 presents the country context, summarising the major shocks experienced during the period and reviewing trends in consumption and multidimensional poverty as documented in official assessments. Section 3 describes the data and methodologies used. Section 4 presents the main results, and Section 5 discusses their implications and concludes.

2 Context

Mozambique remains among the world's poorest countries, whether poverty is assessed through monetary indicators or multidimensional measures (Mahdi *et al*., 2018; 2019; World Bank, 2020; 2021; 2023a; DNPED, forthcoming; GdM, 2024). Although multidimensional poverty has steadily declined since 1996/97, monetary poverty has followed a different trajectory: after years of gradual reduction, it began to rise again between 2014/15 and 2019/20 and showed only a modest improvement in 2022 (DNPED, forthcoming; GdM, 2024). This reversal reflects the fact that, even before the COVID-19 pandemic, the country was already facing a series of severe and overlapping shocks. These included: (i) a debt crisis that undermined Mozambique's international credibility and led the International Monetary Fund and other development partners to suspend financial support; (ii) macroeconomic instability, marked by sharp currency depreciation and widespread price increases; (iii) recurrent climate-related disasters, most notably the devastating cyclones Idai and Kenneth in 2019; and (iv) the escalation of armed conflict in the northern province of Cabo Delgado from 2017 onwards, involving Islamist insurgent groups and foreign military forces, which also disrupted the development of the region's natural gas sector. Against this backdrop, the arrival of the COVID-19 pandemic further aggravated an already deteriorating welfare situation.

These shocks contributed to a rapid increase in poverty, as illustrated in Table 1, which also confirms the persistent rural–urban divide: rural households remain significantly poorer than their urban counterparts. The table further shows that, since 2014/15, the southern region has consistently recorded the lowest poverty rates. Moreover, both the rural–urban gap and the South–Centre/North gap widened in 2014/15 and again in 2019/20, before narrowing somewhat in 2022. The widening observed in 2014/15 largely reflects the fact that urban areas and southern provinces captured most of the gains from the preceding period of sustained economic growth (DEEF, 2016; Mahdi *et al*., 2018; 2019; World Bank, 2020; 2021; 2023a; 2023b). By contrast, the divergence in 2019/20 appears to stem from the greater vulnerability of rural households and those located in the Centre and North. The combined effects of the COVID-19 shock and the sharp rise in prices between 2014/15 and 2019/20 played a vital role in deepening poverty and widening spatial inequalities (Betho *et al*., 2022; Barletta *et al*., 2022a; Salvucci and Tarp, 2024a; 2024b). National poverty rates declined again in 2022, but the modest improvement masks important spatial heterogeneity. Between 2019/20 and 2022, poverty fell in rural areas and in the northern provinces, while it continued to rise in urban areas—especially in the South (DNPED, forthcoming; GdM, 2024; Salvucci and Tarp, 2024c). Because urban and southern households are generally better off in consumption terms, these dynamics contributed to a reduction in inequality. After increasing steadily from a national Gini coefficient of roughly 0.40 in 2014/15 to 0.51 in 2019/20, inequality fell to around 0.45 in 2022, with declines observed in both urban and rural areas, though more pronounced in urban settings (Barletta *et al*., 2022b; Salvucci and Tarp, 2024c). A similar spatial pattern emerges when examining non-monetary dimensions of poverty.

Access to basic services, housing quality, and ownership of durable goods have consistently been worse in rural areas of the Centre and North than in urban areas and the South. Moreover, disparities in multidimensional poverty across regions are substantially larger – and more persistent – than those observed in consumption poverty (DEEF, 2016; Castigo and Salvucci, 2017; INE, 2015, 2021; 2023; DNPED, forthcoming; GdM, 2024).

Table 1: Consumption poverty estimates, 1996/97–2014/15 (%)

Area	Consumption poverty rate (%)				Multidimensional poverty rate (%)			
	1996/97	2002/03	2008/09	2014/15	1996/97	2002/03	2008/09	2014/15
National	69.7	52.8	51.7	46.1	85.7	75.7	69.3	54.8
Urban	61.8	48.2	46.8	37.4	50.2	41.2	31.4	18.1
Rural	71.8	55.0	53.8	50.1	95.2	92.1	85.9	71.9
North	67.3	51.9	45.1	55.1	95.3	86.8	81.3	67.8
Centre	74.1	49.2	57.0	46.2	92.5	83.8	80.3	63.6
South	65.5	59.9	51.2	32.8	64.0	48.4	33.0	18.8

Note: Consumption poverty rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Multidimensional poverty rates are computed using the Alkire-Foster method, but using a nationally defined set of multidimensional poverty indicators, as in DEEF (2016) and DNPED (forthcoming).

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

3 Data and methodology

3.1 Data

Our analysis draws on three rounds of the Mozambican Household Budget Survey (*Inquérito ao Orçamento Familiar*: IOF) conducted by the National Statistics Institute (*Instituto Nacional de Estatística*: INE) in 2014/15, 2019/20, and 2022 (hereafter IOF14, IOF19, and IOF22). These surveys constitute the core instruments of Mozambique's official poverty-monitoring system. They are nationally representative and follow a stratified two-stage cluster sampling design that ensures comparability across rounds. Each survey collects detailed information on household demographics, consumption expenditures, food acquisition, and subjective assessments of food adequacy, enabling the construction of both objective poverty indicators – such as consumption aggregates, calorie intake, and multidimensional poverty indices – and subjective food insecurity measures (DEEF, 2016; World Bank, 2023a; INE, 2015; 2021; 2023; DNPED, forthcoming).

Although the three surveys differ slightly in implementation, they remain highly comparable in design and core content. IOF19 and IOF22 share an almost identical structure and include approximately 13,000 and 15,000 households, respectively, each interviewed once across four quarters. IOF14, by contrast, covers roughly 11,000 households interviewed three times between mid-2014 and mid-2015. Despite this difference in interview frequency, IOF14 maintains strong methodological alignment with the later rounds, particularly in the measurement of household consumption expenditures. Overall, the consistency in sampling strategy, questionnaire structure, and consumption module design provides a high degree of confidence in cross-round comparability.[1] INE is responsible for designing and implementing the IOF surveys, while the Ministry of Economy and Finance has conducted the official poverty analyses, with technical support from partners such as IFPRI, UNU-WIDER, and the University of Copenhagen, depending on the survey year. Further methodological details are available in INE (2015; 2021), DEEF (2016), and DNPED (forthcoming).

We now turn to a more detailed description of the main indicators considered in the analysis. Regarding food security, we focus on three self-reported indicators: (i) the number of meals consumed by the household the day before the interview; (ii) the perceived adequacy of the household's diet during the previous month; and (iii) the number of months in which the household experienced food problems due to lack of money or other resources. These indicators are intended to roughly capture short-, medium-, and long-term dimensions of food security, respectively. Conceptually, they align with experiential food insecurity measures such as HFIAS and FIES, albeit in a simplified form.

[1] Also, the panel structure of IOF14 is not considered in the analysis of welfare indicators, and households interviewed in different quarters are regarded as different households, making the survey structure comparable to subsequent (and earlier) ones.

The main poverty indicator used in the analysis is real *per capita* consumption, constructed following the methodology applied in Mozambique's official poverty assessments. As described in the Fourth National Poverty Assessment (DEEF, 2016) and based on the PLEASe methodology (Arndt *et al*., 2017), nominal consumption is first obtained by aggregating daily, monthly, and annual expenditures, consumption from own production, in-kind receipts, imputed and actual rents, and the use value of durable goods. These aggregates are then made comparable across space and time using spatial and temporal price indices. The resulting deflated consumption aggregate is used to compute real *per capita* consumption, which is compared to the national poverty line to determine each household's poverty status.

Caloric intake *per capita* is also estimated from reported consumption. However, in Mozambique these estimates suffer from measurement error for at least two reasons. First, caloric intake from food consumed away from home cannot be accurately captured. Second, caloric estimates in recent survey waves show systematic underestimation, a problem that has expanded from urban southern areas in earlier surveys to rural areas in the most recent rounds. DEEF (2016) discusses potential causes and proposes imputation strategies.[2] In this study, we use both the standard calorie estimates and an adjusted measure that corrects for mismatches between items reported in the meal-description module and those recorded in the consumption or expenditure modules. When a household reports consuming a food item in the meal module but does not report it elsewhere, an imputed quantity – equal to half the median per-person daily consumption of that item within the household's spatial domain – is added. This adjustment follows DEEF (2016) and Squarcina and Egger (2022).

For multidimensional poverty, we rely on the six indicators included in the national multidimensional poverty index presented in DEEF (2016) and DNPED (forthcoming): completion of primary education, access to safe water, sanitary conditions, housing quality, access to electricity, and ownership of basic durable goods. A household is classified as multidimensionally poor if its weighted deprivation score exceeds 0.60, equivalent to being deprived in at least four of the six indicators. In the present study, we use both the individual indicators and the overall multidimensional poverty status as regressors for subjective food insecurity.

We also incorporate variables capturing exposure to actual shocks and self-reported shocks, available for IOF19 and IOF22. These variables are included because households' experiences of shocks may influence how they report food security. For actual shocks, we consider drought intensity, wet-spell intensity, cyclone intensity, and conflict-related events. Drought and wet intensity are derived from Climate Hazards Infrared Precipitation with

[2] It appears that this limitation is caused partly by rare but important purchases, such as flour and grains, which are listed by households among the consumed items in the meal descriptions they provide, but do not appear in any of the modules regarding daily expenditures or consumption from own production. Moreover, consumption under-reporting seems to be more widespread among larger households than among smaller ones.

Stations (CHIRPS) rainfall estimates (Funk *et al*., 2015), using the Standardised Precipitation Index over six months (SPI-6) for drought and over three months (SPI-3) for excess rainfall. A household is coded as exposed if it resides in an area experiencing drought or excess wetness, and the corresponding SPI value is used as the intensity measure. Cyclone exposure is constructed by merging survey locations with historical cyclone tracks from the International Best Track Archive for Climate Stewardship (IBTrACS). A household is coded as exposed if a cyclone track passed within 100 km of its centroid during the relevant period, and wind-speed data are used to capture intensity (Knapp *et al*., 2010; Gahtan *et al*., 2024). Conflict exposure is measured using Armed Conflict Location and Event Data (ACLED), coding households as exposed if a conflict event occurred within 10 km of their centroid, supplemented by the number of events to capture intensity (Raleigh *et al*., 2023; ACLED, 2024).

As mentioned, self-reported shocks are also included. In IOF19 and IOF22, households were asked whether they experienced losses due to shocks in the previous 12 months, including drought, floods, cyclones, acute illness, COVID-19, death of a household member, and other less frequent events. Information on social transfers is also available for these waves. We use the amount received in social assistance programmes – both directly and interacted with actual shocks – to assess whether social protection mitigates subjective food insecurity. Finally, we include a variable capturing households' self-reported perception of whether their economic situation improved, worsened, or remained stable, as this may also influence how food security is reported. Descriptive statistics for the variables used in the analysis are presented in Table 2.

Table 2: Descriptive statistics for the variables used in the analysis

	2014/15			2019/20			2022		
Variable	**Obs.**	**Mean**	**SD**	**Obs.**	**Mean**	**SD**	**Obs.**	**Mean**	**SD**
How many meals did the household have yesterday?									
None	-			13342	0.01	0.07	15,382	0.01	0.07
One	-			13342	0.11	0.31	15,382	0.10	0.30
Two	-			13342	0.60	0.49	15,382	0.57	0.49
Three or more	-			13342	0.29	0.45	15,382	0.32	0.47
During the last month, the household had a diet that was:									
Less than adequate	31,942	0.40	0.49	13342	0.54	0.50	15,382	0.50	0.50
Adequate	31,942	0.57	0.49	13342	0.45	0.50	15,382	0.49	0.50
More than adequate	31,942	0.03	0.18	13342	0.01	0.10	15,382	0.01	0.10
In the last 12 months, in how many months did this household have food problems due to lack of money or other resources?	31,947	2.02	2.46	13342	3.23	2.71	15,383	2.85	2.50
Real consumption (MZN/person/day)	33,172	47.29	87.91	13300	66.69	123.98	15,382	68.03	96.07
Multidimensional poverty index	31,947	0.44	0.42	13342	0.43	0.42	15,383	0.42	0.42
Kilocalories (kcal/person/day)	32,356	1373.2	895.16	13222	1002.9	752.49	15,267	1069.9	812.31
Kilocalories (kcal/person/day), imputed	30,849	1849.7	868.96	12734	1964.4	1035.6	14,939	1643.5	902.98
Average log consumption, enumeration area	33,173	0.22	0.50	13343	-0.20	0.65	15,383	-0.13	0.56
How do you evaluate the household's economic situation compared to a year ago?									
Worse or much worse	31,939	0.26	0.44	13342	0.53	0.50	15,382	0.44	0.50
Same or don't know	31,939	0.48	0.50	13342	0.35	0.48	15,382	0.44	0.50
Better or much better	31,939	0.27	0.44	13342	0.12	0.32	15,382	0.13	0.33
Household head's gender (man=0; woman=1)	32,298	0.24	0.43	13302	0.24	0.43	15,380	0.25	0.43
Household head's education									
No education	33,173	0.31	0.46	13302	0.49	0.50	15,380	0.46	0.50
Primary, 1st cycle (5 years)	33,173	0.38	0.48	13302	0.18	0.38	15,380	0.18	0.38
Primary, 2nd cycle (7 years)	33,173	0.15	0.36	13302	0.18	0.38	15,380	0.18	0.39

