CLASSIFYING FOOD INSECURITY USING FEWS NET MATRIX ANALYSIS: ASSESSING THE NEED FOR HUMANITARIAN FOOD ASSISTANCE

Humanitarian Food Assistance Averted
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REAL Resilience Evaluation, Analysis and Learning

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Acronyms

CARI	Consolidated Approach to Reporting Indicators of Food Insecurity (Index) (WFP)
FCS	Food Consumption Score
FEWS NET	Famine Early Warning Systems Network
FIES	Food Insecurity Experience Scale
HDDS	Household Dietary Diversity Score
HFA	Humanitarian Food Assistance
HFIAS	Household Food Insecurity Access Scale
HHS	Household Hunger Scale
IPC	Integrated Phase Classification
L4R	Livelihoods for Resilience
PREG	Partnership for Resilience and Economic Growth
PRIME	Pastoralist Areas Resilience Improvement through Market Expansion
rCSI	Reduced Coping Strategies Index
REAL	Resilience Evaluation, Analysis and Learning
RISE	Resilience in the Sahel Enhanced
TLU	Tropical Livestock Unit
USAID	United States Agency for International Development

1. Research Overview

1.1 Problem Statement

One of the underlying assumptions of resilience programming is that vulnerable populations will improve their capacity to effectively deal with and recover from shocks and stresses in ways that "reduce chronic vulnerability"[1] and do not have negative consequences on household well-being. That is, today's resilience investments are expected to strengthen the ability of vulnerable populations to use information, skills, training, assets and other resources in ways that reduce—or avoid—the negative impacts of future shocks while at the same time do not negatively impact current (or future) household food security or other well-being outcome. Theoretically, improved ability of households and communities to prepare for, deal with, and recover from shocks should lead to less need for donor-supported humanitarian food assistance (HFA); the better able households are to maintain their food consumption patterns in the face of a shock or stress the less likely they need emergency food—or other—assistance. Evidence for the validity of this assumption would be valuable for helping to rationalize investments in resilience strengthening programs not only for global-level donors but also for national governments. Although numerous studies (including those used in the current study) have shown that improved resilience capacity contributes to better household outcomes (e.g., food security),[2] the assumption that strengthened resilience capacity will reduce the need for HFA, including emergency food assistance, in the face of shocks and stressors has yet to be empirically tested.

One of the most common tools available to humanitarian response practitioners for determining the need for HFA is the Integrated Food Insecurity Phase Classification (IPC) methodology, which classifies households according to one of five categories of acute food insecurity that threaten lives or livelihoods based on readily available data, including from household surveys. However, not all household surveys collect data on the same food security indicators and therefore a method for comparing—or converging—indicators is needed.

The Famine Early Warning Systems Network (FEWS NET) has developed an approach ("The Matrix") for analyzing data from household surveys that aligns well with the IPC conceptual framework and produces food insecurity classifications that are IPC-compatible.[3] The Matrix approach utilizes several food security and livelihoods coping strategies indicators in its analysis, including the Food Consumption Score (FCS), the Household Hunger Scale (HHS), the Household Dietary Diversity Score (HDDS), the Reduced Coping Strategies Index (rCSI), and a livelihood coping indicator. However, many resilience-building initiatives use measures of food security that have not been used in The Matrix approach, most notably the Household Food Insecurity Access Scale (HFIAS) and the Food Insecurity Experience Scale (FIES).[4] Given the wide use of the HFIAS and FIES in resilience programming supported by global donors (e.g., USAID, FAO, WFP), there is need for an analytical approach that is sufficiently flexible to allow for

[1] USAID defines resilience as "the ability of people, households, communities, countries and systems to mitigate, adapt to and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth." USAID. 2012. Building Resilience to Recurrent Crises: Policy and Programming Guidance. December.

[2] See Smith L, Frankenberger T, Fox K, Nelson S and T Griffin. 2019. Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation: Endline Survey Report. Washington, D.C.: Resilience Evaluation, Analysis and Learning (REAL) Associate Award. See also Bene C, Frankenberger T and Nelson S. 2015. Design, monitoring, and evaluation of resilience interventions: Conceptual and empirical considerations. Brighton, U.K.: IDS.

[3] FEWS NET. 2021. FEWS NET Matrix Analysis: Integrated analysis of survey-based indicators for classification of acute food insecurity. Washington, DC: FEWS NET.

[4] The FIES has recently been added as a measure of first-level food security outcomes in the IPC. See IPC Global Partners. 2021. Integrated Food Security Phase Classification Technical Manual Version 3.1. Evidence and Standards for Better Food Security and Nutrition Decisions. Rome.

use of additional indicators of food security beyond those tested so far by The Matrix approach. Ultimately, such an approach would allow for better understanding by donors, governments, and implementers of how modest investments in resilience programming can reduce the need for—and therefore the cost of—HFA.

1.2 Research Goal and Objectives

The overarching goal of the current research is to test the hypothesis that investments in resilience programming reduces the need for HFA in vulnerable populations. In order to develop and test an analytical model for measuring the extent to which resilience programming reduces the need for HFA in the face of shocks and stressors, a series of steps are required. Conducted sequentially, this research involves two key objectives:

1) Exploring the applicability of using different food security indicators in FEWS NET's Matrix Analysis approach as a means for measuring the need for HFA at the household level; and
2) Exploring various analytical models to identify a theoretically optimal approach for measuring the extent to which resilience programming reduces the need for HFA in the face of shocks.

This is the first of two technical reports that collectively address these research objectives. Findings related to the second objective are reported elsewhere.[5] Table 1 summarizes how this process unfolds across the two reports.

Table 1: Research objectives and activities

Technical Paper	Research Objectives	Description of Research Activity
Technical Paper No. 1	To assess the applicability of the FEWS NET Matrix Analysis approach for measuring the need for HFA at the household level using different food security indicators	• Use the FEWS NET Matrix Analysis approach with different indicators to classify households into IPC phases and compare and contrast results • If possible, identify potential preferred indicators to include in household surveys to allow accurate measurement of the need for HFA
Technical Paper No. 2	To assess the relationships among resilience programming, resilience capacities, and the need for HFA	Use multivariate regression analysis on existing datasets to assess the relationship between resilience programming and the need for HFA
	To assess various models for measuring the extent to which resilience programming reduces the need for HFA in the face of shocks	• Test different methodological models using existing datasets to measure the extent to which resilience programming reduces the need for HFA and compare and contrast results • Apply a potentially "optimal" methodological model to datasets from two impact evaluations to assess the relationship between resilience capacities and the need for HFA

[5] TANGO. 2021b. Humanitarian Food Assistance Averted. Technical Paper 2: The Relationship of Resilience to the Need for Humanitarian Food Assistance.

2. Background

As noted in Table 1, the first step in this process focuses on assessing the applicability of the FEWS NET Matrix approach for measuring ***the need for HFA,*** as indicated by IPC Phases 3, 4, and 5, using a variety of different food security indicators. This section briefly describes the IPC phases, FEWS NET's Matrix approach, and the food security indicators used for this stage of the research. Section 2 is followed by a section that describes the process for creating IPC-compatible indicators not currently discussed in The Matrix approach but widely used by USAID, FAO, WFP and other global donors.

2.1 The Integrated Food Insecurity Phase Classification (IPC)

The Integrated Food Insecurity Phase Classification (IPC) is a widely accepted scale for describing the severity of food emergencies and is intended to help governments and humanitarian actors make decisions about responding to current or potential food security crises. Classification of vulnerable households into IPC phases of food insecurity is based on a convergence of available data and evidence at a national level, including household-level indicators related to food consumption, livelihoods, malnutrition, and mortality.[6] Table 2 describes the five phases of the IPC scale as it relates to food insecurity; IPC phases are based on household ability to meet both their food ***and non-food*** needs. Households in IPC 3, 4, and 5 (crisis, emergency, and famine, respectively) are considered in need of HFA, which constitutes the focus of the current research.

Table 2: IPC acute food insecurity phase descriptions for households

Phase 1 Minimal		Households are able to meet essential food and non-food needs without engaging in atypical and unsustainable strategies to access food and income.
Phase 2 Stressed		Households have minimally adequate food consumption but are unable to afford some essential non-food expenditures without engaging in stress-coping strategies.
Need for Humanitarian Food Assistance	**Phase 3 Crisis**	Households either: • Have food consumption gaps that are reflected by high or above-usual acute malnutrition; OR • Are marginally able to meet minimum food needs but only by depleting essential livelihood assets or through crisis-coping strategies.
	Phase 4 Emergency	Households either: • Have large food consumption gaps which are reflected in very high acute malnutrition and excess mortality; OR • Are able to mitigate large food consumption gaps but only by employing emergency livelihood strategies and asset liquidation.
	Phase 5 Catastrophe/ Famine	Households have an extreme lack of food and/or other basic needs even after full employment of coping strategies. Starvation, death, destitution, and extremely critical acute malnutrition levels are evident.

Sources: FEWS NET Web site accessed 21 January 2021 https://fews.net/IPC; IPC Global Partners. 2021. Integrated Food Security Phase Classification Technical Manual Version 3.1. Evidence and Standards for Better Food Security and Nutrition Decisions. Rome.

One of the challenges in making accurate IPC classifications is in the convergence of evidence from data sources that use different food security indicators; using different indicators may result in different IPC classifications. Ensuring the reliability and comparability of IPC classifications is an important analytical problem and is described in Box 1.

[6] FEWS NET Web site accessed 21 January 2021 https://fews.net/IPC

Box 1: "Convergence of evidence" challenges in analyzing acute food insecurity

1) Different food security indicators measure different aspects of acute food insecurity and behave differently in different contexts. As a result, different indicators often do not align, not only with each other but with IPC phase classifications.
2) The use of summary results lends itself to assuming that the households classified in a given phase by one indicator are the same as the households classified in that phase by other indicators, which is not necessarily—or typically—true.
3) Based on the IPC framework, households should be classified on the acute scale based on two criteria: i) are households able to meet their basic food needs and if not, the size of the gap between needs and actual consumption should be known, and ii) are households meeting basic food needs, or facing relatively small food gaps because the household is using negative livelihood coping strategies (e.g., asset stripping)?

   In practice this means a two-step process is needed for classifying households. Households should first be classified based on their food consumption status and subsequently "reclassified" by considering their livelihood coping strategies. This ensures that households whose food consumption is adequate, but only because the household is engaging in negative livelihood coping strategies, are not overlooked. However, this type of two-step process is difficult, if not impossible, when classification of the same dataset using different food security indicators yields different summary results depending on the indicator used to make the classification.

Source: FEWS NET. 2019. FEWS NET Matrix Analysis: Integrated analysis of survey-based indicators for classification of acute food insecurity. Washington, DC: FEWS NET.

2.2 FEWS NET Matrix Analysis

FEWS NET's Matrix approach was developed to address the variability of household survey data used to capture acute food insecurity across different programming contexts (see Box 1) and to provide guidance on how to converge these indicators to create an IPC-compatible assessment that can provide early warning signals to help facilitate humanitarian response planning. The Matrix is a flexible approach that allows for combining various food security and livelihood coping strategies indicators into a food consumption/livelihood coping indicator matrix that aligns well with IPC phase classifications. The approach uses the Food Consumption Score (FCS), the Household Dietary Diversity Score (HDDS), the reduced Coping Strategies Index (rCSI), the Household Hunger Scale (HHS), and a livelihood coping indicator,[7] all of which are included in the IPC reference table. The guidance provides detailed instructions for conducting the analysis, including converting the data, constructing a food consumption matrix, incorporating livelihoods coping, estimating humanitarian food assistance (HFA),[8] and using outputs from the process as inputs into IPC or IPC-compatible analyses.

