Comparing Household Food Security Indicators to Inform IPC Acute Food Insecurity Phase Classification

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INTRODUCTION

The Integrated Food Security Phase Classification (IPC) is a widely used set of tools and procedures for classifying the severity of chronic and acute food insecurity across geography and time using a convergence of available data and information. One of the strengths of the IPC is that it provides a framework, in the form of reference tables and guidance materials, for incorporating a wide range of data from different sources into food security analyses. However, to date, little analysis has explored how well the indicators used to proxy household food consumption in the IPC's Acute Food Insecurity Reference Table and their chosen thresholds:

- Align with one another
- Accurately reflect the phase descriptions provided in that table
- Capture the full range of food insecurity severity the acute IPC measures.

The Household Food Consumption Indicators Study (HFCIS) utilized over 65,000 observations from 21 secondary datasets spanning 10 countries in Africa, Asia, and the Caribbean and applied a range of analytical methods—including descriptive statistics, correlations and cross-tabulations, network modularity and principle component analyses, and broad and restricted sensitivity analyses—to examine these questions for a subset of food security indicators used in the acute IPC. These indicators are: household dietary diversity score (HDDS), food consumption score (FCS), household hunger score (HHS), and coping strategies index/reduced coping strategies index (CSI/rCSI*) [*Though the acute IPC does not currently apply rCSI, it was considered in this analysis given its strong correlation with CSI and its comparability across contexts.]

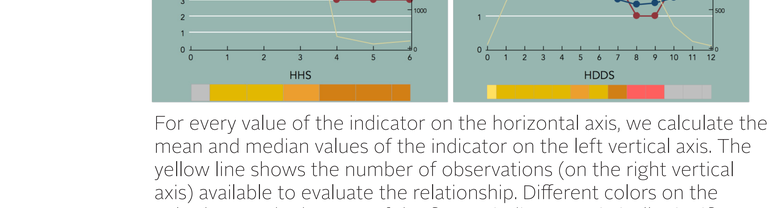
The IPC Acute Food Insecurity Reference Table for Household Group Classification

		Phase 1 None	Phase 2 Stressed	Phase 3 Crisis	Phase 4 Emergency	Phase 5 Catastrophe
Phase Name and Description		*HH group is able to meet essential food and non-food needs without engaging in atypical, unsustainable strategies to access food and income, including any reliance on humanitarian assistance.*	*Even with any humanitarian assistance: HH group has minimally adequate food consumption but is unable to afford some essential non-food expenditures without engaging in irreversible coping strategies*	*Even with any humanitarian assistance: HH group has food consumption gaps with high or above usual acute malnutrition; OR HH group is marginally able to meet minimum food needs only with accelerated depletion of livelihood assets that will lead to food consumption gaps.*	*Even with any humanitarian assistance: HH group has large food consumption gaps resulting in very high acute malnutrition and excess mortality; OR HH group has extreme loss of livelihood assets that will lead to large food consumption gaps in the short term.*	*Even with any humanitarian assistance: HH group has an extreme lack of food and/or other basic needs even with full employment of coping strategies. Starvation, death, and destitution are evident.*
Priority Response Objectives		Action required to Build Resilience and for Disaster Risk Reduction	Action required for Disaster Risk Reduction and to Protect Livelihoods	Urgent Action Required to: Protect livelihoods, reduce food consumption gaps, and reduce acute malnutrition	Save lives and livelihoods	Prevent widespread death and total collapse of livelihoods
Household Outcomes (directly measured or inferred)	Food Consumption* (quantity and nutritional quality)	**Quantity**: adequate (2,100kcal pp/day); stable **HDDS**: no recent deterioration *and >=4 food groups* (based on 12 food groups) **FCS**: *"acceptable consumption"; stable* **HHS**: *"none" (0)* **CSI**: *= reference, stable* **HEA**: *No "Livelihood Protection Deficit"*	**Quantity**: minimally adequate (2,100kcal ppl day) **HDDS**: recent deterioration of HDDS (loss of 1 food group from typical based on 12 food groups) **FCS**: *"acceptable" consumption (but deteriorating)* **HHS**: *"slight" (1)* **CSI**: *= reference, but unstable* **HEA**: *"Small or moderate Livelihood Protection Deficit"*	**Quantity**: food gap; below 2,100 kcal pp/day OR 2,100 kcal pp/day via asset stripping **HDDS**: severe recent deterioration of HDDS (loss of 2 food groups from typical based on 12 food groups) **FCS**: *"borderline" consumption* **HHS**: *"moderate" (2–3)* **CSI**: *> reference and increasing* **HEA**: *Substantial "Livelihood Protection Deficit" OR small "Survival Deficit" of <20%*	**Quantity**: large food gap; much below 2,100kcal pp/day **HDDS**: *<4 out of 12 food groups* **FCS**: *"poor" consumption* **HHS**: *"severe" (4–6)* **CSI**: *Significantly > reference* **HEA**: *"Survival Deficit" >20% but <50% with reversible coping considered*	**Quantity**: extreme food gap **HDDS** *1–2 out of 12 food groups* **FCS**: [below] *"poor" consumption* **HHS**: *"severe" (6)* **CSI**: *far > reference* **HEA**: *"Survival Deficit" >50% with reversible coping considered*
	Livelihood Change (assets and strategies)	Sustainable livelihood strategies and assets	**Livelihood:** Stressed strategies and assets; reduced ability to invest in livelihoods **Coping**: "Insurance Strategies"	**Livelihood:** Accelerated depletion/erosion of strategies and assets that will lead to high food consumption gaps **Coping**: "Crisis Strategies"	**Livelihood:** Extreme depletion/ liquidation of strategies and assets that will lead to very high food consumption gaps **Coping**: "Distress Strategies"	**Livelihood:** Near complete collapse of strategies and assets **Coping**: effectively no ability to cope
Contributing Factors		*For Contributing Factors, specific indicators and thresholds for inferring Phase need to be determined and analyzed according to the unique causes and livelihood context of household groups. General descriptions are provided below. See IPC Analytical Framework for further guidance on key aspects of availability, access, utilization, and stability.*				
	Food Availability, Access, Utilization, and Stability	Adequate to meet food consumption requirements and short-term stable; Safe Water ≥15 litres pppd	Borderline adequate to meet food consumption requirements; Safe Water marginally ≥15 litres pppd	Highly inadequate to meet food consumption requirements; Safe Water 7.5 to 15 litres pppd	Very highly inadequate to meet food consumption requirements; Safe Water 4 to 7.5 litres pppd	Extremely inadequate to meet food consumption requirements; Safe Water <4 litres pppd
	Hazards and Vulnerability	None or minimal effects of hazards and vulnerability on livelihoods and food consumption	Effects of hazards and vulnerability stress livelihoods and food consumption	Effects of hazards and vulnerability result in loss of assets and/or significant food consumption deficits	Effects of hazards and vulnerability result in large loss of livelihood assets and/ or food consumption deficits	Effects of hazards and vulnerability result in near complete collapse of livelihood assets and/ or near complete food consumption deficits