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	2014/15			2019/20			2022		
Secondary, 1st cycle (10 years)	33,173	0.09	0.29	13302	0.06	0.23	15,380	0.07	0.25
Secondary, 2nd cycle (12 years)	33,173	0.04	0.21	13302	0.06	0.24	15,380	0.07	0.25
Tertiary	33,173	0.02	0.15	13302	0.04	0.19	15,380	0.04	0.20
Household head's age	32,281	43.83	14.14	13,302	43.11	14.62	15,291	43.06	14.63
Household size	33,173	6.21	2.94	13,343	6.05	2.84	15,383	5.72	2.48
Access to durable goods (no=0; yes=1)	33,023	0.49	0.50	13,343	0.58	0.49	15,383	0.63	0.48
Safe water (no=0; yes=1)	33,140	0.47	0.50	13,343	0.50	0.50	15,383	0.46	0.50
Quality sanitation (no=0; yes=1)	33,140	0.70	0.46	13,343	0.68	0.47	15,383	0.67	0.47
Roof quality (no=0; yes=1)	33,140	0.57	0.50	13,343	0.52	0.50	15,383	0.50	0.50
Access to electricity (no=0; yes=1)	33,140	0.71	0.45	13,343	0.68	0.47	15,383	0.64	0.48
Rural	33,173	0.68	0.47	13,343	0.65	0.48	15,383	0.66	0.48
Region (1=North, 2=Centre, 3=South)	31,947	1.90	0.75	13,343	1.85	0.74	15,383	1.85	0.74
Month of interview	-			13,302	6.99	3.40	15,380	6.03	3.38
Value received in social transfers	-			13,342	47.37	391.25	15,383	128.32	1059.0
Drought intensity (SPI-6)	-			13,343	0.29	0.53	15,383	0.22	0.48
Wet intensity (SPI-3)	-			13,343	0.10	0.36	15,383	0.63	0.69
Windspeed (cyclone)	-			13,343	0.00	0.00	15,383	1.46	8.37
Number of conflict-related events	-			13,343	0.06	0.37	15,383	0.09	0.53
Exposure to COVID-19 (self-reported)	-			13,342	0.00	0.00	15,383	0.03	0.17
Exposure to drought (self-reported)	-			13,342	0.21	0.41	15,382	0.16	0.37
Exposure to flood (self-reported)	-			13,342	0.11	0.32	15,382	0.17	0.38
Exposure to cyclone (self-reported)	-			13,342	0.08	0.27	15,382	0.15	0.36
Acute illness (self-reported)	-			13,342	0.00	0.07	15,382	0.01	0.08
Death of a household member (self-reported)	-			13,342	0.01	0.08	15,382	0.01	0.08

Note: Consumption poverty rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Multidimensional poverty rates are computed using the Alkire-Foster method, but using a nationally defined set of multidimensional poverty indicators, as in DEEF (2016) and DNPED (forthcoming). Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

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3.2 Methodology

In the following sections, the empirical analysis proceeds in three steps. First, we examine the prevalence of the self-reported food insecurity indicators across survey rounds and geographic areas, comparing their evolution with trends in consumption, consumption-based poverty, recorded and imputed calorie intake, and multidimensional poverty. To facilitate comparison (including visually), the self-reported indicators are transformed into binary variables. Specifically, for the number of meals, we construct a binary variable equal to one if the household reports consuming fewer than three meals the previous day; for dietary adequacy, we define a binary indicator equal to one if the household perceives the quality of its diet or meals as inadequate; and for the number of months with food problems, we create a binary variable equal to one if the household experienced food problems in more than one month. This first step assesses whether subjective indicators follow the same broad trajectory as standard poverty and food security measures. Second, using these binary indicators, we compute the correlations between the three self-reported food insecurity measures and the standard welfare, poverty, and food security indicators described earlier. These correlation coefficients – together with their statistical significance – are presented and discussed for different sub-populations. Finally, we analyse the selected self-reported food insecurity indicators within a multivariate framework.

Because the original variables are ordered categorical measures, we estimate ordered probit models to examine their association with the regressors described in Section 3.1. As a robustness check, we also estimate probit models using the binary transformations of the indicators. To further examine the divergence between subjective and objective measures, we classify households into four groups: (i) neither food insecure nor poor; (ii) poor but not food insecure; (iii) food insecure but not poor; and (iv) both food insecure and poor. We then estimate a multinomial logit model, using the same set of explanatory variables described above, to identify the determinants of membership in each group, with particular attention to the two mismatch categories: households that are food insecure but not poor, and those that are poor but not food insecure.

4 Results

In this section, we first present the prevalence of the self-reported food insecurity indicators at the national level and across survey rounds. Table 3 panel (a) reports the distribution of the number of meals consumed the day before the interview—an indicator available only from 2019/20 onward. Several patterns emerge. First, the share of individuals reporting fewer than three meals declined slightly between 2019/20 and 2022, while the proportion reporting three or more meals increased, as expected. Although not shown, poor households are disproportionately represented among those consuming none, one, or two meals per day: in both 2019/20 and 2022, between 70% and 80% of individuals reporting zero, one, or two meals are classified as poor using the consumption aggregate and national poverty line. This share falls to roughly 50% among those reporting three or more meals.

Table 3 panel (b) presents the percentage of individuals reporting the adequacy of their diet over the previous month for the period 2014/15–2022. The results closely mirror national trends in consumption-based poverty: a marked deterioration between 2014/15 and 2019/20, followed by a partial recovery between 2019/20 and 2022. Specifically, the share of individuals reporting that their diet was less than adequate rises sharply between 2014/15 and 2019/20, before declining modestly in 2022. A similar pattern emerges when examining the number of months in which households experienced food problems due to lack of money or other resources (Table 3 panel (c)). The share of individuals reporting no food problems (zero months) falls by more than half between 2014/15 and 2019/20, then increases again (albeit modestly) between 2019/20 and 2022. Conversely, the proportion reporting food problems in one or more months rises substantially between 2014/15 and 2019/20 and then declines between 2019/20 and 2022, with the largest reductions observed among those experiencing food problems for seven to nine months.

Table 3: Percentage of people declaring the number of meals had on the day before, the adequacy of their diet in the past month, and the number of months in which they had food problems due to lack of money or other resources, with statistical significance, 2014/15–2022

	2014/15	2019/20	2022
How many meals did the household have yesterday?			
None	-	0.54	0.50
One	-	10.81	10.06
Two	-	59.72	57.41**
Three or more	-	28.94	32.03***
During the last month, the household had a diet that was:			
Less than adequate	40.11	54.25***	50.25***
Adequate	56.72	44.83***	48.81***
More than adequate	3.17	0.92***	0.95
In the last 12 months, in how many months did this household have food problems due to lack of money or other resources?			
0	30.23	13.16***	16.09**
1	16.38	11.56***	11.05
2	24.37	20.65***	23.05**
3	16.19	21.65***	23.77*
4	5.21	11.11***	10.07
5	2.03	6.77***	5.63*
6	1.07	4.14***	3.25*
7	0.53	2.81***	1.84***
8	0.14	2.45***	0.98***
9	0.09	1.44***	0.51***
10	0.05	0.48***	0.56
11	0.51	0.41	0.34
12	3.20	3.37	2.86

Note: Statistical significance with respect to the comparison with previous year. * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations using 2014/15, 2019/20, and 2022 IOF data.

Next, we present the prevalence of the self-reported food insecurity indicators – transformed into binary variables – across survey rounds, geographic areas, consumption quintiles, consumption poverty status, calorie intake, multidimensional poverty, and other household characteristics, including the gender of the household head, exposure to actual shocks, self-reported exposure to shocks, and receipt of social transfers. These patterns are shown in Figure 1, Figure 2, and Figure 3, corresponding respectively to: (i) whether the household consumed fewer than three meals; (ii) whether the household perceived its diet or meals as inadequate; and (iii) whether the household experienced food problems in more than one month.

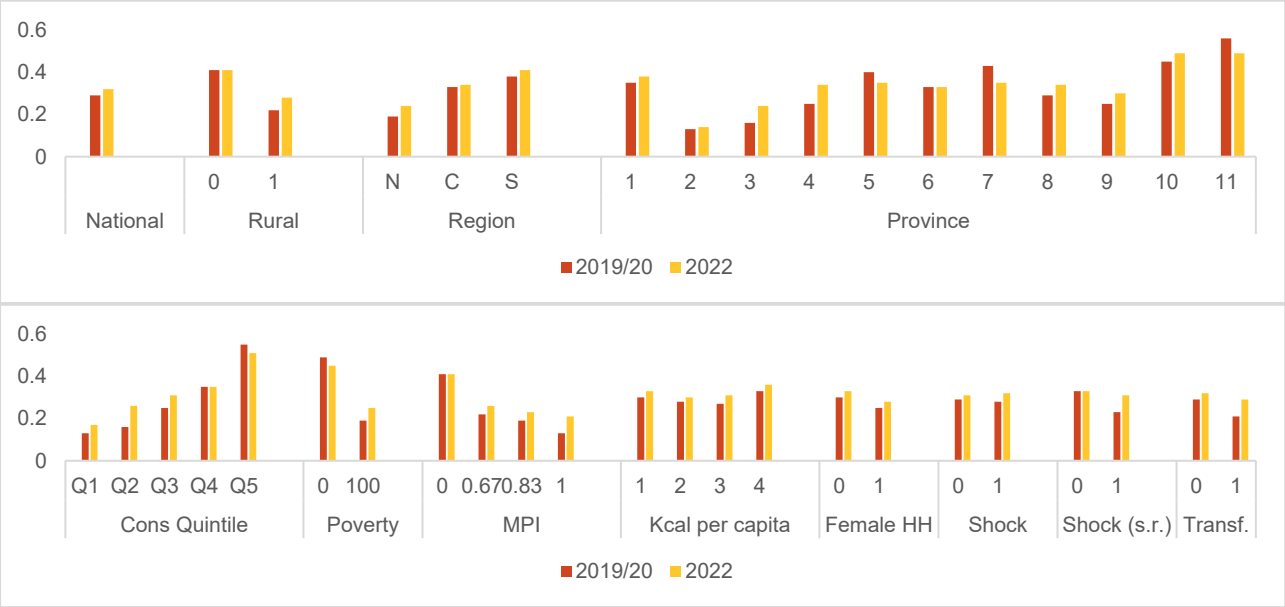
At the urban–rural level, all three indicators deteriorate between 2014/15 and 2019/20 in both areas, although rural households begin from substantially higher levels of self-reported deprivation. A modest improvement is visible in 2022, which is somewhat more pronounced in rural areas. A similar dynamic emerges across regions: the northern and central provinces consistently report higher levels of self-reported food insecurity, all regions experience worsening conditions in 2019/20 relative to 2014/15, and all show partial recovery in 2022, with the improvement strongest in the North. At the provincial level, the sharpest deteriorations in diet adequacy between 2014/15 and 2019/20 are observed in Cabo Delgado, Nampula, Manica, Sofala, Maputo Province, and Maputo City. However, recovery in 2022 is evident only in Nampula and Maputo City, while several provinces (Niassa, Cabo Delgado, Tete, Inhambane, and Gaza) continue to report worsening diet adequacy. Most provinces also show a substantial increase in the share of individuals experiencing food problems in more than one month between 2014/15 and 2019/20, followed by signs of improvement in 2022 everywhere except Tete and Cabo Delgado.[3]

Self-reported food insecurity worsens and then partially improves across all consumption quintiles, among both poor and non-poor households, and among multidimensionally poor and non-poor households. However, the differences in levels of self-reported deprivation across these groups are striking. Lower-quintile, consumption-poor, and multidimensionally poor households consistently report much higher levels of food insecurity. By contrast, differences across calorie intake groups are relatively small. With respect to the gender of the household head, individuals in female-headed households report lower numbers of meals and poorer diet adequacy, indicating a gendered dimension of food insecurity. Differences in self-reported food insecurity between individuals exposed and not exposed to actual shocks (drought, flood, cyclone, and conflict) are relatively modest. In contrast, much larger differences emerge when comparing individuals who self-report exposure to shocks with those who do not. Those reporting exposure to drought, floods, cyclones, acute illness, COVID-19, or the death of a household member are significantly more likely to report having eaten fewer meals, having had an inadequate diet, and having experienced food problems in

[3] For Cabo Delgado this is likely linked to the ongoing conflict in the region, while in Tete this has likely to do with the slowing down of coal mining activities.

more than one month. Differences also appear between beneficiaries and non-beneficiaries of social transfers, particularly regarding the number of meals consumed and diet adequacy.