As previously noted, however, many resilience programs use other food security indicators, for which The Matrix approach provides no specific guidance. Thus, the first step of this research activity is to test the applicability of the HFIAS and/or FIES as alternative indicators for estimating the likelihood that a household will need HFA based on The Matrix methodology. Such application may provide supporting evidence for using FEWS NET's approach to estimate the extent to which resilience programming reduces the need for HFA in the next stage of this research (TANGO 2021b).

[7] WFP. 2015. Technical Guidance Note. Consolidated Approach to Reporting Indicators of Food Security (CARI). November.
[8] Household receipt of humanitarian food assistance (HFA) is not included in this part of the analysis (i.e., measuring the need for HFA) because, for analytical purposes, HFA will be used as an explanatory variable in regression analyses examining the relationship between resilience capacity and the need for HFA (see TANGO 2022b).

2.3 Food Security Indicators

As part of the current research, one of the key challenges to be addressed relates to flexibility of the analysis approach in terms of the indicators being used. The food security indicators used in the current research include the Household Dietary Diversity Score (HDDS), Household Food Insecurity Access Scale (HFIAS), Household Hunger Scale (HHS), and the Food Insecurity Experience Scale (FIES);[9] neither the HFIAS nor FIES are currently included in the FEWS NET guidance.

- The Household Hunger Scale (HHS) is a three-question survey used to measure household hunger in food insecure areas and has the advantage of being appropriate for cross-cultural comparison.[10] Thus, HHS can be used to assess the food security status of different populations, for example, in different countries. The HHS is a household food deprivation scale, which is based on the idea that the experience of household food deprivation causes predictable reactions that can be captured through a survey. It measures varying levels of food insecurity as experienced by a household including: 1) anxiety about household food supply; 2) insufficient quality, which includes variety, preferences, and social acceptability; and 3) insufficient food supply and intake and the physical consequences. It is measured with a 30-day recall period. According to the HHS guidance, longer periods of recall risk introducing bias from inaccurate recall over longer periods of time. In contrast, shorter recall periods may not fully capture the degree of deprivation experienced by households.
- The Household Food Insecurity Access Scale (HFIAS) is similar to the HHS in that it is a culturally comparable measure of food insecurity (access).[11] It differs in that it measures quantity and quality. In contrast to the HHS, the HFIAS involves nine questions that represent increasing levels of food insecurity (access) along with "frequency-of-occurrence" to determine how often the condition occurred. Occurrence questions include perceptions of food vulnerability, such as anxiety or worry about household food supply, insufficient quality (including diversity and food preferences), and insufficient food intake, as well as behavioral responses, such as eating fewer meals or less preferred types of food. The recall period for the HFIAS is recommended as four weeks (30-days).
- The Food Insecurity Experience Scale (FIES) consists of eight questions about household access to adequate food.[12] The FIES measures people's experiences and behaviors associated with increasing difficulty accessing food. Similar to but shorter than the HFIAS, it includes questions about anxiety or worry and behavioral responses to a lack of access to food.
- The Household Dietary Diversity Score (HDDS) is a measure of food access that also captures food quality, at least in terms of the different food groups (not individual foods) consumed by a household.[13] Households that consume a more diversified diet tend to have better outcomes, including birth weight and child anthropometric status. A more diversified diet, perhaps from additional income, is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein), and household income. Thus, the HDDS can also be used as a proxy measure for the socio-economic status of the household. The HDDS uses a 24-hour recall period.

[9] This research does not make any assessment about which food security indicator(s) may be better overall or in different contexts, nor does it assess their comparative advantages/disadvantages.
[10] Ballard T, Coates J, Swindale A, and Deitchler M. 2011. Household Hunger Scale: Indicator Definition and Measurement Guide. Washington, DC: Food and Nutrition Technical Assistance II Project, FHI 360.
[11] Coates J, Swindale A, and Bilinsky P. 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C.: FHI 360/FANTA.
[12] https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1236494/.
[13] Swindale A and Bilinsky P. 2006. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v. 2). Washington, D.C.; FHI 360/FANTA.

- The reduced Coping Strategy Index (rCSI) is a subset of the Coping Strategies Index (CSI), which is context-specific.[14] In contrast, the rCSI is used to compare food security across different contexts by using a set of five individual coping behaviors with universal severity weightings, that is, they can be used by any household anywhere. They include: i) eating less-preferred foods; ii) borrowing money or food from friends/relatives; iii) limiting portions; iv) limiting adult intake; and v) reducing the number of meals eaten per day.

Finally, the Food Consumption Score (FCS) is another commonly used indicator in food security surveys and aggregates household-level data on the diversity and frequency of food groups consumed over the seven days prior to a survey and then weights the data according to the relative nutritional value of the consumed food groups.[15] The scores are classified into poor, borderline, or acceptable levels of food security. The FCS is a proxy indicator of household caloric availability and has been validated against quantity of caloric intake, as well as with the HDDS. Data to calculate the FCS was not collected by any of the studies used in the current research (see Table 3).

3. Creating IPC-compatible Datasets

3.1 Datasets

The current research applies FEWS NET Matrix methodology to four household datasets collected from household surveys designed to measure resilience capacities and outcomes in different contexts:[16]

- Pastoralist Resilience Improvement and Market Expansion Impact Evaluation - Endline (PRIME EL) survey in Ethiopia;
- Resilience in the Sahel Enhanced (RISE) II Impact Evaluation - Midline (RISE ML) survey in Niger and Burkina Faso;
- Livelihoods for Resilience Baseline (L4R BL) survey in Ethiopia; and
- Partnership for Resilience and Economic Growth Phase I Endline (PREG I EL) survey in northern Kenya.

The four datasets were selected because they capture data from different contexts and represent different types of evaluations; the PRIME EL and RISE ML are both impact evaluations, the L4R BL is a performance evaluation, and the PREG I EL is an analysis of pre-post changes.

In the context of IPC analysis, food consumption indicators include direct measures of food consumption (e.g., FCS, HDDS) and proxies (e.g., HHS, HFIAS, FIES, rCSI). The Matrix approach considers the FCS and HDDS to be food frequency indicators and the HHS, HFIAS, FIES, and rCSI to be experiential indicators. One indicator from each group is recommended for analysis using The Matrix approach. Table 3 shows the range of food security and coping strategy indicators used by each survey relative to those used in the FEWS NET approach.

[14] Maxwell D and Caldwell R. 2008. The Coping Strategies Index Field Methods Manual. Second Edition, January 2008. https://documents.wfp.org/stellent/groups/public/documents/manual_guide_proced/wfp211058.pdf

[15] Coates J, Rogers BL, Webb P, Maxwell D, Houser R and McDonald C. 2007. Diet Diversity Study. Emergency Needs Assessment Service. Rome: World Food Programme. See also Weismann D, Basset L, Benson T and Hoddinott J. 2009. Validation of the World Food Programmes Food Consumption Score and Alternative Indicators of Household Food Security. IFPRI Discussion Paper 00870. June 2009.

[16] All four surveys were conducted by TANGO International.

Table 3. Food security and coping strategy indicators from four datasets.

FEWS NET Matrix Analysis Indicators	Indicators used in datasets			
	PRIME Endline Ethiopia January 2018 (2,750 HHs)	RISE Midline Burkina Faso/Niger May 2017 (2,492 HHs)	L4R Baseline Ethiopia August 2018 (3,335 HHs)	PREG I Endline Kenya Sept. 2018 (2,820 HHs)
Food Frequency Indicators (FCS, HDDS)	HDDS	HDDS	HDDS	HDDS
Experiential Indicators (rCSI, HHS)	rCSI, HHS, HFIAS	HHS, HFIAS	CSI, FIES (30-day recall)	HHS, FIES (12-month recall[2])
Livelihood-based coping indicator (LBC)[1]	Data on coping strategies includes answers to the question, "How did you cope with the stressful events you experienced in the last year?"[3]	Data on coping strategies includes answers to the question, "How did you cope with the shocks you experienced in the last 12 months?"[3]	Data on coping strategies includes answers to the question "How did you cope with the shock(s) over the last 12 months?"[3]	Data on coping strategies includes answers to the question "Did you or your household use any of the following strategies to cope with any shock/stress over the last 12 months?"[3]

[1] WFP. 2015. Technical Guidance Note. Consolidated Approach to Reporting Indicators of Food Insecurity (CARI). November.
[2] The Matrix approach uses a 30-day recall period for capturing acute food insecurity with the FIES.
[3] The Matrix approach uses a recall period for coping strategies not exceeding 30 days.

3.2 Mapping HFIAS and FIES Responses to IPC Categories

The ability to reliably compare various food security rating systems is dependent on the specific choice of thresholds used to convert HFIAS and FIES to the various IPC classifications. Given the current lack of guidance for using the HFIAS or FIES in The Matrix approach, responses to the HFIAS and FIES survey questions must be mapped to IPC phases before they can be used in FEWS NET's Matrix analysis.

According to the guidance, frequency-of-occurrence responses in the HHS survey (commonly used in The Matrix approach) are recoded from three frequency categories (i.e., rarely, sometimes, often) to two (i.e., rarely/sometimes, often).[17] Thus, the HFIAS frequency-of-occurrence questions are recoded in the same manner as that prescribed in the FEWS NET guidance for HHS. Thresholds developed here correspond as closely as possible with the FEWS NET categorization that uses HHS.[18] Results of mapping the HFIAS to IPC categories are shown in Table 22 (Annex 1).

Like HFIAS, FIES is not included in the FEWS NET guidance. Unlike the HFIAS and HHS however, FIES does not measure how often a household experiences food insecurity. Rather, FIES scores range on a scale from 0-8, representing the sum of the "yes" responses across the eight yes/no questions. Thus, the

[17] FEWS NET. 2019. FEWS NET Matrix Analysis: Integrated analysis of survey-based indicators for classification of acute food insecurity. Washington, DC: FEWS NET.
[18] This research calculates HHS using standard FANTA guidance and categorizes HHS values following the IPC 3.0 reference table (see IPC Global Partners. 2019. Integrated Food Security Phase Classification Technical Manual Version 3.0. Evidence and Standards for Better Food Security and Nutrition Decisions. Rome.)

two FIES response categories align directly with those for the IPC categories based on the HHS and are shown in Table 23 (Annex 1).

Although the IPC Technical Manual Version 3.1 (2021) includes thresholds for the 30-day FIES, no cut-off values distinguish Phases 3, 4, and 5 (FIES > 0.36 for Phases 3, 4, and 5). Rather, the new guidance instructs users to make distinctions based on non-defining characteristics (NDC). Thus, the current analysis maps the FIES to IPC categories in the same manner as described for the HFIAS in order to be consistent.

3.3 Comparing IPC Phase Classifications: HHS versus HFIAS

This section uses the FEWS NET Matrix approach with data on HFIAS from the PRIME EL and RISE II ML to classify households into IPC phases and then compares the classifications with the IPC classification based on HHS for each dataset.

Table 4 shows results using data from the PRIME EL. Blue borders indicate cells where IPC phase classifications based on HHS converge with those based on HFIAS. For example, both indicators (i.e., HHS and HFIAS) yield the same results for Phases 3, 4, and 5. It should be noted, however, that it cannot be reliably assumed that the households classified using the HHS are the same as those classified using HFIAS.[19] Table 5 shows results of the same analysis using data from the RISE I ML.