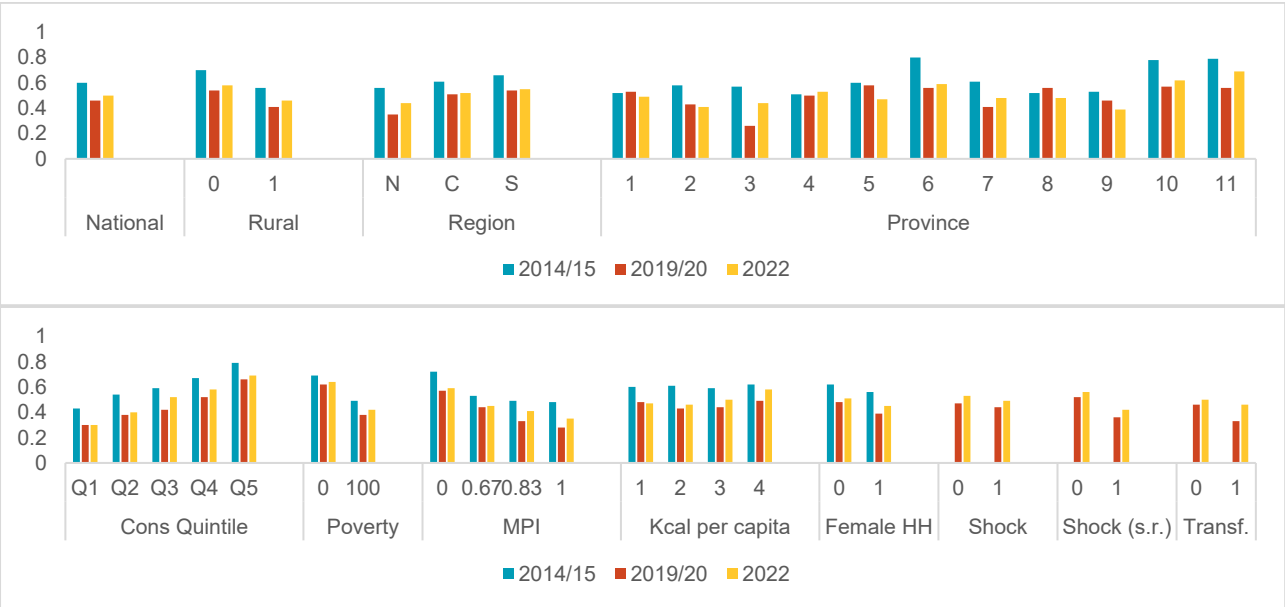
Figure 1: Percentage of people who report consuming fewer than three meals on the day before, 2019/20–2022



Note: Regions: N=North, C=Centre, S=South. Provinces: 1=Niassa, 2=Cabo Delgado, 3=Nampula, 4=Zambezia, 5=Tete, 6=Manica, 7=Sofala, 8=Inhambane, 9=Gaza, 10=Maputo Province, 11= Maputo City. Consumption poverty rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Multidimensional poverty rates are computed using the Alkire-Foster method, but using a nationally defined set of multidimensional poverty indicators, as in DEEF (2016) and DNPED (forthcoming). MPI=Multidimensional Poverty Index. Kcal *per capita*: 1=<500 kcal per person per day, 2=500–1,000 kcal per person per day, 3=1,000–1,800 kcal per person per day, 4=>1,800 kcal per person per day. Shock: having been exposed to at least one of the shocks considered (drought, flood, cyclone, conflict). Shock (s.r.): self-reported exposure to any of the self-reported shocks considered (drought, flood, cyclone, acute illness, COVID-19, death of a household member). Transf.: having received a social transfer.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

Figure 2: Percentage of people perceiving the quality of the diet/meals as inadequate, 2014/15–2022

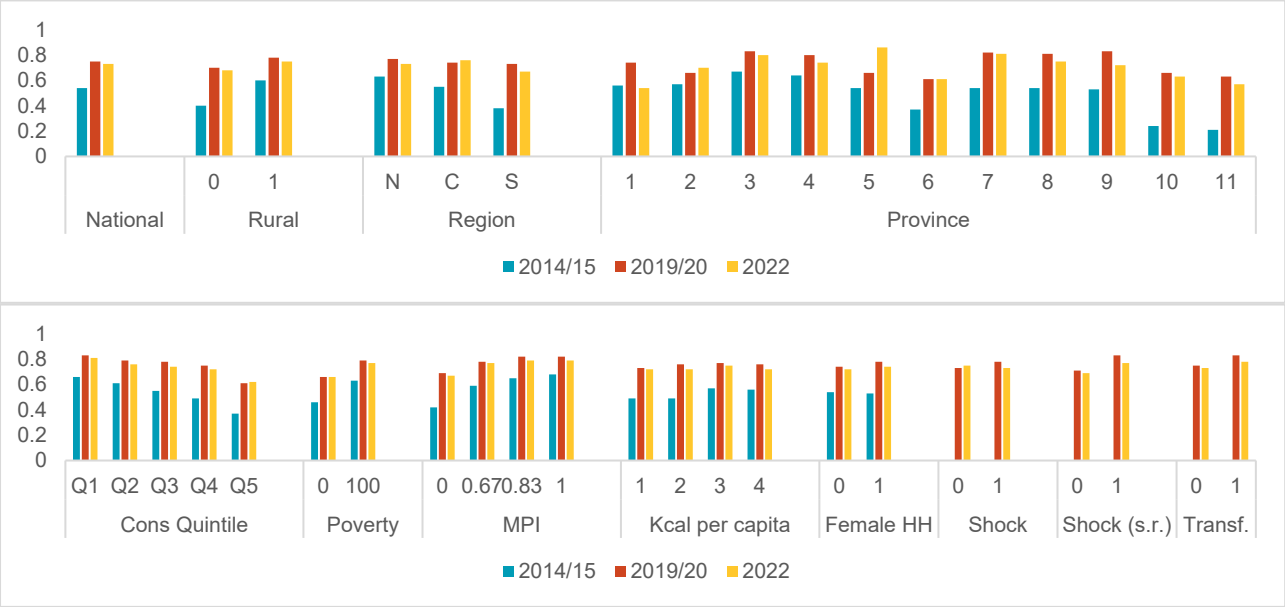


Note: Regions: N=North, C=Centre, S=South. Provinces: 1=Niassa, 2=Cabo Delgado, 3=Nampula, 4=Zambezia, 5=Tete, 6=Manica, 7=Sofala, 8=Inhambane, 9=Gaza, 10=Maputo Province, 11= Maputo City. Consumption poverty

rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Multidimensional poverty rates are computed using the Alkire-Foster method, but using a nationally defined set of multidimensional poverty indicators, as in DEEF (2016) and DNPED (forthcoming). MPI=Multidimensional Poverty Index. Kcal *per capita*: 1=<500 kcal per person per day, 2=500–1,000 kcal per person per day, 3=1,000–1,800 kcal per person per day, 4=>1,800 kcal per person per day. Shock: having been exposed to at least one of the shocks considered (drought, flood, cyclone, conflict). Shock (s.r.): self-reported exposure to any of the self-reported shocks considered (drought, flood, cyclone, acute illness, COVID-19, death of a household member). Transf.: having received a social transfer.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

Figure 3: Percentage of people reporting to have experienced food problems in more than one month, 2014/15–2022



Note: Regions: N=North, C=Centre, S=South. Provinces: 1=Niassa, 2=Cabo Delgado, 3=Nampula, 4=Zambezia, 5=Tete, 6=Manica, 7=Sofala, 8=Inhambane, 9=Gaza, 10=Maputo Province, 11= Maputo City. Consumption poverty rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Multidimensional poverty rates are computed using the Alkire-Foster method, but using a nationally defined set of multidimensional poverty indicators, as in DEEF (2016) and DNPED (forthcoming). MPI=Multidimensional Poverty Index. Kcal *per capita*: 1=<500 kcal per person per day, 2=500–1,000 kcal per person per day, 3=1000–1,800 kcal per person per day, 4=>1,800 kcal per person per day. Shock: having been exposed to at least one of the shocks considered (drought, flood, cyclone, conflict). Shock (s.r.): self-reported exposure to any of the self-reported shocks considered (drought, flood, cyclone, acute illness, COVID-19, death of a household member). Transf.: having received or not a social transfer.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

We also present the pairwise correlations between the three self-reported food insecurity indicators and the standard welfare, poverty, and food security measures described earlier. These correlation coefficients, together with their statistical significance, are reported in Table 4. The results show that both the number of meals and the adequacy of the diet are positively correlated with household consumption and negatively correlated with consumption-based and multidimensional poverty status. Correlation coefficients range from 0.20 to 0.30 in absolute value, indicating a moderate – although far from perfect – alignment between self-reported food security and consumption-based or multidimensional welfare measures. By contrast, the correlations with caloric intake, whether recorded or imputed, are much weaker. The number of months in which households report experiencing food problems is negatively correlated with consumption and positively correlated with consumption and multidimensional poverty status, as expected, although the magnitudes

are slightly smaller than for the other indicators. The three self-reported food insecurity indicators are also correlated with one another, with coefficients ranging from 0.19 to 0.31 in absolute value.

It is important to note that the alignment between subjective food insecurity and objective welfare indicators varies across sub-populations. Urban and rural households, households in different regions, and households with distinctive characteristics or shock exposures exhibit distinct patterns of association. These differences likely reflect heterogeneity in exposure to shocks, coping strategies, expectations, and reporting behaviour, meaning that aggregate correlations may mask substantial variation in how households experience and report food insecurity. Although not shown, the correlations tend to be stronger in rural than in urban areas, stronger in some relatively better-off provinces than in poorer ones, and stronger among poor than among non-poor households.

Table 4: Pairwise correlations between self-reported food security indicators and standard welfare/poverty/food security indicators

Variables	Number of meals	Diet adequacy	Months with food problems	Log cons./z	Cons. poverty rate	Multidim. poverty rate	Kcal pc	Kcal pc (imputed)
Number of meals	1.000							
Diet adequacy	0.290*	1.000						
Months with food problems	-0.191*	-0.312*	1.000					
Log cons./z	0.258*	0.299*	-0.215*	1.000				
Cons. poverty rate	-0.216*	-0.238*	0.173*	-0.748*	1.000			
Multidim. poverty rate	-0.220*	-0.226*	0.123*	-0.334*	0.262*	1.000		
Kcal pc	0.019*	0.012*	-0.029*	0.285*	-0.300*	0.258*	1.000	
Kcal pc (imputed)	0.057*	0.040*	-0.032*	0.215*	-0.232*	0.112*	0.569*	1.000

Note: Consumption poverty rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Multidimensional poverty rates are computed using the Alkire-Foster method, but using a nationally defined set of multidimensional poverty indicators, as in DEEF (2016) and DNPED (forthcoming). Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

Next, we present the results from the ordered probit regressions estimated on: (i) the number of meals consumed the day before the interview (zero, one, two, or three or more); (ii) the perceived adequacy of the household's diet during the previous month (less than adequate, adequate, or more than adequate); and (iii) the number of months in the previous year in which the household experienced food problems due to lack of money or other resources (ranging from zero to 12). The main results are reported in Table 5 and Figure 4. Marginal effects are presented in Figure 5 and in the Appendix (Table A.3). In these regressions, we include recorded caloric intake *per capita* (rather than the imputed measure) and the individual multidimensional poverty indicators (rather than the composite multidimensional poverty status). For each ordered probit model, we present two specifications: one excluding actual and self-reported shocks (available only after 2014/15) and one including them. This explains the difference in the number of observations across columns 3–5 and 4–6 of the table. Alternative specifications using imputed caloric intake instead of recorded intake, and using multidimensional poverty status instead of the individual indicators, are reported in the Appendix (Table A.1). The Appendix also presents probit regressions estimated on the binary versions of the three food security indicators as an additional robustness check (Table A.2). Marginal effects for the probit specification are also presented in the Appendix (Table A.4).

Household consumption emerges as a strong correlate of all self-reported food insecurity indicators. Caloric intake is also significantly associated with the number of meals and the number of months with food problems, suggesting that perceived food security is intricately linked to overall household economic resources and, to some extent, to measured caloric availability. When imputed caloric intake is used instead of recorded intake, the association between caloric intake and diet adequacy also becomes statistically significant (results not shown). Geographic controls and household characteristics – including the education of the household head, household size, and residence in rural or urban areas and in the northern, central, or southern regions – are all significantly associated with the self-reported food insecurity indicators. Household head gender also matters. Individuals in female-headed households are less likely to report an adequate or more than adequate diet. Among the multidimensional poverty indicators, ownership of basic durable goods and access to improved sanitation are the variables most consistently associated with all three self-reported food insecurity measures. Access to electricity is statistically significant only in the regression on the number of meals.[4]

When measures of exposure to objectively measured climate- and conflict-related shocks (drought intensity, wet-spell intensity, cyclone-related wind speed, and conflict events), which are available only after 2014/15, are included, they are generally not statistically significant predictors of self-reported food insecurity. The only exception is drought intensity, which is negatively associated with perceived diet adequacy, as expected. By

[4] Note that, as described, this variable is only available after 2014/15.

contrast, self-reported exposure to shocks is more consistently and strongly associated with the food insecurity indicators. Self-reported exposure to drought is linked to a lower probability of consuming more meals, a lower probability of reporting an adequate or more than adequate diet, and a higher probability of experiencing food problems in a larger number of months. Self-reported exposure to cyclones is also associated with lower perceived diet adequacy, while self-reported exposure to floods, COVID-19, and the death of a household member are associated with experiencing food problems in more months. This divergence between actual and self-reported shocks likely reflects the fact that subjective reports capture the severity of shocks as experienced by households, including dimensions not fully captured by objective indicators. Households' self-reported perception of whether their economic situation improved, worsened, or remained stable also consistently affects reported food security. Reporting an improvement relative to the previous year is associated with consuming more meals, perceiving the diet as adequate, and experiencing food problems in fewer months. This reinforces the idea that subjective food insecurity is shaped not only by current deprivation but also by expectations, perceived vulnerability, and psychological dimensions of wellbeing—factors not fully captured by standard welfare indicators.