For both datasets, there is exact convergence of categorizations for the most severe levels of food insecurity, Phases 3, 4 and 5, at least at the aggregate level. For the PRIME EL data, 610, 54 and 54 households are in Phases 3, 4 and 5, respectively, regardless of whether categorization is based on the HHS or HFIAS. The same is true for the RISE I ML data: classification of households into the highest three phases (i.e., the most food insecure) is the same whether using HHS or HFIAS.

The divergence in categorization lies in the first two food insecurity phases. For both datasets, using HFIAS results in more households classified in Phase 2, and less in Phase 1 compared with results using the HHS. For example, HFIAS-based classification using PRIME EL data places 56 percent of households into Phase 2 and only 17 percent in Phase 1. HHS-based classification results in a much higher percentage (54 percent) in Phase 1, the lowest level of food insecurity, and only 19 percent in Phase 2. The same pattern is evident in the RISE II ML dataset, where 43 percent of households are placed in Phase 2 and 42 percent in Phase 1. In contrast, only 10 percent of households are placed in Phase 2 when classified using HHS and substantially more—75 percent—in Phase 1.

Table 4: IPC classifications using HFIAS versus HHS – PRIME EL data

		IPC phase classification based on HHS (# of households)					Total based on HFIAS)
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	
IPC phase classification based on HFIAS (# of households)	Phase 1	455 (17%)	0	0	0	0	453 (17%)
	Phase 2	978 (37%)	498 (19%)	0	0	0	1476 (56%)
	Phase 3	0	0	610 (23%)	0	0	610(23%)
	Phase 4	0	0	0	54 (2%)	0	54 (2%)

[19] This is one of the shortcomings of this summary analysis. See also Box 1 in this report and FEWS NET. 2019. FEWS NET Matrix Analysis: Integrated analysis of survey-based indicators for classification of acute food insecurity. Washington, DC: FEWS NET.

		IPC phase classification based on HHS (# of households)					Total based on HFIAS)
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	
	Phase 5	0	0	0	0	54 (2%)	54 (2%)
Total based on HHS		1431 (54%)	498 (19%)	610 (23%)	54 (2%)	54 (2%)	n = 2651 (100%))

Table 5: IPC classifications using HFIAS versus HHS – RISE I ML data

		IPC phase classification based on HHS (# of households)					Total based on HFIAS Phase 2
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	
IPC phase classification based on HFIAS (# of households)	Phase 1	1031 (42%)	0	0	0	0	1031 (42%)
	Phase 2	813 (33%)	250 (10%)	0	0	0	1063 (43%)
	Phase 3	0	0	324 (13%)	0	0	324 (13%)
	Phase 4	0	0	0	24 (1%)	0	24 (1%)
	Phase 5	0	0	0	0	28 (1%)	28 (1%)
Total based on HHS		1844 (75%)	250 (10%)	324 (13%)	324 (13%)	24 (1%)	n = 2470 (100%)

Such results suggest that: i) HHS somewhat underestimates the severity of food insecurity, or ii) HFIAS slightly overestimates the severity of food insecurity, at least in certain contexts. However, focusing on only IPC phases 3 and above, there are no differences in classification regardless of whether HHS or HFIAS are used. Compared with the HHS, the HFIAS-based categorization is the more inclusive indicator to use if considering the full range of phases (one through five) used in the IPC classifications; however, there are no differences between HHS and HFIAS for the three most severe phases that ultimately inform HFA priorities.

Unfortunately, none of the available datasets used in this analysis include measures of both the FIES and HHS, which would allow the FEWS NET Matrix approach to be used for classifying households into IPC phases based on the FIES and compared with those based on the HHS. Instead, the analysis shifts to constructing the food consumption matrix using FIES in combination with other food consumption indicators (e.g., HDDS, rCSI).

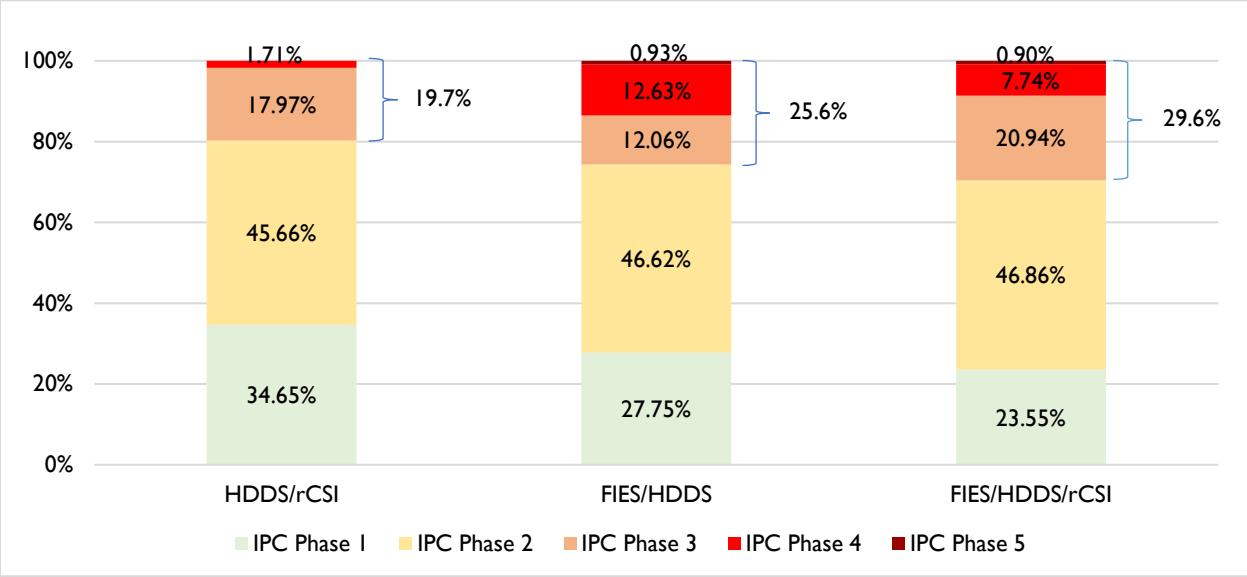
3.4 Comparing IPC Phase Classifications: HDDS, rCSI and FIES Combinations

This section uses the FEWS NET Matrix approach to construct food consumption matrices using three different combinations of available food security indicators: i) HDDS and rCSI, ii) FIES and HDDS, and iii) FIES, HDDS, and rCSI. As was done in the previous section with HFIAS, FIES responses are utilized for purposes of IPC classification in a manner aligning with similar responses that use HHS from the formal IPC classification. Data are from the L4R BL,[20] which will be explored in more detail in Section 5.3.

[20] The PREG I EL includes FIES questions utilizing a 12-month recall, which is not appropriate for use with FEWS NET's Matrix approach. Thus, data from the PREG I EL are not used for this analysis.

Figure 1 compares IPC categorizations based on the different combinations of food security indicators from the L4R dataset (i.e., HDDS, rCSI, FIES). Overall, more households are classified as severely food insecure (IPC Phases 3, 4 and 5) when including the FIES indicator in the analysis. When adding FIES to the classification based on HDDS/rCSI (first column), there is an increase of nearly 10 percentage points in households classified as Phases 3, 4 and 5 (last column). There is a similar, though smaller, increase of 6 percentage points when using the FIES in combination with the HDDS rather than rCSI (first column compared to the middle column). As with the HFIAS, these results suggest either an over- or under-classification of the severity of household food insecurity depending on which combination of indicators are used. When presented with the availability of multiple food security indicators, an analyst should evaluate differences in humanitarian food assistance need implied using the different indicators and use additional contextual information (e.g., qualitative data, other quantitative indicators, timely secondary contextual data) to help triangulate the most appropriate estimate. FIES, HDDS, and rCSI is most relevant. In the interest of improving the precision of the IPC classification process, further testing of FIES across other datasets is needed to validate its use in constructing the food consumption matrix.

Figure 1: Summary results for different food consumption matrices using the L4R BL dataset



4. Using Livelihood Coping Indicators to Categorize Food Insecurity

4.1 Livelihood Coping Strategies

IPC protocols define acute food insecurity not only by a lack of access to adequate quantities of food but also on the use of negative livelihood coping strategies to prevent or lessen household food deficits. In order to incorporate household-level data on livelihood coping strategies into the food consumption matrix used in FEWS NET's Matrix approach, coping strategies are first classified according to severity. According to the guidelines, "severity is based on how severe food consumption gaps would need to be for a household to utilize a given strategy." The Matrix approach typically uses four levels of coping, including stressed, crisis, emergency, and catastrophe, with a fifth—full exhaustion of coping capacity—as a possibility in some contexts. The current analysis uses the more typical four. It should be noted that

these categories reflect household actions (e.g., asset depletion) that address current food access shortages (i.e., 30-day recall period) experienced by a household rather than those used over longer periods of time to cope with livelihood challenges generally.

According to FEWS NET, WFP's Consolidated Approach to Reporting Indicators of Food Security (CARI) guidance[21] has some flexibility for categorizing livelihood strategies into the four levels of food insecurity. For example, selling livestock is coded as a *"stress"* strategy based on the CARI. However, in this analysis, tropical livestock units (TLUs) are used to help distinguish two levels of severity with this coping mechanism: *"stressed"* for households with total livestock assets greater than 1.4 TLU (equivalent to two cows) and *"emergency"* for households with less than 1.4 TLU. Such a distinction may capture "full exhaustion" of coping capacity in certain contexts, in this case, households with few livestock assets to sell or slaughter as a means of coping with acute food shortages versus those with more. Figure 2 shows how coping strategies from the PRIME EL are mapped onto the four levels of severity used in The Matrix approach based on WFP's guidance.

Figure 2: Level of severity for negative coping strategies from the PRIME EL

Level of Severity	PRIME EL Negative Livelihood Coping Strategies
Stressed	Sell household items
	Use money from savings
	Take out a loan from a money lender
	Take out a loan from a bank
	Take up new wage labor
	Sell livestock (TLU>1.4)[1]
	Slaughter livestock (TLU>1.4)[1]
	Sell productive items
	Move to less expensive housing
Crisis	Take children out of school
	Send child or an adult to stay with relatives
Emergency	Lease land
	Sell livestock (TLU≤1.4)[1]
	Slaughter livestock (TLU≤1.4) [1]
Catastrophe	Migrate (the whole family)
	Send children to work for money

[1] A threshold TLU (tropical livestock unit) value is used to split "selling livestock" and "slaughtering livestock" into two categories of severity. Households selling or slaughtering livestock are categorized under "emergency" if the TLU value is at or below 1.4 (equivalent to two cows weighted at 0.7 each) and "stressed" if the value is above 1.4.

5. Conducting a Matrix Analysis with Alternative Indicators

This section utilizes the FEWS NET Matrix approach with four alternative indicators to classify households according to IPC phases of food insecurity. The four datasets described in Section 3.1 (i.e., PRIME EL, RISE I ML, L4R BL, and PREG I EL) are used in the analysis. Findings include a brief review of

[21] WFP. 2015. Consolidated Approach to Reporting Food Insecurity Indicators (CARI). Technical Guidance Note. Second Edition. November 2015. Rome: World Food Program.

each dataset and potential methodological considerations necessary for analysis, followed by construction of a food consumption matrix, a food consumption/livelihoods coping matrix, and a comparison of the single-matrix (food consumption) and combined-matrix (food consumption + livelihood coping) approaches to IPC classification.

5.1. PRIME Endline

The PRIME EL dataset includes a food frequency indicator (i.e., HDDS) and three experiential food security indicators (i.e., HHS, HFIAS, rCSI). All but the HFIAS are specified in FEWS NET's guidance. Data for calculating a livelihood-based coping indicator are available from the shocks module (Module 3) of the PRIME EL survey instrument, and are based on the question, *"How did you cope with the stressful events you experienced in the last year?"* IPC classifications for HFIAS were conducted as described in Section 3.3 (see also Table 22; Annex 1).

Constructing the Food Consumption Matrix

The food consumption matrix for household data from the PRIME EL using HHS, HDDS, and the rCSI is presented in Table 6. The matrix using HFIAS, HDDS, and the rCSI from the same dataset is shown in Table 7.

Before populating the matrix, the matrix cells are color-coded to indicate the IPC category that coincides with the corresponding ranges or values for each of the three indicators per the IPC 3.0/3.1 reference table.[22] Each cell represents household responses to each of the indicators; the HHS, HDDS, and rCSI in Table 6 and HFIAS, HDDS, and rCSI in Table 7. The matrix is then populated with the percentages of households that fall within the ranges of indicator values prescribed by the IPC 3.0/3.1 reference table. Each table demonstrates how households are distributed across IPC phases based on the combination of their responses to each of the three indicators.

Table 6: Food consumption matrix with HHS, HDDS and rCSI, PRIME EL

	rCSI<4			rCSI 4-18			rCSI>18		
	HDDS >4	HDDS 3-4	HDDS 0-2	HDDS >4	HDDS 3-4	HDDS 0-2	HDDS >4	HDDS 3-4	HDDS 0-2
HHS=0	8.89%	5.94%	0.64%	16.78%	9.38%	1.46%	5.57%	4.48%	1.23%
HHS=1	1.46%	0.71%	0.22%	6.32%	3.55%	1.20%	2.54%	1.98%	0.67%
HHS=2-3	0.71%	0.64%	0.19%	5.53%	4.19%	2.06%	4.26%	3.85%	1.46%
HHS=4	0.04%	(-)	0.04%	0.15%	0.34%	0.15%	0.37%	0.60%	0.34%
HHS=5-6	0.04%	(-)	(-)	0.22%	0.04%	0.07%	0.45%	0.56%	0.71%

[22] Analyses were conducted prior to publication of the IPC 3.1 guidance (2021). However, the IPC reference table did not change other than the addition of the FIES in version 3.1.

Table 7: Food consumption matrix with HFIAS, HDDS and rCSI, PRIME EL

	rCSI<4			rCSI 4-18			rCSI>18		
	HDDS >4	HDDS 3-4	HDDS 0-2	HDDS >4	HDDS 3-4	HDDS 0-2	HDDS >4	HDDS 3-4	HDDS 0-2
HFIAS=1	6.18%	3.55%	0.42%	3.89%	1.76%	0.23%	0.69%	0.34%	0.19%
HFIAS=2	3.93%	2.94%	0.46%	19.54%	11.22%	2.33%	7.44%	5.95%	1.76%
HFIAS=3	0.73%	0.65%	0.19%	5.53%	4.24%	2.10%	4.31%	3.85%	1.49%
HFIAS=4	0.04%	(-)	0.04%	0.15%	0.34%	0.15%	0.38%	0.61%	0.31%
HFIAS=5	0.04%	(-)	(-)	0.23%	0.04%	0.08%	0.42%	0.57%	0.69%

HFIAS categories: 1 = food secure to moderately food insecure, 2 = moderately to severely food insecure access, 3-4 = = severely food insecure access, 5 = extremely severe food insecure access. Extremely food insecure access includes households that responded that i) in the past four weeks, they (sometimes or often) went a whole day/night without eating anything because there was not enough food AND ii) in the past four weeks, they (often) went to sleep at night hungry because there was not enough food.

Table 8 shows a summary of the results for each IPC phase using the two food consumption indicator combinations reported in Table 6 and 7. Results show that there is convergence in the most severe phases of food insecurity—Phases 4 and 5. However, results also show that more households are classified in need of HFA (IPC Phases 3, 4, and 5) when using the HFIAS than with the HHS; 26 percent of households are classified in need of HFA when measured with the HHS compared to 31 percent when measured with the HFIAS.

Table 8: Summary results of the food consumption matrices using PRIME EL data

IPC Phase	% HHs using HHS, HDDS, rCSI	% HHs using HFIAS, HDDS, rCSI
IPC 1	14.8	9.7
IPC 2	59.3	59.1
IPC 3	22.9	28.2
IPC 4	2.2	2.1
IPC 5	0.8	0.8

Classifying Livelihood Coping Categories

Although some guidance exists (e.g., CARI), aligning livelihood coping strategies with IPC severity categories is context-specific and needs to be done separately for every country/survey, for example through a rapid qualitative assessment of each context. Table 9 shows the categorization into IPC phases of the negative livelihood strategies reported in the PRIME EL survey that was developed for this analysis. The levels of severity shown in this and subsequent tables are color-coded to correspond to IPC phases as determined relevant to each individual survey.

According to FEWS NET guidance, coping strategies should reflect actions that would mitigate short-term food deficits rather than those used to deal with longer-term acute food insecurity. For example, coping strategies which a household indicates they did not use because they had already exhausted that approach over the last 12 months should not be included. Thus, the livelihood coping strategies are context-specific and likely to vary across surveys, programs, and countries.

Coping strategies used by less than five percent of respondents are not included in further analyses. In many cases, this may eliminate inclusion of strategies that reflect longer-term acute food insecurity, which are not appropriate for estimating current food insecurity.[23]

Table 9: Severity level of negative livelihood coping strategies using the PRIME EL dataset

Level of Severity	PRIME EL Negative Livelihood Coping Strategies[1]	PRIME EL frequencies n = 3919
Stressed	Sell household items	1.35%
	Use money from savings	7.66%
	Take out a loan from a money lender	6.49%
	Take out a loan from a bank	0.44%
	Take up new wage labor	20.25%
	Sell livestock (TLU>1.4)[1]	60.04%
	Slaughter livestock (TLU>1.4)[1]	12.19%
	Sell productive items	1.06%
	Move to less expensive housing	1.24%
Crisis	Take children out of school	8.43%
	Send child or an adult to stay with relatives	5.33%
Emergency	Lease land	2.37%
	Sell livestock (TLU≤1.4)[1]	7.81%
	Slaughter livestock (TLU≤1.4) [1]	1.46%
Catastrophe	Migrate (the whole family)	4.20%
	Send children to work for money	2.41%

[1] Coping strategies used by less than 5% of respondents are not included in The Matrix analysis. Note, the original Matrix guidance utilizes all coping strategies, regardless of prevalence of use.
[2] A threshold TLU (tropical livestock unit) value is used to split "selling livestock" and "slaughtering livestock" into two categories of severity. Households selling or slaughtering livestock are categorized under "emergency" if the TLU value is at or below 1.4 (equivalent to two cows weighted at 0.7 each) and "stressed" if the value is above 1.4.

Constructing the Food Consumption/Livelihood Coping Matrix

The IPC classifications made using food consumption indicators are now combined with those constructed using livelihood coping categories. As described previously, prior to populating the matrix each cell is classified into an IPC phase based on how that combination of food consumption and livelihoods coping relates to the phase descriptions in the IPC 3.0/3.1 reference table (see color-coding in Table 10 and 11). In cases where the indicative phases suggested by the food consumption and livelihoods coping categories do not concur, the classification protocols provided in the FEWS NET

23 FEWS NET. 2019. FEWS NET Matrix Analysis: Integrated analysis of survey-based indicators for classification of acute food insecurity. Washington, DC: FEWS NET.

Matrix guidelines are used.[24] Hence, the IPC classification (reflected via color-coding) shown in tables combining food consumption and livelihood coping categories may vary across surveys. In the four datasets used in our analyses, the IPC classification happens to be the same across all four.

The combined food consumption/livelihoods coping matrix using HHS, HDDS and the rCSI from the PRIME EL dataset is presented in Table 10 and the matrix using the HFIAS, HDDS, and rCSI from the same dataset in Table 11. Each table demonstrates how households are distributed across IPC phases based on the combination of responses to the respective indicators. For easier comparison, summary results are presented in Table 12.

Table 10: Combined food consumption/livelihoods coping matrix for the PRIME EL using HHS, HDDS and rCSI

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	2.32%	10.16%	1.20%	1.16%	(-)
Food Consumption Phase 2	11.10%	37.29%	6.80%	4.15%	(-)
Food Consumption Phase 3	6.88%	10.58%	3.06%	2.35%	(-)
Food Consumption Phase 4	0.75%	0.82%	0.37%	0.22%	(-)
Food Consumption Phase 5	0.37%	0.26%	0.11%	0.04%	(-)

Table 11: Combined food consumption/livelihood coping matrix for the PRIME EL using HFIAS, HDDS and rCSI

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	1.37%	6.91%	0.84%	0.61%	(-)
Food Consumption Phase 2	11.03%	37.48%	6.26%	4.35%	(-)
Food Consumption Phase 3	7.86%	13.70%	3.97%	2.71%	(-)

[24] Per FEWS NET Matrix guidelines: when the indicative phase suggested by the food consumption indicators is higher than that suggested by the livelihoods change indicator, the overall classification should follow the food consumption classification. When the indicative phase suggested by the food consumption indicators is lower than that suggested by the livelihoods change indicator, the overall classification should more heavily weight the livelihood coping indicator. The only exception to this guidance relates to Catastrophe (Phase 5). To be classified in Catastrophe for the current period, a household must be facing extreme food gaps, even if coping has been exhausted.

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 4	0.76%	0.76%	0.38%	0.23%	(-)
Food Consumption Phase 5	0.34%	0.27%	0.11%	0.04%	(-)

Table 12 shows a summary of the results for each IPC phase using the two food consumption/livelihood coping matrices reported in Table 10 and 11. As was the case for the single matrix (i.e., food consumption only), results show that there is convergence in the most severe phase of food insecurity and that slightly more households are classified in need of HFA (IPC Phases 3, 4, and 5) when using the HFIAS than with the HHS. When livelihood coping is included, 38 percent of households are classified in need of HFA when measured with the HHS compared to 42 percent when measured with the HFIAS.

Table 12: Summary results of the food consumption/livelihood coping matrices using PRIME EL data

IPC Phase	% HHs using HHS/coping	% HHs using HFIAS/coping
IPC 1	12.5	8.3
IPC 2	49.6	49.4
IPC 3	32.6	36.8
IPC 4	4.5	4.9
IPC 5	0.8	0.8

Comparing Single- and Combined-Matrices

Figure 3 shows results from the single-matrix involving only the food consumption indicators (see also Table 8) and shows the increase in people classified as needing HFA when using the HFIAS as one of the food consumption indicators when constructing the matrix. According to the results, there is a 5 percentage point increase in households classified as needing HFA when using the HFIAS compared to using the HHS (31.1 versus 25.9 percent, respectively).