Finally, social transfers do not appear to be statistically associated with improved perceived food security. The coefficient on transfers is almost never significant, whether included alone or interacted with shock exposure. This suggests that, while transfers may support household livelihoods, they may be too small or insufficiently targeted to influence self-reported food security. The only exception is a positive and statistically significant interaction between transfers and drought intensity in the diet-adequacy regression, suggesting a potential mitigating effect of transfers in the face of severe drought. Overall, social protection appears to function more as shock-responsive support than as a structural mechanism for reducing perceived food insecurity.

Table 5: Ordered probit regression on number of meals had on the day before, adequacy of the diet in the past month, and number of months with food problems due to lack of money or other resources, 2014/15–2022

	1	2	3	4	5	6
Dependent variable	**Number of meals**	**Number of meals**	**Diet adequacy**	**Diet adequacy**	**Months with food problems**	**Months with food problems**
Log consumption/poverty line	.339***	.348***	.266***	.302***	-.164***	-.185***
Kilocalories (kcal/person/day)	0***	0***	0	0	0***	0***
Average consumption enumeration area	-.037	-.035	.055*	.014	-.088***	-.061
Same economic situation	.246***	.245***	.622***	.758***	-.463***	-.508***
Better economic situation	.483***	.489***	.949***	.966***	-.609***	-.757***
Female household head	-.043*	-.042*	-.055***	-.067**	.035**	.032
HH educ. Primary, 1st cycle (5 years)	.117***	.12***	.089***	.094***	-.02	-.036
HH educ. Primary, 2nd cycle (7 years)	.145***	.144***	.1***	.131***	-.026	-.056**
HH educ. Secondary, 1st cycle (10 years)	.182***	.177***	.165***	.202***	-.062**	-.101**
HH educ. Secondary, 2nd cycle (12 years)	.321***	.313***	.176***	.232***	-.132***	-.126***
HH educ. Tertiary	.656***	.639***	.231***	.308***	-.254***	-.256***
Household head's age	.004	.004	0	0	.004	.001
Household head's age squared	0	0	0	0	0	0
Household size	.124***	.126***	.048***	.036**	-.02***	-.018**
Household size squared	-.004***	-.004***	-.002***	-.001	.001***	.001***
Access to durable goods	-.067**	-.064**	-.11***	-.179***	.109***	.123***
Safe water	.009	.004	-.068**	-.063*	.05**	.039
Quality sanitation	-.073**	-.076**	-.088***	-.135***	.108***	.121***
Roof quality	.003	.005	-.128***	-.043	.049**	.018
Access to electricity	-.114***	-.1***	-.057	.052	.013	-.091
Urban: Centre	.327***	.34***	.2***	.16**	-.11**	.114*
Urban: South	.342***	.358***	.066	-.001	-.141***	.24***
Rural: North	-.004	.005	.162***	-.084	-.148***	-.038
Rural: Centre	.286***	.299***	.188***	.16**	-.138***	.062
Rural: South	.317***	.341***	.02	.121	.123**	.384***

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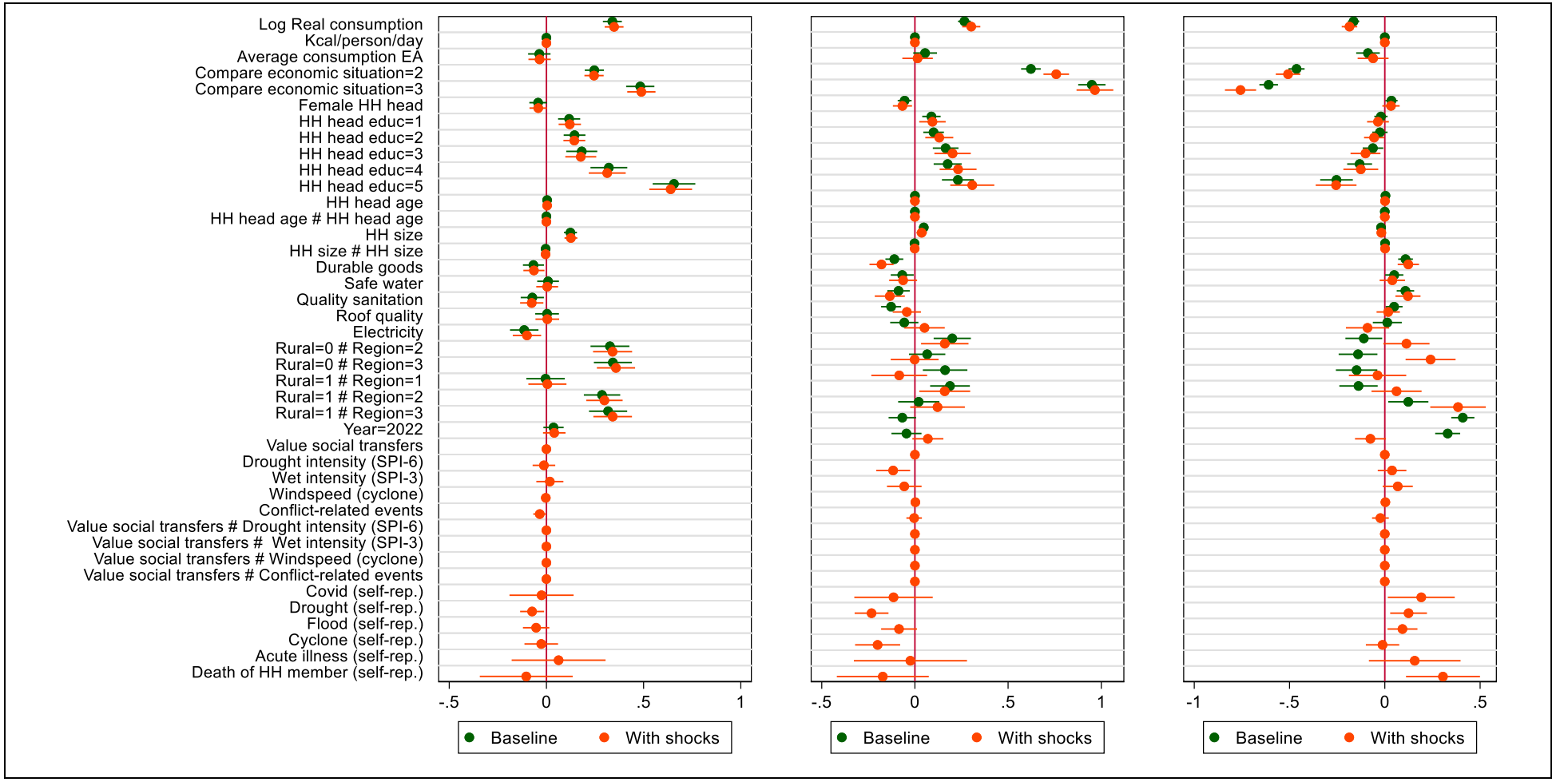
	1	2	3	4	5	6
2019			-.067*		.409***	
2022	.037	.04	-.045	.07	.33***	-.076*
Value received in social transfers		0		0		0
Drought intensity (SPI-6)		-.013		-.117**		.038
Wet intensity (SPI-3)		.018		-.057		.068*
Windspeed (cyclone)		-.003		.003		.003
Number of conflict-related events		-.034**		-.004		-.023
Social transfers * Drought intensity (SPI-6)		0		0***		0
Social transfers * Wet intensity (SPI-3)		0		0		0
Social transfers * Windspeed (cyclone)		0		0		0
Social transfers * Conflict-related events		0		0		0
Exposure to COVID-19 (self-rep.)		-.025		-.115		.191**
Exposure to drought (self-rep.)		-.074**		-.233***		.125**
Exposure to flood (self-rep.)		-.053		-.085*		.093**
Exposure to cyclone (self-rep.)		-.027		-.2***		-.012
Acute illness (self-rep.)		.063		-.024		.157
Death of a household member (self-rep.)		-.104		-.172		.305***
Observations	28417	28417	59560	28417	59564	28417

Note: Coefficients associated with the months of interview are not displayed. Self-rep.=Self-reported. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

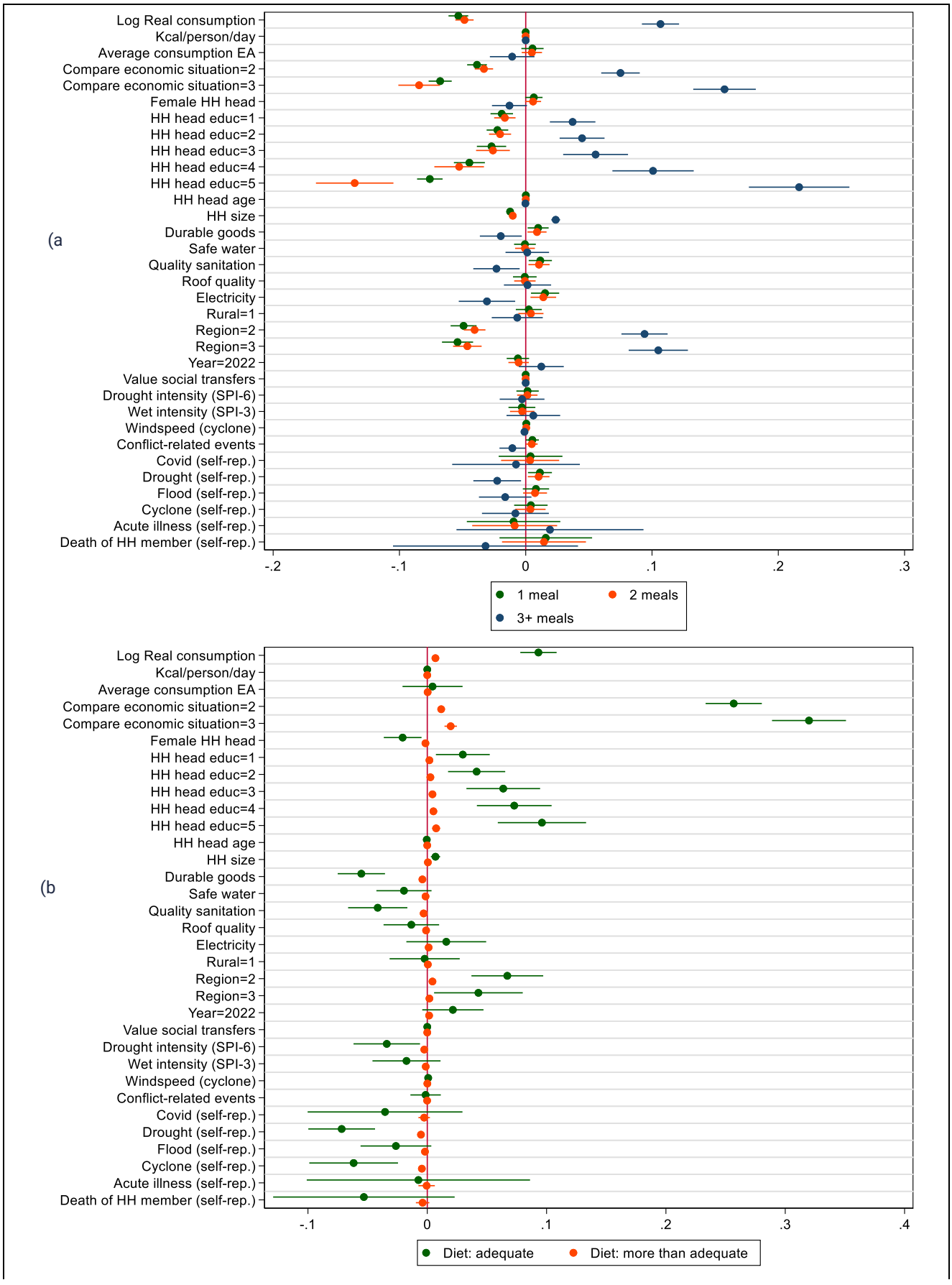
Figure 4: Coefficient plots from ordered probit regression on number of meals had on the day before, adequacy of the diet in the past month, and number of months with food problems due to lack of money or other resources, 2014/15–2022