Figure 3: Summary results for the HHS-based and HFIAS-based food consumption matrices using the PRIME EL dataset

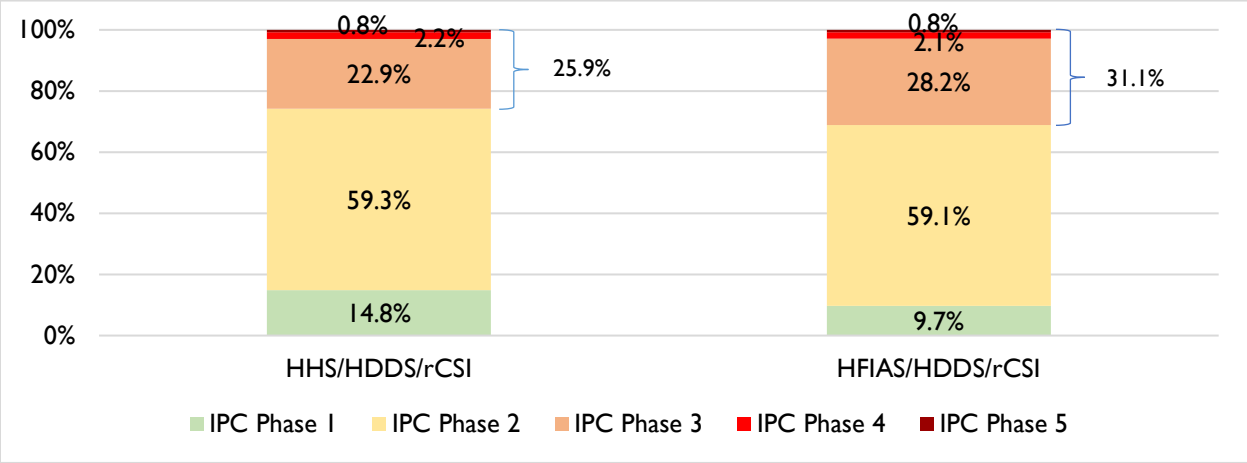


Figure 4 shows similar results when a livelihoods coping component is combined with the food consumption indicators; use of HFIAS results in a larger proportion of households falling into IPC Phases 3, 4, and 5 compared with the HHS. That is, using the HFIAS indicator increases the percentage of households classified in need of HFA by 4 percentage points compared to the HHS.

Figure 4: Summary results for the HHS-based and HFIAS-based food consumption/ livelihood coping matrices using the PRIME EL dataset

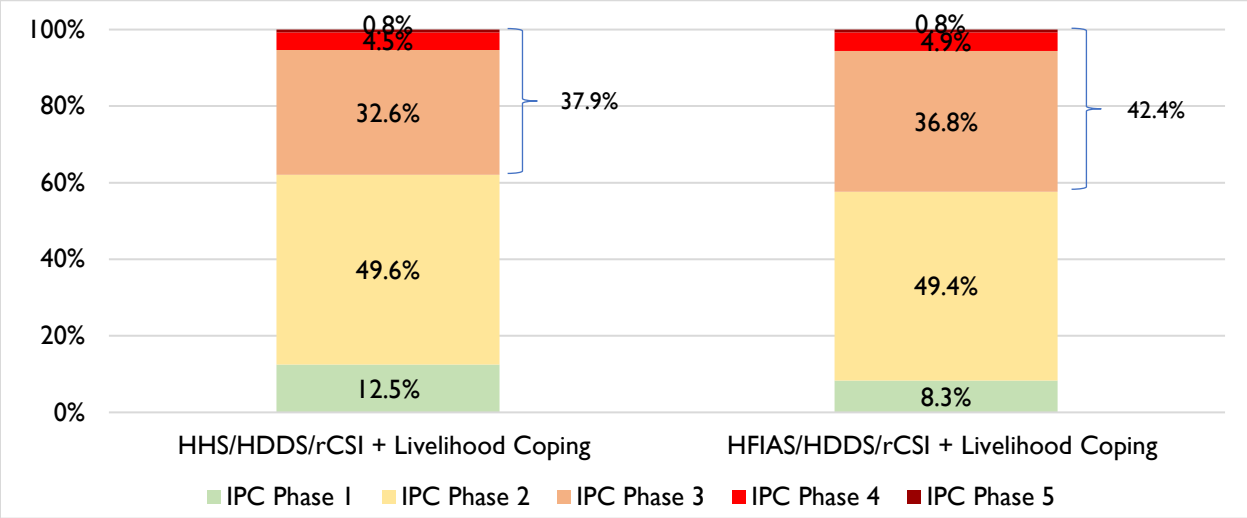


Figure 4 also demonstrates that adding the livelihoods coping categories into the food consumption matrix analysis (i.e., combined-matrix) increases the percentage of households in IPC Phase 3 and higher for both HHS- and HFIAS-based formulations. Thus, using livelihood coping indicators increases the percentage of households classified in need of HFA; in the case of the PRIME EL dataset, by 12 and 11 percentage points for the HHS- and HFIAS-based formulations, respectively.

5.2 RISE I Midline

The RISE I ML dataset differs only slightly from the PRIME EL in that it includes the HDDS, HHS, and HFIAS. It does not, however, include the rCSI. IPC classifications for HFIAS were conducted as described in Section 3.3 (see also Table 22; Annex 1). Data for calculating the livelihood coping indicator are available from the shocks module of the RISE I ML survey instrument and are based on the question, *"How did you cope with the shocks(s) you experienced in the last 12 months?"* The FEWS NET guidance recommends a 30-day recall period for the livelihoods coping formulations. Thus, results using the RISE I ML dataset do not follow that aspect of the recommended guidance and results should be viewed with this caveat in mind.

Constructing the Food Consumption Matrix

Food consumption matrices using data from the RISE I ML were developed in the manner described in Section 5.1 for the PRIME EL, including color-coding and populating the cells with the percentages of households that fall within the ranges of indicator values prescribed by the IPC 3.0 reference table. The food consumption matrix using HHS and HDDS can be found in Table 24 and the matrix using HFIAS and HDDS in Table 25, both in Annex 1.

Table 13 shows a summary of the results using RISE I ML data, which is consistent with earlier findings using PRIME EL data; there is convergence in IPC Phases 4 and 5 as well as more households classified as needing HFA overall when the matrix is constructed with the HFIAS (15.3percent) versus with the HHS (10.9 percent).

Table 13: Summary results of the food consumption matrices using RISE I ML data

IPC Phase	% HHs using HHS/coping	% HHs using HFIAS
IPC 1	66.8	38.4
IPC 2	22.2	46.3
IPC 3	9.1	13.3
IPC 4	1.4	1.5
IPC 5	0.4	0.5

Classifying Livelihood Coping Categories

Table 14 shows how the negative livelihood coping strategies reported in the RISE I ML survey were categorized according to IPC phases and the percentage of households reporting their use. As previously noted, responses are based on a 12-month rather than the recommended 30-day recall period. Regardless, the coping strategies listed primarily reflect household actions that would mitigate food deficits in the context of the RISE I program implementation area.

Table 14: Severity level of negative livelihood coping strategies using the RISE I ML

Level of Severity	RISE ML Negative Livelihood Coping Strategies[1]	RISE ML Frequencies n = 3634
Stressed	Sell household items	6.96%
	Use money from savings	18.89%
	Take out a loan from a money lender	8.41%
	Take out a loan from a bank	0.78%
	Take up new wage labor	2.85%
	Sell livestock (TLU>1.4)[2]	49.46%
	Sell productive items	1.11%
	Move to less expensive housing	0.08%
	Hunting/gathering	5.61%
	Evacuation of termite mounds	0.12%
Crisis	Take children out of school	0.99%
	Send child or an adult to stay with relatives	3.17%
	Eat lean season food	2.56%
	Consume seed stock	12.37%
Emergency	Lease land	4.04%
	Sell livestock (TLU≤1.4)[1]	26.48%
	Slaughter livestock (TLU≤1.4)[1]	2.80%
	Migrate (the whole family)	2.43%

Level of Severity	RISE ML Negative Livelihood Coping Strategies[1]	RISE ML Frequencies n = 3634
Catastrophe	Send children to work for money	0.29%

[1] Coping strategies utilized by less than 5% of respondents were not included in the current analysis. Note, the original Matrix guidance utilizes all coping strategies, regardless of prevalence of use.
[2] A threshold TLU (tropical livestock unit) value is used to split "selling livestock" and "slaughtering livestock" into two categories of severity. Households selling or slaughtering livestock are categorized under "emergency" if the TLU value is at or below 1.4 (equivalent to two cows weighted at 0.7 each) and "stressed" if the value is above 1.4.

Constructing the Food Consumption/Livelihood Coping Matrix

Combining the food consumption and livelihood coping categories developed with data from the RISE I ML follows the same procedure described for the PRIME EL (see Section 5.1). Results for the combined food consumption/livelihood coping matrix using HHS and HDDS (Table 26) and for the HFIAS and HDDS (Table 27) are presented in Annex 1.

Table 15 shows a summary of the results for the two food consumption/livelihood coping matrices. In contrast to results using data from the PRIME EL, there is less convergence between the HHS and HFIAS formulations with data from the RISE I ML; the data converge only in the most severe category of food insecurity, IPC Phase 5. However, the results are similar in that more households are classified as needing HFA using the HFIAS (40 percent) than with the HHS (35 percent).

Table 15: Summary results of the food consumption/livelihood coping matrices using RISE I ML data

IPC Phase	% HHs using HHS/coping	% HHs using HFIAS/coping
IPC 1	46.3	29.4
IPC 2	18.7	30.6
IPC 3	30.0	33.7
IPC 4	4.6	5.9
IPC 5	0.4	0.4

Comparing Single- and Combined-matrices

When only the food consumption matrix is used for IPC classification of households, using HFIAS as an indicator results in a higher proportion (8 percentage points) of sampled households classified in need of HFA than when using the HHS (Figure 5). There is also a considerable reduction in households classified in IPC Phase I, or minimal food insecurity, with a concomitant shift in households classified as IPC Phase 2 (Stressed) when using HFIAS compared to HHS. Regardless, the analysis still shows good convergence at IPC Phases 4 and 5, the most severe levels of food insecurity.

Figure 5: Summary results for the HHS-based and HFIAS-based food consumption matrices using the RISE I ML dataset

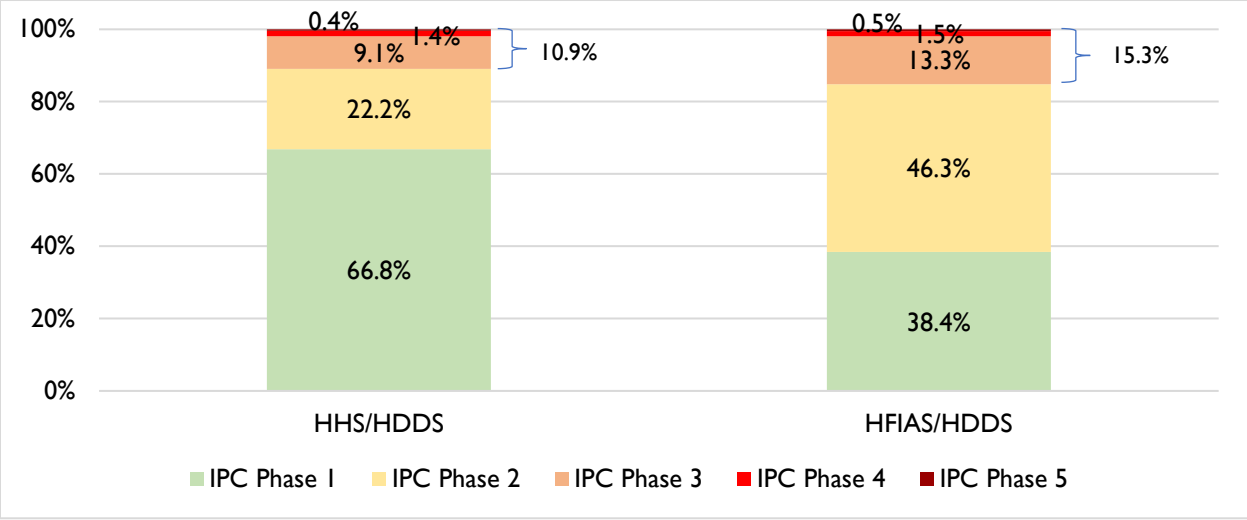
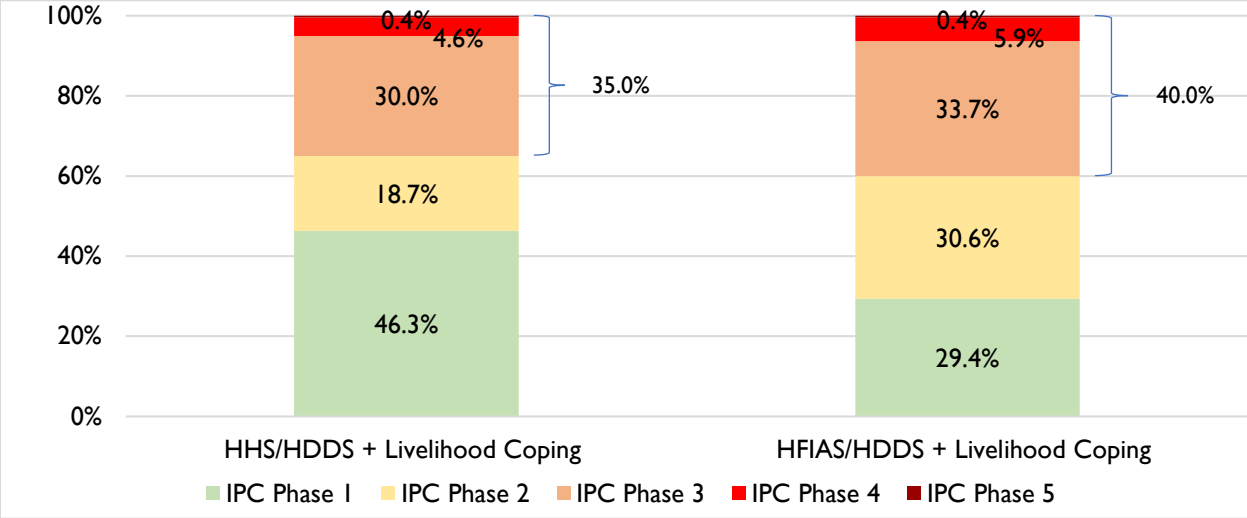


Figure 6 shows the same pattern for the combined food consumption/livelihood coping matrix; more households are classified as needing HFA when using the HFIAS than the HHS. However, convergence of results from the two approaches only occurs for IPC Phase 5; the approaches do not converge in IPC Phase 4, which has been the case so far.

Figure 6: Summary results for the HHS-based and HFIAS-based food consumption/livelihood coping matrices using the RISE I ML dataset



Comparison of Figure 5 (food consumption indicators only) and Figure 6 (food consumption plus livelihood coping) shows that adding livelihood coping strategies substantially increases the proportion of households in IPC Phase 3 or higher regardless of whether the HHS or HFIAS is used; there is a 24-25 percentage point increase.

5.3 L4R Baseline

The L4R BL dataset includes HDDS as a food frequency indicator and the FIES and CSI as food experiential indicators. The FIES indicator uses a 30-day recall period (the FEWS NET recommended recall period), and is used for IPC classifications based on the mapping exercise conducted in Section 3.2 (see also Table 23; Annex 1). Data for calculating the livelihood coping indicator are available from the shocks module of the L4R BL survey instrument and are based on the question, *"How did you cope with [the shock] over the last 12 months?"* As noted for the RISE I ML (Section 5.2), the FEWS NET guidance recommends a 30-day rather than 12-month recall period for the livelihoods coping formulations. Thus, results using the L4R dataset should be viewed with this caveat in mind. Finally, the L4R dataset uses the full CSI, which must be converted to the rCSI. Guidance for calculating the rCSI is described in the CSI Field Methods Manual.[25]

Constructing the Food Consumption Matrix

The L4R dataset allows for constructing food consumption matrices based on different combinations of food security indicators: i) a matrix using HDDS and rCSI, ii) a matrix using HDDS and FIES, and iii) a matrix that combines all three, HDDS, rCSI and FIES. L4R is the only one of the four datasets where the FIES indicator with 30-day recall is used, hence the comparisons of food consumption matrices with and without this variable are of particular interest. The distributions of households across all possible cells for each of the three matrices are presented in Annex 1 (Table 28, Table 29, and Table 30, respectively).

Table 16 shows a summary of the results for the food consumption matrices using L4R BL data. Summary results for the FIES/HDDS matrix (Table 29) are not reported, as they were presented in Section 3.4 and represent an intermediate formulation; the summary results of key interest involve the addition of FIES to the HDDS/rCSI matrix. The key take-away from the summary results is the increase in households classified in IPC Phases 3, 4, and 5 when FIES is included in analysis (this is also the case when comparing the HDDS/rCSI matrix with the FIES/HDDS matrix; see Section 3.4).

Table 16: Summary results for the food consumption matrices using L4R BL data

IPC Phase	% HHs using HDDS/rCSI	% HHs using FIES/HDDS/rCSI
IPC 1	34.7	23.6
IPC 2	45.7	46.9
IPC 3	18.0	20.9
IPC 4	1.7	7.7
IPC 5	(-)	0.9

Classifying Livelihood Coping Categories

Table 17 shows the categorization into IPC phases of the percentage of households with negative livelihood strategies reported in the L4R BL. It should be noted that the recall period for coping responses used in the L4R survey instrument is 12 months; the FEWS NET Matrix guidance recommends 30-day recall. The livelihood coping strategies in Table 17 are specific to the L4R implementation area and vary somewhat with those for the PRIME project (Table 9), even though both are implemented in Ethiopia.

[25] Maxwell D. and R. Caldwell. 2008. The Coping Strategies Index: A tool for measurement of household food security and the impact of food aid programs in humanitarian emergencies. Field Methods Manual. Second Edition. January 2008.

Table 17: Severity level of negative livelihood coping strategies using L4R BL data

Level of Severity	L4R Baseline Negative Livelihood Coping Strategies[1]	L4R Baseline Frequencies n = 3725
Stressed	Sell household items	0.28%
	Use money from savings	3.32%
	Take out a loan from a money lender	10.22%
	Take out a loan from a bank	0.09%
	Got food on credit from a local merchant	6.30%
	Take up new wage labor	25.39%
	Sell livestock (TLU>1.4) [2]	19.28%
	Sell productive items	0.09%
	Move to less expensive housing	3.93%
	Reduce non-essential household expenses	34.31%
Crisis	Take children out of school	1.30%
	Send child or an adult to stay with relatives	1.01%
Emergency	Lease land	1.71%
	Sell livestock (TLU≤1.4)[2]	9.15%
	Slaughter livestock	0.47%
Catastrophe	Migrate (the whole family)	0.44%
	Send children to work for money	0.66%

[1] Coping strategies utilized by less than 5% of respondents were not included in analysis.
[3] A threshold TLU (tropical livestock unit) value is normally used to split "selling livestock" and "slaughtering livestock" into two categories of severity. However, the TLU threshold was not applied to "slaughtering livestock" in the L4R baseline analysis because less than 5% of households utilized this livelihood strategy.

Constructing the Food Consumption/Livelihood Coping Matrix

Combining the food consumption and livelihood coping matrices developed with data from the L4R dataset follows the same procedure described for the PRIME EL (see Section 5.1). Results for the combined food consumption/livelihood coping matrices using HDDS and rCSI are presented in Table 31 and Table 32 presents results for FIES, HDDS, and rCSI, both in Annex 1.

Table 18 shows a summary of the results for the two food consumption/livelihood coping matrices. In contrast to results using data from the PRIME EL or RISE I ML, there is less convergence overall between the two approaches (with/without FIES), except for Phases 2 and 3. However, more households are classified in need of HFA when the FIES is including in combination with the HDDS and rCSI.

Table 18: Summary results for the food consumption/livelihood coping matrices using L4R BL data

IPC Phase	% HHs using HDDS/rCSI	% HHs using FIES/HDDS/rCSI
IPC 1	32.5	22.3
IPC 2	42.0	42.9
IPC 3	21.1	23.7
IPC 4	4.4	10.2
IPC 5	(-)	0.9

Comparing Single- and Combined-matrices

Figure 7 summarizes and compares the results for the food consumption matrices developed with and without the FIES. Overall, the IPC phase distributions generated by the addition of FIES show a decrease in IPC Phase 1 and an increase across the more severe IPC phases. The addition of FIES into the formulation increases the percentage of households classified in need of HFA from 20 to 30 percent (see also Section 3.4). While the additional gradation across the IPC phases provided by the FIES indicator is viewed generally as a positive, the utilization of FIES should be further tested across other datasets that include a comparable food security variable used as part of FEWS NET guidance (i.e., HHS) in order to validate the use of this variable when computing the food consumption matrix.[26]

Figure 7: Summary results for food consumption matrices with/without FIES using L4R BL data