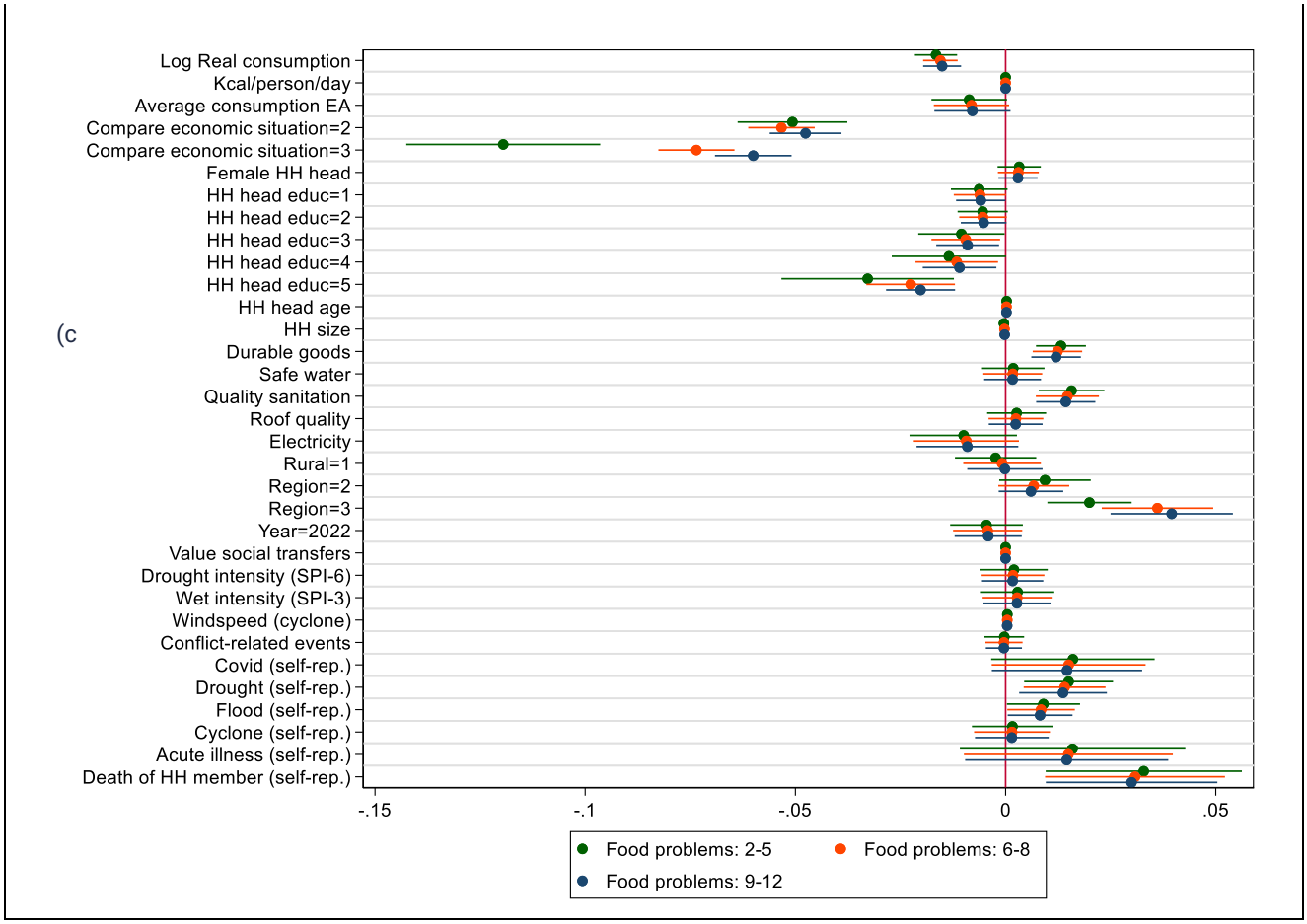


Note: Coefficients associated with the months of interview are not displayed. Self-rep.=Self-reported.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

Figure 5: Coefficient plots (marginal effects) from ordered probit regression on number of meals had on the day before (panel a), adequacy of the diet in the past month (panel b), and number of months with food problems due to lack of money or other resources (panel c), 2014/15–2022





Note: Coefficients associated with the months of interview are not displayed. Self-rep.=Self-reported. Base category for number of meals had on the day before (panel a) is zero meals; base category for adequacy of the diet in the past month (panel b) is less than adequate diet; base category for the number of months with food problems (panel c) is food problems in at most one month.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

As outlined in Section 3.2, we further explore the divergence between subjective and objective measures of welfare by estimating a multinomial logit model using the same set of explanatory variables described above. Households are first classified into four categories: (1) neither food insecure nor poor; (2) poor but not food insecure; (3) food insecure but not poor; and (4) both food insecure and poor. The multinomial logit model is then used to examine the determinants of membership in each category, with particular attention to the two mismatch groups, i.e. households that are food insecure but not poor, and those that are poor but not food insecure. Table 6 presents the results for the classification based on consumption poverty. We also estimate an analogous model using the four categories relative to food insecurity and multidimensional poverty status, instead of consumption poverty status; these results are reported in the Appendix (Table A.5).

As shown in Table 6, most variables that were statistically significant in the ordered probit regressions retain their significance in the multinomial logit framework. However, focusing on the two mismatch categories reveals several noteworthy differences. For instance, access to quality roofing and electricity is specifically associated with a higher likelihood of being poor but still able to consume at least three meals per day. Conversely, residing in either rural or urban areas of the southern region is specifically associated with a higher likelihood of consuming fewer than three

meals per day despite not being consumption-poor. This pattern is plausible: the South is the least poor region but also the most urbanised and the least reliant on own-production for food, making households more vulnerable to market-driven food access constraints. Additional heterogeneity emerges when considering diet adequacy. Being in a female-headed household, having access to improved sanitation and electricity, and living in urban areas of the Centre and South are all associated with a higher likelihood of reporting an inadequate diet despite not being consumption-poor. By contrast, self-reported exposure to drought, floods, and cyclones is associated with a higher likelihood of reporting an adequate diet while being consumption-poor. This divergence between actual and self-reported shocks again suggests that subjective shock measures capture dimensions of hardship not fully reflected in objective indicators. With respect to the number of months with food problems, the binary variable considered is food problems in at most one month, and the base category in this case is the category (4) both food insecure and poor. Here as well, as in the case of adequate diet, living in a female-headed household, having quality roofing and electricity, and living in the urban areas of the Centre and South are all specifically associated with reporting an inadequate diet despite not being consumption-poor. Marginal effects for the multinomial logit regression are displayed in Figure 6, only focusing on the mismatch categories (2) poor but not food insecure, and (3) food insecure but not poor.

Table 6: Multinomial logit regression on number of meals, diet adequacy, and months with food problems, on the categories (1) not food insecure and not poor, (2) poor but not food insecure, (3) food insecure but not poor, and (4) both food insecure and poor, 2014/15–2022

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Categories (1: not food insecure and not poor; 2: poor but not food insecure; 3: food insecure but not poor; 4: both food insecure and poor)	2	3	4	2	3	4	1	2	3
Dependent variable	Number of meals	Number of meals	Number of meals	Diet adequacy	Diet adequacy	Diet adequacy	Months with food problems	Months with food problems	Months with food problems
Kilocalories (kcal/person/day)	-.001***	0*	-.001***	-.001***	0***	-.001***	.001***	0	.001***
Average consumption enumeration area	-2.491***	-.211***	-2.757***	-2.445***	-.109	-2.769***	2.727***	.232**	2.574***
Same economic situation	.062	-.246***	-.359***	.022	-1.304***	-1.327***	1.113***	1.03***	0.067
Better economic situation	-.24**	-.683***	-1.191***	-.396***	-1.704***	-2.015***	1.952***	1.464***	.459***
Female household head	.116	.023	.278***	.154**	.053	.335***	-.188**	-0.024	-.238***
HH educ. Primary, 1st cycle (5 years)	-.258**	-.293***	-.504***	-.249***	-.158	-.406***	.369***	.159*	.261***
HH educ. Primary, 2nd cycle (7 years)	-.434***	-.376***	-.678***	-.361***	-.239**	-.612***	.494***	.177**	.393***
HH educ. Secondary, 1st cycle (10 years)	-.561***	-.48***	-.813***	-.466***	-.465***	-.833***	.656***	.237**	.459***
HH educ. Secondary, 2nd cycle (12 years)	-1.446***	-.888***	-1.809***	-1.357***	-.741***	-1.627***	1.617***	0.213	1.134***
HH educ. Tertiary	-1.998***	-1.382***	-3.048***	-2.064***	-1.051***	-2.673***	2.584***	0.255	1.811***
Household head's age	.004	-.001	-.002	.005	0	-.002	-0.012	-.017*	-0.002
Household head's age squared	0	0	0	0	0	0	0	0	0
Household size	.509***	-.194***	.473***	.555***	-.09***	.565***	-.614***	0.031	-.589***
Household size squared	-.017***	.006***	-.018***	-.021***	.002	-.021***	.022***	-0.003	.022***
Access to durable goods	1.143***	.17**	1.288***	1.084***	.338***	1.488***	-1.32***	-.238***	-1.164***
Safe water	.078	.049	.103	.082	.185*	.212**	-0.064	-0.074	-0.089
Quality sanitation	.579***	.259***	.668***	.388***	.141	.714***	-.64***	-.296***	-.542***
Roof quality	.521***	-.032	.63***	.752***	.325***	.775***	-.689***	-0.021	-.604***
Access to electricity	.347***	.136	.568***	.478***	-.007	.383***	-.533***	0.006	-.387***
Urban: Centre	.502***	-.424***	-.106	.423***	-.133	.045	-.276*	-0.052	-.32***
Urban: South	.567***	-.261**	.087	.429***	.127	.404***	-0.233	-0.074	-.469***
Rural: North	-.085	.202	-.07	-.153	.168	-.094	.363*	0.213	0.202
Rural: Centre	-.189	-.253*	-.73***	-.313**	-.21	-.729***	.496***	0.066	.412***
Rural: South	.13	-.288**	-.358**	.112	-.012	-.24	0.096	-0.21	-0.031

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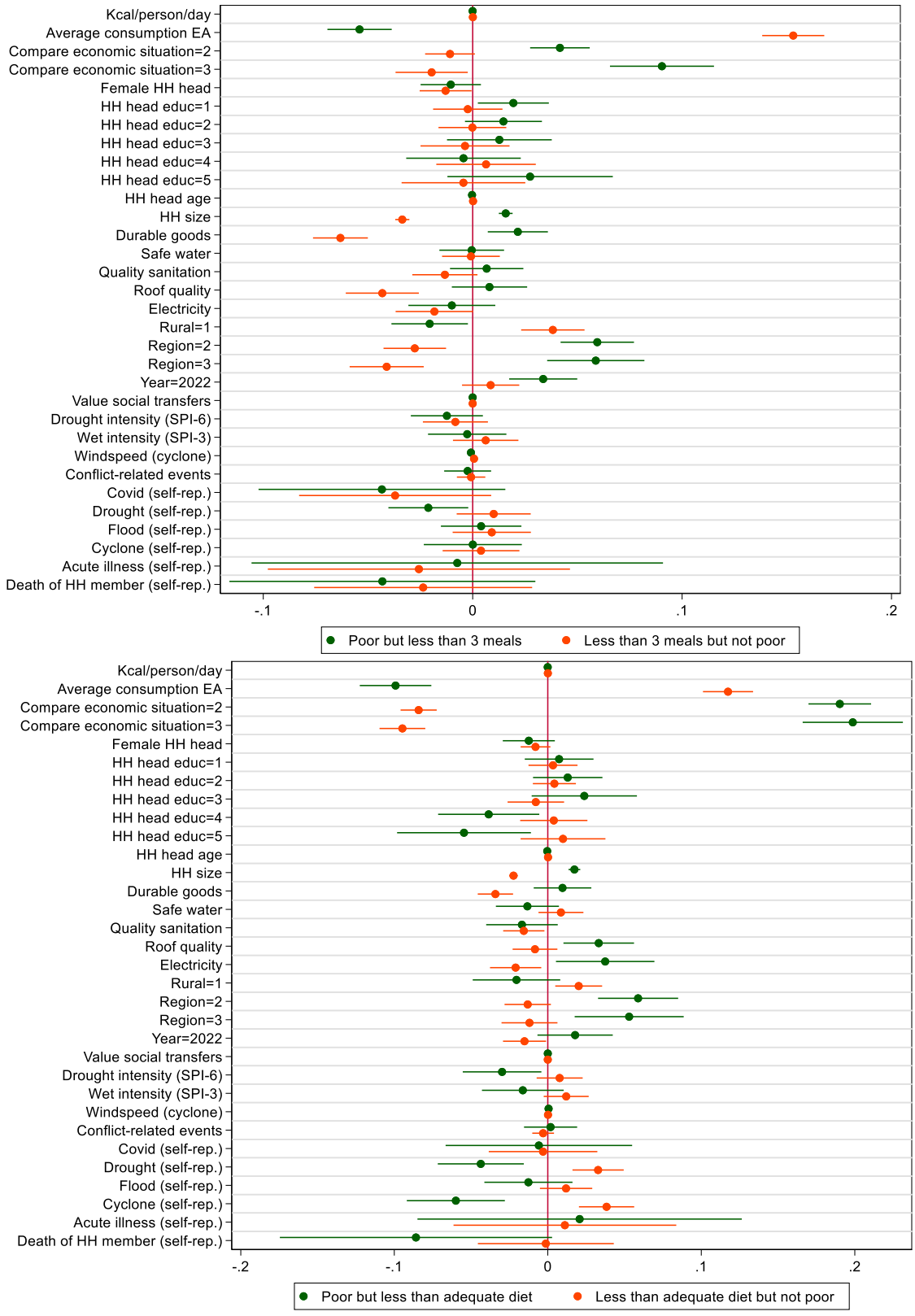
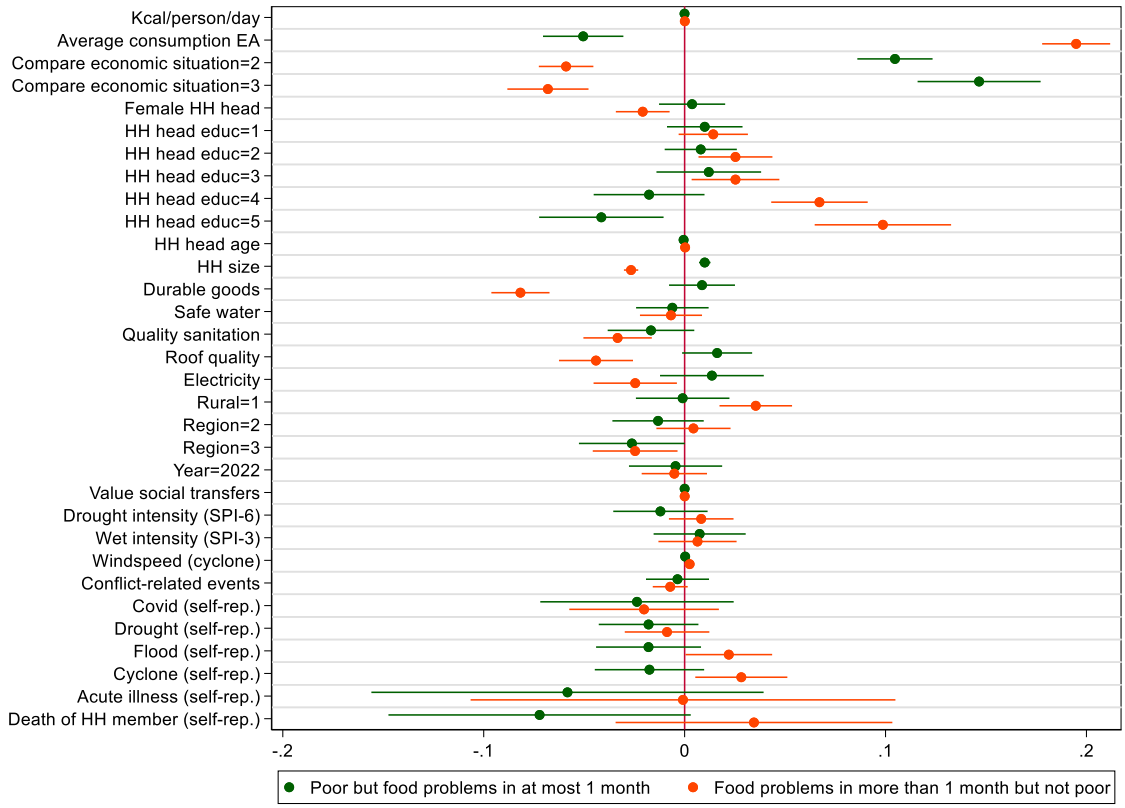
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2022	.414***	.196**	.136	.079	-.159*	-.014	-0.17	-0.074	-0.113
Value received in social transfers	0	0	0	0	0	0	0	0	0
Drought intensity (SPI-6)	-.17*	-.13	-.049	-.07	.121	.153	-0.106	-0.114	0.002
Wet intensity (SPI-3)	-.106	-.008	-.1	-.086	.12	-.002	0.167	0.106	0.122
Windspeed (cyclone)	-.008	.004	-.002	-.005	-.003	-.011	0.016	-0.002	0.002
Number of conflict-related events	.029	.024	.066*	.039	-.012	.043	-0.026	-0.047	-.072*
Social transfers * Drought intensity (SPI-6)	0	0	0	0	0	0**	0	0	0**
Social transfers * Wet intensity (SPI-3)	0**	0	0	0	0	0	0	0	0
Social transfers * Windspeed (cyclone)	0	0	0	0	0	0	-.001***	0	0
Social transfers * Conflict-related events	0	0	0	0	0	0	0	0	0
Exposure to COVID-19 (self-rep.)	-.152	-.204	.339*	.288	.178	.455*	-.431*	-0.308	-.363**
Exposure to drought (self-rep.)	-.112	.104	.073	.034	.499***	.36***	0.128	-0.154	-0.048
Exposure to flood (self-rep.)	.171	.173	.154	.094	.227*	.216*	-.418***	-0.197	-0.002
Exposure to cyclone (self-rep.)	-.227*	-.124	-.289**	-.172	.464***	.202	0.028	-0.115	.219**
Acute illness (self-rep.)	-.06	-.216	.046	.328	.284	.257	-0.382	-0.586	-0.232
Death of a household member (self-rep.)	-.639	-.431	-.29	-.541	-.138	-.011	-0.214	-.637*	0.104
Constant	-2.282***	1.633***	-.076	-1.837***	.767**	-1.059***	.815**	-.831**	1.818***
Observations	28398	28398	28398	28398	28398	28398	28398	28398	28398