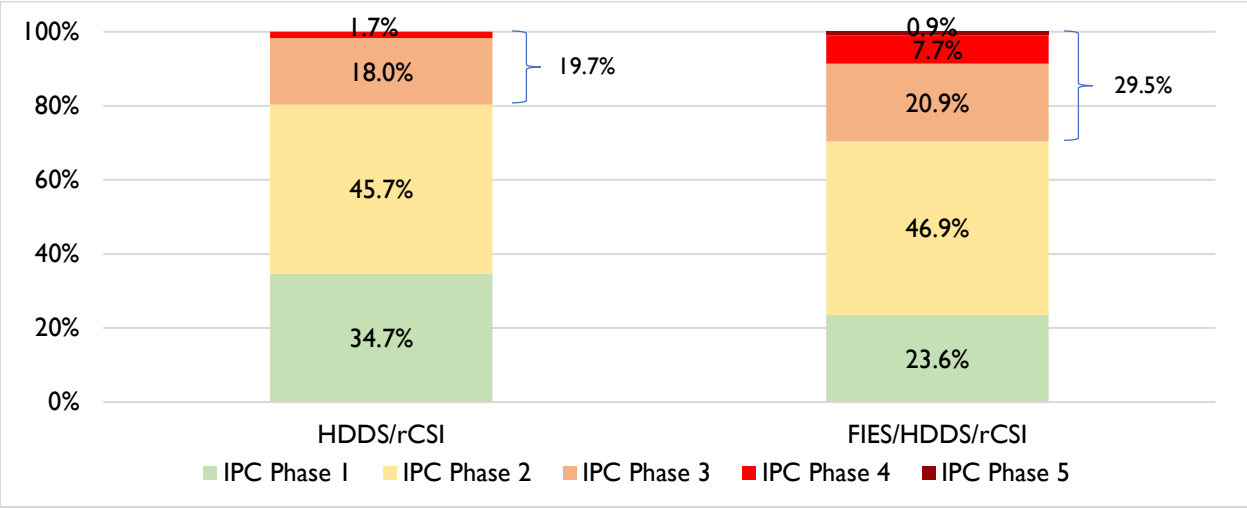
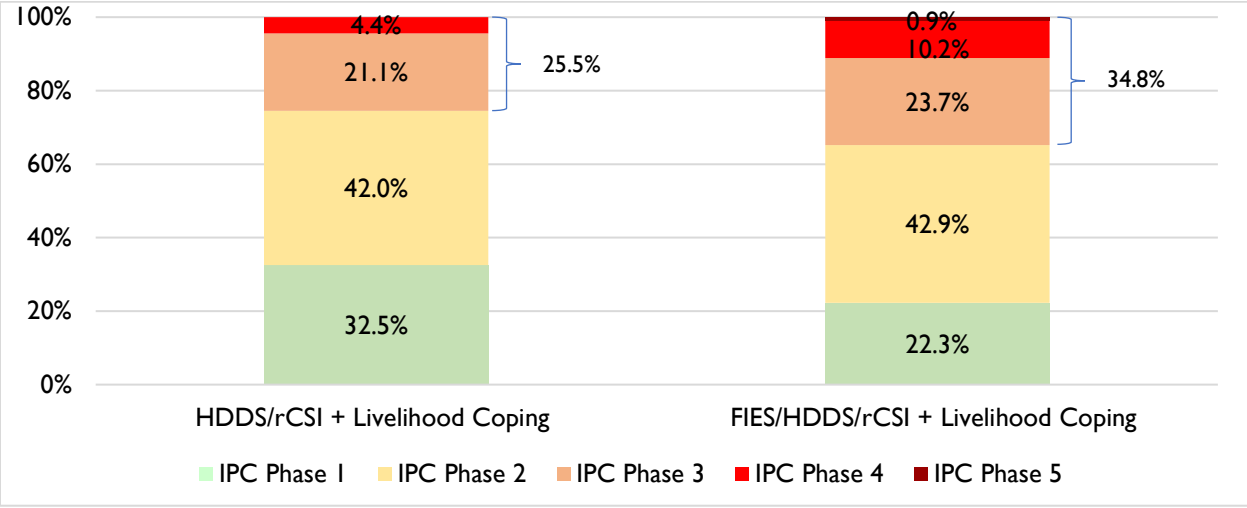


Figure 8 shows the same pattern for the combined food consumption/livelihood coping matrix; more households are classified as needing HFA when including the FIES than without it.

Figure 8: Summary results for food consumption/livelihood coping matrices with/without FIES using L4R BL data



[26] While this distribution also shifted when using HFIAS compared to HHS in the PRIME and RISE data, there is a close relationship and overlap of survey questions between the HHS and HFIAS that does not exist for the FIES.

Contrasting results from single-matrix formulations (Figure 7) with those involving food consumption and livelihood coping (Figure 8) suggests, again, that the addition of livelihood coping strategies into the analysis substantially increases the proportion of households that fall into IPC categories 3 and higher, in this case by approximately 9 percentage points.

5.5 PREG I Endline

The PREG I EL dataset includes the HDDS (food frequency indicator) and the HHS and FIES (food experiential indicators). The FIES indicator uses a 12-month recall period (the FEWS NET recommended recall period is 30-days) and was therefore not used in this analysis. Data for calculating the livelihood coping indicator are available from the shocks module of the PREG I EL survey instrument and are based on the question, *"Did you or your household use any of the following strategies to cope with any shock/stress over the last 12 months?"* As previously noted, the FEWS NET guidance recommends a 30-day rather than 12-month recall period for the livelihoods coping formulations. Thus, results using the PREG I EL dataset should be viewed with this caveat in mind.

Constructing the Food Consumption Matrix

Table 19 presents a summary of how households are classified by IPC phases using the HHS and HDDS food consumption indicators. Just under 26 percent of households are classified as needing HFA.

Table 19: Summary results for the food consumption matrix using PREG I EL data

IPC Phase	% HHs using HHS/HDDS
IPC 1	37.7
IPC 2	36.8
IPC 3	21.4
IPC 4	3.3
IPC 5	0.8

Classifying Livelihood Coping Categories

Table 20 shows the categorization into IPC phases of the percentage of households with negative livelihood strategies reported in the PREG I EL. As with previous datasets, the PREG I EL survey uses a 12-month recall period whereas the FEWS NET Matrix guidance recommends 30-day recall.

Table 20: Severity level of negative livelihood coping strategies using PREG I EL data

Level of Severity	PREG I EL Negative Livelihood Coping Strategies[1]	PREG I EL Frequencies n=1929
Stressed	Sell household items	0.40%
	Use money from savings	5.50%
	Take out a loan from a money lender	0.40%
	Take out a loan from a bank	0.20%
	Got food on credit from a local merchant	20.66%
	Take up new wage labor	6.94%
	Sell livestock (TLU>1.4) [2]	24.68%
	Sell productive items	0.05%

Level of Severity	PREG I EL Negative Livelihood Coping Strategies[1]	PREG I EL Frequencies n=1929
	Reduce non-essential household expenses	19.87%
	Move to less expensive housing	0.84%
Crisis	Take children out of school	0.59%
	Send child or an adult to stay with relatives	1.29%
Emergency	Lease land	0.30%
	Sell livestock (TLU≤1.4) [2]	4.66%
	Slaughter livestock	4.56%
Catastrophe	Migrate (the whole family)	4.56%
	Send children to work for money	0.10%

[1] Coping strategies utilized by less than 5% of respondents are not included in analyses.
[2] A threshold TLU (tropical livestock unit) value is normally used to split "selling livestock" and "slaughtering livestock" into two categories of severity. However, the TLU threshold was not applied to "slaughtering livestock" in the PREG I EL analysis because less than 5% of households utilized this livelihood strategy.

Constructing the Food Consumption/Livelihood Coping Matrix

Combining the food consumption and livelihood coping matrices developed with HHS and HDDS data from the PREG I EL dataset follows the same procedure described for the PRIME EL (see Section 5.1) with detailed results presented in Table 34 (Annex 1).

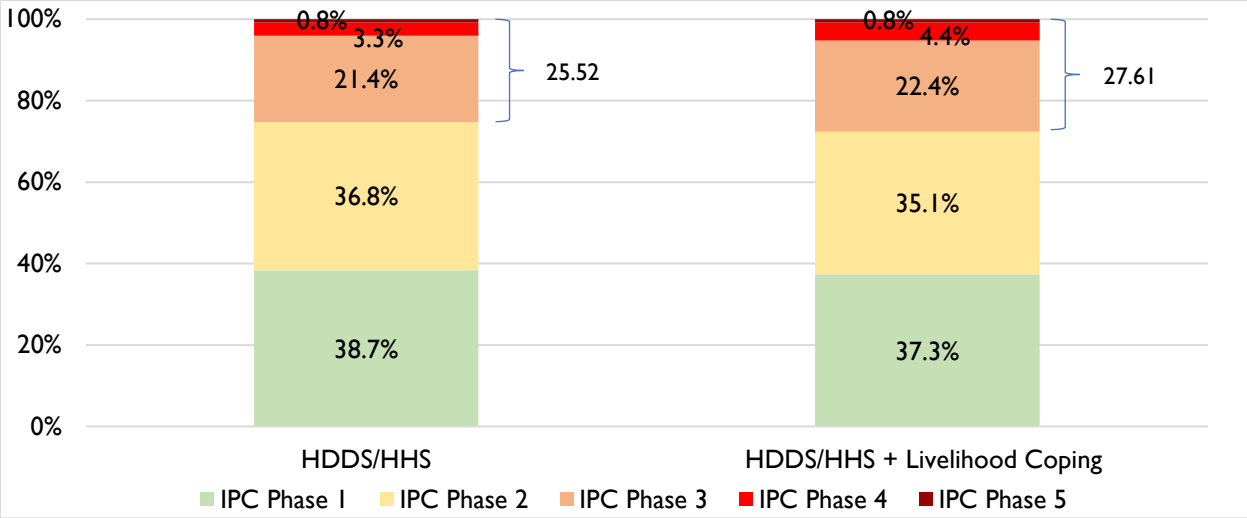
Table 21: Summary results for the food consumption/livelihood coping matrix using PREG I EL data

IPC Phase	% HHs using HHS/HDDS
IPC 1	37.3
IPC 2	35.1
IPC 3	22.4
IPC 4	4.4
IPC 5	0.9

Comparing single- and combined-matrices

Figure 9 compares categorization of households into IPC categories based on only food consumption indicators (HDDS and HHS) in the left-hand column with food consumption indicators plus livelihood coping strategies in the right-hand column. In contrast to the analyses with other datasets, inclusion of the livelihood coping strategy categories has little affect on the proportion of households in most IPC phases, including Phase 3 and higher. Though there is little difference between the two formulations, the use of a combined matrix involving both food consumption and livelihood coping remains a preferred approach, given the potential harm that can result from errors of exclusion.

Figure 9: Summary results for the food consumption matrix with/without the livelihood coping matrix using PREG I EL data



6. Summary Observations and Recommendations

The goal of the research reported here was to assess the applicability of using different food security indicators in FEWS NET's Matrix Analysis approach as a first step in developing improved methodologies for measuring the need for humanitarian food assistance at the household level. Four different datasets with varying combinations of food security and livelihood coping strategy indicators were used with The Matrix approach to construct a measure of need for humanitarian food assistance that is compatible with IPC categorizations.

Based on analysis with data from the PRIME EL and RISE I ML, using the HFIAS results in greater gradation of households across the less severe IPC categories than when the HHS is used. For both datasets, using HFIAS results in more households classified in IPC Phase 2 and less in Phase 1 compared to results using HHS. Additionally, there is substantial convergence of categorization for the most severe levels of food insecurity (IPC Phases 3, 4 and 5) between datasets.

FIES is also examined as a food consumption indicator, using the methodology in a similar fashion to that which was adapted for HFIAS. However, FIES data based on a 30-day recall period is only available in the L4R BL survey. The limited availability of FIES data in the selected datasets precluded the ability to validate its usefulness, leaving this as an area for further exploration. The new IPC 3.0 thresholds also offer an area for further testing, with FIES and other food security indicators.

Data regarding negative livelihood coping strategies adopted by households to mitigate food deficiencies was integrated into the measure of the need for HFA. Results show that using a combined food consumption/livelihood coping matrix to produce IPC phase classifications also results in more households being classified in IPC Phases 3, 4, and 5 than when the livelihood coping data are not used. While including a livelihood coping indicator into the analysis appears appropriate if the data are available, more research is needed on the effects of using 12-month recall rather than the 30-days recommended by the FEWS NET approach. That is, all of the datasets used here involved a 12-month recall period for coping strategies. As noted in the FEWS NET guidance, longer-term coping capacity is important but not relevant to the estimation of current food insecurity, which is the focus of the

livelihood coping component used in The Matrix approach. Thus, more work is needed on ensuring only those coping strategies that reflect household actions to deal with a lack of food access in "the last 30-days" are included in the analysis.

Overall, this research suggests that the FEWS NET framework can use data from many different survey instruments as well as several different indicators. As a first attempt at such an analysis, we also acknowledge potential limitations in the methodology, in particular, the assumed greater gradation across IPC phases with the HFIAS compared to the HHS. Rather, this may simply reflect that the HFIAS indicator is picking up on increased variation in the lower IPC bounds. Additionally, the datasets available for this study do not allow for the possibility of comparing results using either the HFIAS or HHS against a separate measure of food security for the same households. In the case of the livelihood coping component, there is a lack of independent guidance for categorizing livelihood coping strategies into IPC-compatible levels of severity, not the least because such categorization needs to be specific to the program operating context.

Given the preliminary nature of the analysis, along with numerous methodological caveats, the recommendations below are made on conceptual rather than empirical grounds.

- The IPC phase distributions generated by FIES in the L4R dataset show a decrease in IPC Phase 1 and an increase across the more severe IPC phases compared to the distribution generated using only HDDS and rCSI. While the additional gradation across the IPC phases provided by the FIES indicator can be viewed as a positive, **the FIES should be tested with datasets that include a comparable food security variable (i.e., HHS) in order to validate the use of FIES in computing the food consumption matrix.**
- The Livelihood Coping Categories analysis captures households that may be sustaining food consumption levels at more normal levels in the short-run by adopting livelihood coping strategies that have negative consequences on their future food security. Including some measure of livelihood coping is therefore an important input into the determination of humanitarian food assistance need (as measured by IPC phase classification). **If available, data on livelihood coping strategies should be included as an input into IPC classifications to determine the level of need for humanitarian food assistance.** Results from this analysis of data from four household surveys shows that including the livelihood coping component can dramatically increase the percentage of households in more severe food insecurity phases (e.g., IPC Phases 3, 4, and 5).

Annex 1. Additional Tables

Table 22: IPC phase classifications using HFIAS frequency-of-occurrence questions

HFIAS Question		Response Codes[1]	IPC Phase Classification
Q1	In the past four weeks, did you worry that your household would not have enough to eat?	0 – No 1 – Rarely/Sometimes 2 – Often	**Phase 1** if sum(Q1 to Q9) = 0 or ([Q1+Q2+Q3 +Q4]>0 and [Q5+Q6+Q7+Q8+Q9] = 0)
Q2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of lack of resources?	0 – No 1 – Rarely/Sometimes 2 – Often	
Q3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 – No 1 – Rarely/Sometimes 2 – Often	
Q4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 – No 1 – Rarely/Sometimes 2 – Often	
Q5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 – No 1 – Rarely/Sometimes 2 – Often	**Phase 2** if (Q1+Q2+Q3+Q4) >= 0 and ([Q5+Q6]>0 and [Q7+Q8+Q9] = 1)
Q6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 – No 1 – Rarely/Sometimes 2 – Often	
Q7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 – No 1 – Rarely/Sometimes 2 – Often	**Phase 3** if ([Q1+Q2+Q3+Q4+Q5+Q6] > 0 and ([Q7+Q8+Q9]>1and [Q7+Q8+Q9]<4)) **Phase 4** if ([Q1+Q2+Q3+Q4+Q5+Q6] >= 0 and [Q7+Q8+Q9] = 4) **Phase 5** if ([Q1+Q2+Q3+Q4+Q5+Q6] >= 0 and (Q7+Q8+Q9) >5
Q8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 – No 1 – Rarely/Sometimes 2 – Often	
Q9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 – No 1 – Rarely/Sometimes 2 – Often	

[1] The measurement tool for HFIAS consists of nine occurrence questions that ask whether a specific condition associated with the experience of food insecurity ever occurred during the previous four weeks (30 days). Three of the nine questions (Q7, Q8 and Q9) measure the most severe occurrences of food insecurity and are also utilized in the HHS. Response options regarding frequency are coded as follows: no = 0; once or twice in the past four weeks = 1 ("rarely"); three to ten times in the past four weeks = 1 ("sometimes"); and more than ten times in the past four weeks = 2 ("often").

Table 23: IPC phase classifications using FIES frequency-of-occurrence questions

	FIES Question	Responses	IPC Phase Classification
Q1	During the past 30 days, was there a time when you or others in your household were worried you would not have enough food to eat because of a lack of money or other resources?	0 – No 1 – Yes	**Phase 1** if Sum (Q1 to Q8) = 0 or ([Q1+Q2+Q3]>0 and [Q4+Q5+Q6+Q7+Q8] = 0)
Q2	During the past 30 days, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	0 – No 1 – Yes	
Q3	During the past 30 days, was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	0 – No 1 – Yes	
Q4	During the past 30 days, was there a time when you or others in your household had to skip a meal because of a lack of money or other resources to get food?	0 – No 1 – Yes	**Phase 2** if ([Q1+Q2+Q3] >= 0 and ([Q4+Q5]>0 and [Q6+Q7+Q8] = 0))
Q5	During the past 30 days, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	0 – No 1 – Yes	
Q6	During the past 30 days, was there a time when your household did not have food because of a lack of money or other resources?	0 – No 1 – Yes	**Phase 3** if ([Q1+Q2+Q3+Q4+Q5] >= 0 and [Q6+Q7+Q8] = 1) **Phase 4** if ([Q1+Q2+Q3+Q4+Q5] >= 0 and [Q6+Q7+Q8] = 2) **Phase 5** if ([Q1+Q2+Q3+Q4+Q5] >= 0 and [Q6+Q7+Q8] = 3)
Q7	During the past 30 days, was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	0 – No 1 – Yes	
Q8	During the past 30 days, was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	0 – No 1 – Yes	

Table 24: Food consumption matrix with HHS and HDDS for the RISE 1 ML

	HDDS >4	HDDS 3-4	HDDS 0-2
HHS=0	44.58%	22.23%	7.66%
HHS=1	4.49%	4.17%	1.73%
HHS=2-3	5.90%	4.41%	2.73%
HHS=4	0.20%	0.44%	0.32%
HHS=5	0.28%	0.40%	0.44%

Table 25: Food consumption matrix with HFIAS and HDDS for the RISE 1 ML

	HDDS >4	HDDS 3-4	HDDS 0-2
HFIAS=1	28.06%	10.36%	3.32%
HFIAS=2	21.01%	16.07%	5.95%
HFIAS=3	5.95%	4.45%	2.71%
HFIAS=4	0.20%	0.45%	0.32%
HFIAS=5	0.28%	0.40%	0.45%

HFIAS categories: 1 = food secure to moderately food insecure, 2 = moderately to severely food insecure access, 3-4 = = severely food insecure access, 5 = extremely severe food insecure access. Extremely food insecure access includes households that responded that i) in the past four weeks, they (sometimes or often) went a whole day/night without eating anything because there was not enough food AND ii) in the past four weeks, they (often) went to sleep at night hungry because there was not enough food.

Table 26: Combined food consumption/livelihoods coping matrix for the RISE 1 ML using HHS and HDDS

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	9.95%	36.36%	4.82%	15.69%	(-)
Food Consumption Phase 2	2.97%	10.87%	1.89%	6.50%	(-)
Food Consumption Phase 3	1.48%	3.53%	0.88%	3.17%	(-)
Food Consumption Phase 4	0.40%	0.40%	0.28%	0.36%	(-)
Food Consumption Phase 5	0.16%	0.12%	0.08%	0.08%	(-)

Table 27: Combined food consumption/livelihoods coping matrix for the RISE 1 ML using HFIAS and HDDS

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	6.36%	23.04%	2.27%	6.76%	(-)
Food Consumption Phase 2	6.19%	22.06%	4.05%	14.05%	(-)
Food Consumption Phase 3	1.90%	5.67%	1.30%	4.45%	(-)

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 4	0.40%	0.40%	0.28%	0.36%	(-)
Food Consumption Phase 5	0.16%	0.12%	0.08%	0.08%	(-)

Table 28: Food consumption matrix for rCSI and HDDS using the L4R BL dataset

	HDDS >4	HDDS 3-4	HDDS 0-2
rCSI<4	21.63%	13.02%	0.42%
rCSI 4-18	24.54%	20.70%	1.86%
rCSI>18	7.35%	8.76%	1.71%

Table 29: Food consumption matrix for FIES and HDDS using the L4R BL dataset

	HDDS >4	HDDS 3-4	HDDS 0-2
FIES=1	16.80%	10.95%	0.24%
FIES=2	23.19%	16.26%	1.02%
FIES=3	6.93%	6.30%	0.81%
FIES=4	3.93%	6.21%	0.99%
FIES=5	2.67%	2.76%	0.93%

Table 30: Food consumption matrix for FIES, HDDS, and rCSI using the L4R BL dataset

	rCSI<4			rCSI 4-18			rCSI>18		
	HDDS >4	HDDS 3-4	HDDS 0-2	HDDS >4	HDDS 3-4	HDDS 0-2	HDDS >4	HDDS 3-4	HDDS 0-2
FIES=1	14.67%	8.88%	0.21%	2.04%	2.01%	0.03%	0.09%	0.06%	(-)
FIES=2	5.85%	3.36%	0.09%	14.40%	10.56%	0.60%	2.94%	2.34%	0.33%
FIES=3	0.81%	0.54%	0.06%	4.41%	3.81%	0.57%	1.71%	1.95%	0.18%
FIES=4	0.21%	0.15%	0.03%	2.34%	3.33%	0.45%	1.38%	2.73%	0.51%
FIES=5	0.09%	0.09%	0.03%	1.35%	0.99%	0.21%	1.23%	1.68%	0.69%

Table 31: Combined food consumption/livelihoods coping matrix for the L4R dataset using HDDS and rCSI

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	16.38%	16.11%	(-)	2.16%	(-)
Food Consumption Phase 2	13.77%	28.26%	(-)	3.63%	(-)
Food Consumption Phase 3	3.99%	11.31%	(-)	2.67%	(-)
Food Consumption Phase 4	0.30%	1.20%	(-)	0.21%	(-)
Food Consumption Phase 5	(-)	(-)	(-)	(-)	(-)

Table 32: Combined food consumption/livelihoods coping matrix for the L4R dataset using FIES, HDDS and rCSI

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	12.00%	10.29%	(-)	1.26%	(-)
Food Consumption Phase 2	14.58%	28.32%	(-)	3.96%	(-)
Food Consumption Phase 3	6.09%	12.39%	(-)	2.46%	(-)
Food Consumption Phase 4	1.71%	5.13%	(-)	0.90%	(-)
Food Consumption Phase 5	0.06%	0.75%	(-)	0.09%	(-)

Table 33: Food consumption matrix for the PREG 1 EL using HHS and HDDS

	HDDS >4	HDDS 3-4	HDDS 0-2
HHS=0	32.23%	5.48%	2.12%
HHS=1	8.68%	3.32%	0.97%
HHS=2-3	22.65%	13.64%	5.85%

	HDDS >4	HDDS 3-4	HDDS 0-2
HHS=4	0.97%	0.67%	0.41%
HHS=5	0.89%	1.30%	0.82%

Table 34: Combined food consumption/livelihoods coping matrix for the PREG I EL dataset using HHS and HDDS

	Livelihood Coping Phase 1	Livelihood Coping Phase 2	Livelihood Coping Phase 3	Livelihood Coping Phase 4	Livelihood Coping Phase 5
Food Consumption Phase 1	11.18%	26.12%	(-)	0.41%	(-)
Food Consumption Phase 2	11.44%	23.66%	(-)	1.68%	(-)
Food Consumption Phase 3	8.46%	11.85%	(-)	1.12%	(-)
Food Consumption Phase 4	1.97%	1.15%	(-)	0.15%	(-)
Food Consumption Phase 5	0.52%	0.26%	0.04%	0.04%	(-)