Note: Food insecurity is defined here as, respectively, whether the household reports consuming fewer than three meals (columns 1 to 3); whether the household perceives the quality of the diet/meals as inadequate (columns 4 to 6); and whether the household reports having experienced food problems in more than one month (columns 7 to 9). The categories analysed are: (1) not food insecure and not poor; (2) poor but not food insecure; (3) food insecure but not poor; and (4) both food insecure and poor. The base category for number of meals had on the day before and for adequacy of the diet in the past month is: 1) not food insecure and not poor. The base category for the number of months with food problems in at most one month is: 4) both food insecure and poor. Coefficients associated with the months of interview are not displayed. Self-rep.=Self-reported. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

Figure 6: Coefficient plots (marginal effects) from multinomial logit regression on number of meals, diet adequacy, and months with food problems, on the categories: (1) not food insecure and not poor; (2) poor but not food insecure; (3) food insecure but not poor; and (4) both food insecure and poor, 2014/15–2022. Only mismatch categories (2) and (3) are displayed.





Note: Coefficients associated with the months of interview are not displayed. The base category for number of meals had on the day before (panel a) is zero meals, the base category for adequacy of the diet in the past month (panel b) is less than adequate diet, and the base category for the number of months with food problems (panel c) is food problems in at most one month.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

5 Discussion and conclusions

This study set out to examine how subjective, self-reported indicators of food insecurity align with – or diverge from – standard objective measures of welfare in Mozambique over the period 2014/15–2022. The analysis reveals several consistent patterns that deepen our understanding of household vulnerability in a context marked by recurrent and overlapping shocks.

A first key finding is that trends in self-reported food insecurity broadly mirror national patterns in consumption-based poverty. All three subjective indicators (the number of meals consumed, perceived diet adequacy, and the number of months with food problems) deteriorated markedly between 2014/15 and 2019/20, followed by a partial recovery in 2022. This trajectory is consistent across urban and rural areas, across regions, and across most provinces, although the depth of the deterioration and the extent of the recovery vary substantially across space. These patterns reinforce the view that the period between 2014/15 and 2019/20 was one of significant welfare decline, driven by macroeconomic instability, climate shocks, conflict, and the onset of the COVID-19 pandemic, with only modest improvements thereafter.

At the same time, the analysis highlights important divergences between subjective and objective indicators. Correlations between self-reported food insecurity and consumption-based or multidimensional poverty measures are positive and statistically significant, but moderate in magnitude. Caloric intake (both recorded and imputed) shows even weaker associations. These findings suggest that, while subjective indicators capture aspects of deprivation related to material living standards, they also reflect additional dimensions not fully captured by consumption or calorie-based metrics.

The multivariate analysis further underscores this point. Household consumption is a strong predictor of all three subjective indicators, and caloric intake is associated with the number of meals and the number of months with food problems. Yet a wide range of other factors – including geographic location, household characteristics, asset ownership, and access to basic services – also shape self-reported food insecurity. Notably, female-headed households consistently report worse diet adequacy, even after controlling for consumption and other covariates, pointing to gendered vulnerabilities that standard poverty measures may overlook.

A particularly striking result concerns the role of shocks. Objectively measured exposure to droughts, floods, cyclones, and conflict events shows limited association with subjective food insecurity. By contrast, self-reported exposure to shocks is more strongly and more consistently correlated with all three indicators. Households that report experiencing drought, floods, cyclones, COVID-19, or the death of a household member are significantly more likely to report eating fewer meals, or having an inadequate diet, or experiencing food problems in multiple months. This divergence suggests that subjective shock measures may better capture the severity of events as experienced by households, including psychological stress, uncertainty, and perceived vulnerability—dimensions that objective indicators may fail to reflect.

The multinomial logit analysis reinforces these insights by examining the determinants of mismatch between subjective and objective measures. Several structural characteristics – such as

access to quality roofing, sanitation, and electricity – help explain why some households are poor but do not report food insecurity, while others are not poor but report significant food deprivation. Regional patterns also matter. Households in the southern region, which is relatively better off but more urbanised and less reliant on own-production, are more likely to report food insecurity despite not being consumption-poor. These findings highlight the importance of considering local food conditions, market dependence, regional characteristics, and exposure to price volatility when interpreting subjective food insecurity.

Finally, the analysis finds little evidence that social transfers improve perceived food security. Transfer amounts are generally small in the Mozambican context, and they may therefore fail to influence households' assessments of their food situation, except in the specific case of drought and diet adequacy, where transfers appear to mitigate the negative effect of this severe climatic stress on diet adequacy. This suggests that, while social protection may play a role in buffering extreme shocks, its current scale and targeting may be insufficient to address everyday food insecurity.

Taken together, our results point to several broader conclusions. First, subjective food insecurity indicators provide valuable information that complements standard poverty metrics. They capture dimensions of vulnerability such as perceived exposure to shocks, expectations, stress, and uncertainty that are not fully reflected in consumption or calorie-based measures. Second, the divergence between subjective and objective indicators is not random: it follows systematic patterns linked to geography, gender, household characteristics, and shock exposure. Third, incorporating subjective indicators into poverty-monitoring systems can improve the identification of vulnerable households, particularly in contexts where shocks are frequent and welfare is volatile.

We recognise that our analysis is subject to several limitations; most importantly, the cross-sectional nature of the data restricts our ability to draw causal inferences, particularly regarding the effects of shocks and social protection. Despite this, the combined use of self-reported and objective indicators seems to provide a richer and more nuanced picture of food insecurity and vulnerability in Mozambique, capturing dimensions of hardship that standard poverty metrics alone may overlook. In the Mozambican context, where households face recurrent climatic, economic, and conflict-related shocks, these findings underscore the need for a multifaceted approach to monitoring welfare and designing social protection policies. Strengthening shock-responsive social protection, improving the targeting and adequacy of transfers, and integrating subjective indicators into routine monitoring could help capture households' experiences of food insecurity more accurately and support more effective policy responses.

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Appendix

A.1 Ordered probit regression on number of meals had on the day before, adequacy of the diet in the past month, and number of months with food problems due to lack of money or other resources, 2014/15–2022

	Number of meals	Number of meals	Number of meals	Number of meals	Diet adequacy	Diet adequacy	Diet adequacy	Diet adequacy	Months with food problems	Months with food problems	Months with food problems	Months with food problems
Log consumption/poverty line	.368***	.376***	.369***	.374***	.296***	.339***	.266***	.298***	-.192***	-.207***	-.145***	-.146***
Kilocalories (kcal/person/day)	0***	0***			0	0			0***	0***		
Average consumption enumeration area	-.034	-.034	-.016	-.013	.064**	.007	.051	.016	-.092***	-.053	-.098***	-.065
Same economic situation	.251***	.248***	.241***	.241***	.625***	.758***	.623***	.766***	-.466***	-.507***	-.461***	-.506***
Better economic situation	.483***	.488***	.452***	.46***	.951***	.964***	.943***	.951***	-.611***	-.756***	-.598***	-.739***
Female household head	-.041*	-.041*	-.047**	-.046**	-.056***	-.078***	-.056***	-.068**	.039**	.042*	.034**	.028
HH educ. Primary, 1st cycle (5 years)	.116***	.12***	.107***	.111***	.078***	.07*	.081***	.09**	-.017	-.019	-.015	-.034
HH educ. Primary, 2nd cycle (7 years)	.15***	.148***	.135***	.135***	.085***	.105***	.093***	.126***	-.021	-.037	-.023	-.059**
HH educ. Secondary, 1st cycle (10 years)	.202***	.194***	.167***	.164***	.164***	.182***	.156***	.193***	-.068**	-.082**	-.06**	-.112***
HH educ. Secondary, 2nd cycle (12 years)	.357***	.344***	.287***	.282***	.192***	.225***	.173***	.234***	-.152***	-.115**	-.137***	-.145***
HH educ. Tertiary	.697***	.676***	.611***	.599***	.255***	.311***	.222***	.3***	-.284***	-.255***	-.257***	-.284***
Household head's age	.005	.005	.004	.004	.002	.001	-.001	-.002	.002	0	.005*	.002
Household head's age squared	0*	0*	0	0	0	0	0	0	0	0	0	0
Household size	.129***	.131***	.135***	.138***	.052***	.041***	.053***	.043***	-.025***	-.02**	-.027***	-.029***
Household size squared	-.004***	-.004***	-.004***	-.004***	-.002***	-.001	-.002***	-.001	.001***	.001***	.002***	.002***
Access to durable goods			-.05*	-.048*			-.11***	-.177***			.108***	.12***
Safe water			.01	.004			-.069**	-.07*			.058**	.052
Quality sanitation			-.069**	-.073**			-.09***	-.137***			.111***	.132***
Roof quality			.006	.006			-.128***	-.043			.049**	.02

	Number of meals	Number of meals	Number of meals	Number of meals	Diet adequacy	Diet adequacy	Diet adequacy	Diet adequacy	Months with food problems	Months with food problems	Months with food problems	Months with food problems
Access to electricity			-.1***	-.088**			-.054	.059			.018	-.08
Urban: Centre	.324***	.339***	.293***	.303***	.227***	.17***	.185***	.139**	-.127***	.105*	-.103**	.135**
Urban: South	.373***	.386***	.334***	.351***	.136***	.058	.074	.007	-.197***	.199***	-.149***	.211***
Rural: North	-.048	-.032	-.003	.007	.134**	-.06	.159***	-.082	-.134***	-.075	-.133**	-.03
Rural: Centre	.229***	.25***	.246***	.255***	.156***	.18***	.168***	.124*	-.117**	.026	-.115**	.099
Rural: South	.275***	.305***	.307***	.326***	.021	.141*	.017	.11	.124**	.356***	.122**	.378***
2019					-.059		-.082**		.404***		.406***	
2022	.035	.04	.074***	.078***	-.039	.059	-.045	.089**	.33***	-.066	.32***	-.089**
Value received in social transfers		0		0		0		0		0		0
Drought intensity (SPI-6)		-.014		-.021		-.118**		-.12***		.04		.035
Wet intensity (SPI-3)		.015		.024		-.06		-.063		.069*		.063
Windspeed (cyclone)		-.003		-.004		.003		.002		.003		.003
Number of conflict-related events		-.029*		-.032*		0		-.003		-.025		-.026
Social transfers * Drought intensity (SPI-6)		0		0		0***		0***		0		0
Social transfers * Wet intensity (SPI-3)		0		0		0		0		0		0
Social transfers * Windspeed (cyclone)		0		0		0		0		0		0
Social transfers * Conflict-related events		0		0		0		0		0		0
Exposure to COVID-19 (self-rep.)		-.019		-.014		-.11		-.107		.191**		.189**
Exposure to drought (self-rep.)		-.082***		-.062*		-.24***		-.223***		.127***		.121**
Exposure to flood (self-rep.)		-.056		-.047		-.087*		-.077		.094**		.085**
Exposure to cyclone (self-rep.)		-.032		-.033		-.208***		-.204***		-.005		-.017
Acute illness (self-rep.)		.064		.029		-.023		.014		.156		.169

	Number of meals	Number of meals	Number of meals	Number of meals	Diet adequacy	Diet adequacy	Diet adequacy	Diet adequacy	Months with food problems	Months with food problems	Months with food problems	Months with food problems
Death of a household member (self-rep.)		-.105		-.103		-.179		-.163		.308***		.289***
Multidimensional poverty index	-.081**	-.08**			-.269***	-.266***			.167***	.173***		
Kcal pc (imputed)			0***	0***			0***	0***			0	0**
Observations	28417	28417	27563	27563	59560	28417	57995	27563	59564	28417	57999	27563

Note: Consumption poverty rates are computed using the national poverty line and national poverty rate estimation methodology, as outlined in Arndt *et al*. (2017), DEEF (2016), and DNPED (forthcoming). Coefficients associated with the months of interview are not displayed. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

A.2 Probit regression on whether the household consumed fewer than three meals, whether the household perceived its diet or meals as inadequate, and whether the household experienced food problems in more than one month, 2014/15–2022

	Fewer than three meals	Fewer than three meals	Inadequate diet	Inadequate diet	Food problems in more than one month	Food problems in more than one month
Log real consumption/poverty line	.388***	.395***	.292***	.316***	-.147***	-.174***
Kilocalories (kcal/person/day)	0	0	0	0	0***	0**
Average consumption enumeration area	.004	0	.045	.007	-.072**	-.031
Same economic situation	.2***	.198***	.695***	.803***	-.495***	-.597***
Better economic situation	.472***	.477***	1.012***	.978***	-.616***	-.858***
Female household head	-.048*	-.046	-.053***	-.064**	.003	-.01
HH educ. Primary, 1st cycle (5 years)	.136***	.14***	.104***	.087**	-.029	-.085**
HH educ. Primary, 2nd cycle (7 years)	.153***	.156***	.109***	.132***	-.023	-.074*
HH educ. Secondary, 1st cycle (10 years)	.172***	.169***	.199***	.213***	-.072**	-.114**
HH educ. Secondary, 2nd cycle (12 years)	.332***	.33***	.223***	.251***	-.165***	-.183***
HH educ. Tertiary	.62***	.61***	.422***	.4***	-.274***	-.315***
Household head's age	0	0	.001	.001	.011***	.008*
Household head's age squared	0	0	0	0	0***	0*
Household size	.091***	.093***	.047***	.044***	-.018*	-.019
Household size squared	-.003**	-.003**	-.002***	-.002*	.001**	.001
Access to durable goods	-.038	-.036	-.135***	-.178***	.095***	.086**
Safe water	-.012	-.013	-.065**	-.08**	.072**	.02
Quality sanitation	-.075**	-.078**	-.089***	-.146***	.101***	.117**
Roof quality	-.012	-.012	-.14***	-.036	.071***	-.001
Access to electricity	-.118***	-.111**	-.068	.054	.05	.018
Urban: Centre	.322***	.33***	.268***	.187***	-.12**	.005
Urban: South	.239***	.262***	.138**	.012	-.311***	-.059
Rural: North	-.072	-.066	.139**	-.079	-.07	-.115
Rural: Centre	.213***	.229***	.222***	.184**	-.118**	-.032
Rural: South	.19***	.23***	.051	.143*	-.115**	.051
2019			-.022		.423***	
2022	.07**	.054	-.002	.074*	.406***	.025

	Fewer than three meals	Fewer than three meals	Inadequate diet	Inadequate diet	Food problems in more than one month	Food problems in more than one month
Value received in social transfers		0		0		0
Drought intensity (SPI-6)		-.021		-.114**		.067
Wet intensity (SPI-3)		.009		-.06		-.043
Windspeed (cyclone)		-.003		.003		-.002
Number of conflict-related events		-.018		.003		-.008
Social transfers * Drought intensity (SPI-6)		0		0***		0
Social transfers * Wet intensity (SPI-3)		0		0		0*
Social transfers * Windspeed (cyclone)		0		0		0***
Social transfers * Conflict-related events		0		0		0
Exposure to COVID-19 (self-rep.)		-.125		-.088		.105
Exposure to drought (self-rep.)		-.104***		-.231***		.039
Exposure to flood (self-rep.)		-.032		-.095*		.156***
Exposure to cyclone (self-rep.)		.056		-.244***		.087
Acute illness (self-rep.)		.025		-.008		.224
Death of a household member (self-rep.)		-.032		-.161		.308**
Constant	-1.121***	-1.199***	-.486***	-.489***	.187*	.575***
Observations	28417	28417	59560	28417	59564	28417

Note: Coefficients associated with the months of interview are not displayed. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

A.3 Ordered probit regression on number of meals had on the day before, adequacy of the diet in the past month, and number of months with food problems due to lack of money or other resources, marginal effects, 2014/15–2022

	Cat.	Number of meals		Number of meals		Diet adequacy		Diet adequacy		Months with food problems		Months with food problems	
		dy/dx		dy/dx		dy/dx		dy/dx		dy/dx		dy/dx	
Log real consumption/poverty line	1	-0.005	***	-0.005	***	-0.09	***	-0.1	***	0.049	***	0.047	***
	2	-0.052	***	-0.053	***	0.078	***	0.093	***	-0.028	***	-0.017	***
	3	-0.047	***	-0.048	***	0.013	***	0.007	***	-0.009	***	-0.016	***
	4	0.104	***	0.107	***					-0.013	***	-0.015	***
Kilocalories (kcal/person/day)	1	0	***	0	***	0		0		0	***	0	***
	2	0	***	0	***	0		0		0	***	0	***
	3	0	***	0	***	0		0		0	***	0	***
	4	0	***	0	***					0	***	0	***
Average consumption enumeration area	1	0.001		0		-0.019	*	-0.005		0.034	***	0.025	*
	2	0.006		0.005		0.016	*	0.004		-0.019	***	-0.009	*
	3	0.005		0.005		0.003	*	0		-0.006	***	-0.008	*
	4	-0.011		-0.011						-0.009	***	-0.008	*
Same economic situation	1	-0.003	***	-0.003	***	-0.229	***	-0.268	***	0.15	***	0.152	***
	2	-0.039	***	-0.039	***	0.212	***	0.257	***	-0.08	***	-0.051	***
	3	-0.033	***	-0.033	***	0.017	***	0.012	***	-0.029	***	-0.053	***
	4	0.076	***	0.075	***					-0.041	***	-0.048	***
Better economic situation	1	-0.005	***	-0.005	***	-0.34	***	-0.34	***	0.206	***	0.253	***
	2	-0.067	***	-0.068	***	0.301	***	0.32	***	-0.12	***	-0.119	***
	3	-0.083	***	-0.084	***	0.039	***	0.02	***	-0.037	***	-0.074	***
	4	0.156	***	0.157	***					-0.049	***	-0.06	***
Female household head	1	0.001	*	0.001	*	0.019	***	0.022	**	-0.011	*	-0.009	
	2	0.007	*	0.006	*	-0.016	***	-0.021	**	0.006	*	0.003	
	3	0.006	*	0.006	*	-0.003	***	-0.002	**	0.002	*	0.003	
	4	-0.013	*	-0.013	*					0.003	*	0.003	
HH educ. Primary, 1st cycle (5 years)	1	-0.002	***	-0.002	***	-0.031	***	-0.032		0.006		0.018	*
	2	-0.019	***	-0.019	***	0.027	***	0.03		-0.003		-0.006	*
	3	-0.016	***	-0.017	***	0.004	***	0.002	**	-0.001		-0.006	*

	Cat.	Number of meals		Number of meals		Diet adequacy		Diet adequacy		Months with food problems		Months with food problems	
	4	0.036	***	0.037	***					-0.002		-0.006	**
HH educ. Primary, 2nd cycle (7 years)	1	-0.002	***	-0.002	***	-0.035	***	-0.044	***	0.005		0.016	*
	2	-0.023	***	-0.022	***	0.03	***	0.041	***	-0.003		-0.005	*
	3	-0.02	***	-0.02	***	0.004	***	0.003	***	-0.001		-0.005	*
	4	0.045	***	0.045	***					-0.001		-0.005	*
HH educ. Secondary, 1st cycle (10 years)	1	-0.002	***	-0.002	***	-0.057	***	-0.068	***	0.019	*	0.029	**
	2	-0.028	***	-0.027	***	0.049	***	0.064	***	-0.011	*	-0.011	**
	3	-0.027	***	-0.026	***	0.008	***	0.004	***	-0.003	*	-0.009	**
	4	0.057	***	0.055	***					-0.005	*	-0.009	**
HH educ. Secondary, 2nd cycle (12 years)	1	-0.004	***	-0.004	***	-0.06	***	-0.078	***	0.044	***	0.036	**
	2	-0.046	***	-0.045	***	0.052	***	0.073	***	-0.026	***	-0.013	*
	3	-0.055	***	-0.053	***	0.008	***	0.005	***	-0.007	***	-0.012	**
	4	0.104	***	0.101	***					-0.01	***	-0.011	**
HH educ. Tertiary	1	-0.005	***	-0.005	***	-0.079	***	-0.104	***	0.078	***	0.076	***
	2	-0.078	***	-0.076	***	0.068	***	0.096	***	-0.048	***	-0.033	***
	3	-0.141	***	-0.135	***	0.011	***	0.007	***	-0.012	***	-0.023	***
	4	0.224	***	0.217	***					-0.017	***	-0.02	***
Household head's age	1	0		0		0	**	0		-0.001	***	-0.001	**
	2	0		0		0	**	0		0	***	0	**
	3	0		0		0	**	0		0	***	0	***
	4	0		0						0	***	0	***
Household size	1	-0.001	***	-0.001	***	-0.008	***	-0.007	***	0.002		0.001	
	2	-0.012	***	-0.012	***	0.007	***	0.007	***	-0.001		0	
	3	-0.01	***	-0.01	***	0.001	***	0.001	***	0		0	
	4	0.023	***	0.024	***					0		0	
Access to durable goods	1	0.001	**	0.001	**	0.038	***	0.059	***	-0.039	***	-0.038	***
	2	0.01	**	0.01	**	-0.032	***	-0.055	***	0.022	***	0.013	***
	3	0.009	**	0.009	**	-0.005	***	-0.004	***	0.007	***	0.012	***
	4	-0.021	**	-0.02	**					0.01	***	0.012	***
Safe water	1	0		0		0.023	**	0.021	*	-0.017	*	-0.005	
	2	-0.001		-0.001		-0.02	**	-0.02	*	0.009	*	0.002	

	Cat.	Number of meals		Number of meals		Diet adequacy		Diet adequacy		Months with food problems		Months with food problems	
	3	-0.001		-0.001		-0.003	**	-0.001	*	0.003	*	0.002	
	4	0.003		0.001						0.004	*	0.002	
Quality sanitation	1	0.001	**	0.001	**	0.03	***	0.045	***	-0.041	***	-0.045	***
	2	0.011	**	0.012	**	-0.026	***	-0.042	***	0.023	***	0.016	***
	3	0.01	**	0.011	**	-0.004	***	-0.003	***	0.007	***	0.015	***
	4	-0.022	**	-0.023	**					0.01	***	0.014	***
Roof quality	1	0		0		0.043	***	0.014		-0.017	**	-0.007	
	2	-0.001		-0.001		-0.037	***	-0.013		0.01	**	0.003	
	3	0		-0.001		-0.006	***	-0.001		0.003	**	0.002	
	4	0.001		0.001						0.004	**	0.002	
Access to electricity	1	0.002	***	0.001	**	0.019		-0.017		-0.001		0.028	
	2	0.018	***	0.015	***	-0.017		0.016		0.001		-0.01	
	3	0.016	***	0.014	***	-0.003		0.001		0		-0.009	
	4	-0.035	***	-0.031	***					0		-0.009	
Rural	1	0		0		-0.014		0.002		0.003		0.003	
	2	0.003		0.002		0.013		-0.002		0.001		-0.002	
	3	0.004		0.004		0.001		0		-0.001		-0.001	
	4	-0.008		-0.007						-0.002		0	
Centre	1	-0.004	***	-0.004	***	-0.027	**	-0.071	***	0.018	*	-0.022	
	2	-0.048	***	-0.049	***	0.022	*	0.067	***	-0.011	*	0.009	*
	3	-0.04	***	-0.04	***	0.005	***	0.004	***	-0.003		0.007	
	4	0.092	***	0.094	***					-0.004		0.006	
South	1	-0.005	***	-0.005	***	0.026	*	-0.045	**	-0.034	***	-0.096	***
	2	-0.052	***	-0.054	***	-0.024	*	0.043	**	0.012	*	0.02	***
	3	-0.044	***	-0.046	***	-0.002		0.002		0.008	***	0.036	***
	4	0.101	***	0.105	***					0.014	***	0.04	***
2019	1					0.023	*			-0.126	***		
	2					-0.02	*			0.071	***		
	3					-0.003	*			0.023	***		
	4									0.032	***		
2022	1	-0.001		-0.001		0.015		-0.023		-0.105	***	0.013	

	Cat.	Number of meals	Number of meals	Diet adequacy	Diet adequacy	Months with food problems	Months with food problems
	2	-0.006	-0.006	-0.013	0.021	0.062 ***	-0.005
	3	-0.005	-0.006	-0.002	0.002	0.018 ***	-0.004
	4	0.011	0.012			0.025 ***	-0.004
Value received in social transfers	1		0		0		0 *
	2		0		0		0 *
	3		0		0		0
	4		0				0
Drought intensity (SPI-6)	1		0		0.036 **		-0.005
	2		0.001		-0.034 **		0.002
	3		0.001		-0.002 **		0.002
	4		-0.003				0.002
Wet intensity (SPI-3)	1		0		0.019		-0.008
	2		-0.003		-0.017		0.003
	3		-0.003		-0.001		0.003
	4		0.006				0.003
Windspeed (cyclone)	1		0		-0.001		-0.001
	2		0		0.001		0
	3		0		0		0
	4		-0.001				0
Number of conflict-related events	1		0 **		0.001		0.001
	2		0.005 **		-0.001		0
	3		0.005 **		0		0
	4		-0.011 **				0
Exposure to COVID-19 (self-reported)	1		0		0.038		-0.046
	2		0.004		-0.035		0.016
	3		0.003		-0.003		0.015
	4		-0.008				0.015
Exposure to drought (self-reported)	1		0.001 **		0.077 ***		-0.043 ***
	2		0.011 **		-0.072 ***		0.015 ***
	3		0.01 **		-0.005 ***		0.014 ***
	4		-0.023 **				0.014

	Cat.	Number of meals	Number of meals	Diet adequacy	Diet adequacy		Months with food problems	Months with food problems	
Exposure to flood (self-reported)	1		0.001		0.028	*		-0.026	**
	2		0.008		-0.026	*		0.009	**
	3		0.007		-0.002	*		0.008	**
	4		-0.016					0.008	**
Exposure to cyclone (self-reported)	1		0		0.066	***		-0.005	
	2		0.004		-0.062	***		0.002	
	3		0.004		-0.005	***		0.002	
	4		-0.008					0.001	
Acute illness (self-reported)	1		-0.001		0.008			-0.045	
	2		-0.01		-0.007			0.016	
	3		-0.009		-0.001			0.015	
	4		0.019					0.015	
Death of a household member (self-reported)	1		0.001		0.057			-0.094	***
	2		0.016		-0.053			0.033	***
	3		0.014		-0.004			0.031	***
	4		-0.032					0.03	***
Observations		28,398	28,398	59,541	28,398		59,545	28,398	

Note: The four categories for the number of meals correspond to: 1=None; 2=One; 3=Two; 4=Three or more. The three categories for diet adequacy correspond to: 1=Less than adequate; 2=Adequate; 3=More than adequate. The four categories for the number of months with food problems correspond to: 1=zero to one month; 2=two to five months; 3=six to eight months; 4=nine to 12 months. Coefficients associated with the months of interview are not displayed. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

A.4 Probit regression on whether the household consumed fewer than three meals, whether the household perceived its diet or meals as inadequate, and whether the household experienced food problems in more than one month, marginal effects, 2014/15–2022

	Fewer than three meals		Fewer than three meals		Inadequate diet		Inadequate diet		Food problems in more than one month		Food problems in more than one month	
	dy/dx		dy/dx		dy/dx		dy/dx		dy/dx		dy/dx	
Log real consumption/poverty line	0.117	***	0.119	***	0.096	***	0.103	***	-0.049	***	-0.05	***
Kilocalories (kcal/person/day)	0.000		0		0		0		0	***	0	**
Average consumption enumeration area	0.001		0		0.015		0.002		-0.024	**	-0.009	
Same economic situation	0.061	***	0.06	***	0.25	***	0.281	***	-0.165	***	-0.174	***
Better economic situation	0.151	***	0.152	***	0.356	***	0.341	***	-0.209	***	-0.268	***
Female household head	-0.014	*	-0.014		-0.017	***	-0.021	**	0.001		-0.003	
HH educ. Primary, 1st cycle (5 years)	0.042	***	0.043	***	0.035	***	0.029	**	-0.01		-0.024	**
HH educ. Primary, 2nd cycle (7 years)	0.047	***	0.048	***	0.037	***	0.044	***	-0.008		-0.021	*
HH educ. Secondary, 1st cycle (10 years)	0.053	***	0.052	***	0.067	***	0.071	***	-0.024	**	-0.033	**
HH educ. Secondary, 2nd cycle (12 years)	0.106	***	0.105	***	0.075	***	0.083	***	-0.056	***	-0.054	***
HH educ. Tertiary	0.208	***	0.203	***	0.139	***	0.132	***	-0.094	***	-0.097	***
Household head's age	0		0		0	*	0		0.001	***	0	
Household size	0.018	***	0.019	***	0.008	***	0.008	***	-0.001		-0.001	
Access to durable goods	-0.012		-0.011		-0.045	***	-0.058	***	0.032	***	0.025	**
Safe water	-0.004		-0.004		-0.021	**	-0.026	**	0.024	**	0.006	
Quality sanitation	-0.023	**	-0.024	**	-0.029	***	-0.048	***	0.034	***	0.034	**
Roof quality	-0.004		-0.004		-0.046	***	-0.012		0.024	***	0	
Access to electricity	-0.036	***	-0.033	**	-0.022		0.018		0.017		0.005	
Rural	-0.026	**	-0.023	*	0.004		-0.001		0.008		-0.009	
Centre	0.09	***	0.092	***	0.046	***	0.077	***	-0.024		0.016	
South	0.076	***	0.084	***	-0.006		0.049	**	-0.046	***	0.023	
2019		***		***	-0.007			***	0.143	***	0.007	
2022	0.021	**	0.016		-0.001		0.024		0.138	***		***

	Fewer than three meals	Fewer than three meals		Inadequate diet	Inadequate diet		Food problems in more than one month	Food problems in more than one month	
Value received in social transfers		0			0			0	*
Drought intensity (SPI-6)		-0.005			-0.035	**		0.02	
Wet intensity (SPI-3)		0.003			-0.019			-0.011	
Windspeed (cyclone)		-0.001			0.001			-0.001	
Number of conflict-related events		-0.005			0.001			-0.003	
Exposure to COVID-19 (self-reported)		-0.038			-0.029			0.03	
Exposure to drought (self-reported)		-0.031	***		-0.075	***		0.011	
Exposure to flood (self-reported)		-0.01			-0.031	*		0.045	***
Exposure to cyclone (self-reported)		0.017			-0.08	***		0.025	
Acute illness (self-reported)		0.008			-0.003			0.065	
Death of a household member (self-reported)		-0.01			-0.052			0.089	**
Observations	28,398	28,398		59,541	28,398		59,545	28,398	

Note: Coefficients associated with the months of interview are not displayed. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).

A.5 Multinomial logit regression on the categories (1) not food insecure and not (multidimensionally) poor, (2) (multidimensionally) poor but not food insecure, (3) food insecure but not (multidimensionally) poor, and (4) both food insecure and (multidimensionally) poor, 2014/15–2022

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Categories (1: not food insecure and not poor (base category); 2: poor but not food insecure; 3: food insecure but not poor; 4: both food insecure and poor)	2	3	4	2	3	4	2	3	4
Dependent variable	Number of meals	Number of meals	Number of meals	Diet adequacy	Diet adequacy	Diet adequacy	Months with food problems	Months with food problems	Months with food problems
Kilocalories (kcal/person/day)	.001***	0	.001***	.001***	0	.001***	.001***	0	.001***
Average consumption enumeration area	.057	-.005	.041	.226*	.141*	.059	0	-.043	.234
Same economic situation	-.194*	-.337***	-.52***	-.078	-1.286***	-1.429***	-.128	1.103***	.842***
Better economic situation	.044	-.685***	-.865***	-.061	-1.717***	-1.58***	-.038	1.49***	1.386***
Female household head	-.453***	-.026	-.263***	-.336***	.087	-.176**	-.252***	.073	-.315***
Household head's education	(.112)	(.058)	(.092)	(.094)	(.061)	(.084)	(.084)	(.071)	(.101)
Primary, 1st cycle (5 years)	-.948***	-.196**	-1.275***	-.916***	-.016	-1.162***	-1.032***	.162*	-.938***
Primary, 2nd cycle (7 years)	-1.4***	-.304***	-1.617***	-1.279***	-.159*	-1.529***	-1.322***	.165**	-1.244***
Secondary, 1st cycle (10 years)	-1.927***	-.318***	-2.215***	-1.734***	-.255**	-2.318***	-1.929***	.209**	-1.647***
Secondary, 2nd cycle (12 years)	-2.768***	-.629***	-2.669***	-2.567***	-.492***	-2.417***	-2.15***	.405***	-2.179***
Tertiary	-2.522***	-1.015***	-4.108***	-2.869***	-.681***	-3.246***	-2.787***	.577***	-2.231***
Household head's age	-.068***	.002	-.066***	-.07***	-.009	-.072***	-.066***	-.008	-.082***
Household head's age squared	.001***	0	.001***	.001***	0	.001***	0***	0	.001***
Household size	-.486***	-.213***	-.636***	-.486***	-.126***	-.542***	-.434***	.037	-.408***
Household size squared	.018***	.008***	.021***	.018***	.007***	.018***	.014***	-.001	.01***
Urban: Centre	-.292	-.513***	-1.017***	-.365**	-.277**	-.83***	-.45***	.084	-.578**
Urban: South	-2.57***	-.365***	-2.952***	-2.862***	-.199*	-2.636***	-2.527***	.282*	-2.607***
Rural: North	1.911***	.334**	1.861***	1.796***	.31*	1.766***	1.642***	.235	1.724***
Rural: Centre	1.938***	-.188	1.403***	1.705***	-.366**	1.321***	1.716***	.164	1.631***
Rural: South	-.664***	-.327***	-.988***	-.625***	-.286**	-.96***	-.544***	.139	-1.27***
2022	.023	-.05	-.149	.047	.02	-.161	-.073	-.066	-.132
Value received in social transfers	0	0	0	0**	0	0*	0**	0	0
Drought intensity (SPI-6)	-.183	-.027	-.092	-.237**	.077	.084	-.09	-.119	-.223
Wet intensity (SPI-3)	-.01	.035	.039	-.163	-.096	.062	.033	.134	.036

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Windspeed (cyclone)	.005	.002	.012	.018*	.008	.01	.009	.004	.013
Number of conflict-related events	-.529**	.031	-.531***	-.391*	-.014	-.716***	-.609***	.019	-.378
Social transfers * Drought intensity (SPI-6)	0	0	0	0	0***	0	0	0	0
Social transfers * Wet intensity (SPI-3)	0	0	0	0*	0	0	0*	0*	0
Social transfers * Windspeed (cyclone)	-.001***	0	0	0	0	0	0	0***	-.001***
Social transfers * Conflict-related events	0	0	0	0	0	0	0	0*	-.28***
Exposure to COVID-19 (self-rep.)	-.165	.091	.136	.07	.196	.09	-.008	-.113	-.193
Exposure to drought (self-rep.)	.377***	.289***	.47***	.174	.376***	.603***	.191*	-.167	.227
Exposure to flood (self-rep.)	.11	.088	.143	0	.092	.196	-.018	-.501***	-.135
Exposure to cyclone (self-rep.)	.469***	.207*	.195	.05	.371***	.526***	.122	-.14	-.044
Acute illness (self-rep.)	-.191	-.137	-.225	-.626	-.481	-.158	-.188	-.559	-.367
Death of a household member (self-rep.)	-.057	-.241	.311	.322	.215	.678*	.455	-.332	-.29
Log consumption/poverty line	-1.608***	-.743***	-2.219***	-1.613***	-.679***	-2.085***	-1.484***	.372***	-1.287***
Constant	2.334***	2.001***	5.114***	2.869***	1.315***	4.211***	2.816***	-1.507***	1.853***
Observations	28398	28398	28398	28398	28398	28398	28398	28398	28398

Note: Food insecurity is defined here as, respectively, whether the household reports consuming fewer than three meals (columns 1 to 3), whether the household perceives the quality of the diet/meals as inadequate (columns 4 to 6), and whether the household reports having experienced food problems in more than one month (columns 7 to 9). The categories analysed include: (1) not food insecure and not (multidimensionally) poor; (2) (multidimensionally) poor but not food insecure; (3) food insecure but not (multidimensionally) poor; and (4) both food insecure and (multidimensionally) poor. Coefficients associated with the months of interview are not displayed. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Authors' calculations based on DNPED (forthcoming) and GdM (2024).