KEY FINDINGS

- Diet diversity (FCS, HDDS) and experiential (rCSI, HHS) indicators are reasonably well correlated but likely measure different dimensions of food security. This suggests that these indicators are complementary, but not interchangeable, and that at least one type of each indicator should be applied for acute IPC analyses.
- None of the selected indicators performs well across the full range of food insecurity severity the acute IPC measures. This suggests that attention to which indicators perform best within a given severity range is necessary when converging these indicators with other available evidence in acute IPC analyses.
- Using current acute IPC thresholds, concordance among the selected indicators is relatively weak (42.7%). By adjusting indicator thresholds, concordance can be substantially improved (to 61.4%). However, concordance greater than 61.4% is not possible without creating thresholds that are conceptually illogical or reducing the number of indicator categories to a level that is impractical for acute IPC analyses. This suggests that the selected indicators are not perfectly comparable across contexts and that the dimensions of food security the indicators capture and the broad context in which they are collected must be considered during the acute IPC convergence of evidence process.

Concordance among indicator pairs using current (left image) and HFCIS-suggested (right image) categorical thresholds



ANALYSES

CORRELATIONS & CROSS-TABULATIONS

The HFCIS explored the relationships between the selected indicators through correlations and cross-tabulations. These analyses identified strong correlations between two pairs of indicators—rCSI/HHS (ρ = 0.495) and FCS/HDDS (ρ = 0.592). The remaining indicator pairs were less strongly correlated (ρ ≤ |0.3|) and the consistency of indicator relationships varied among datasets. This suggests that these indicators are reasonably well correlated, but when and where data are collected matters in determining relationships between variables.

The cross-tabulation of indicators, divided into food secure, moderately food insecure, and severely food insecure categories, showed a great deal of variability in how well indicators agreed across datasets. These results indicated that the continuous forms of the selected indicators correlated reasonably well, but that their categorical forms had a higher degree of correlation variability. The authors hypothesized that the limited correlation among the categorical forms of the indicators may be influenced by two key factors: the dimension(s) of food security the indicator(s) captures and the current categorical thresholds. The HFCIS explored each of these in turn.

Summary of correlations among selected indicators

Spearman's rho		RCSI	CSI	FCS	HDDS	HHS
rCSI	Correlation Coefficient	1				
	N	47,643				
CSI	Correlation Coefficient	.663	1			
	N	16,073	17,410			
FCS	Correlation Coefficient	-.232	-.079	1		
	N	32,649	8792	41,288		
HDDS	Correlation Coefficient	-.142	-.153	.592	1	
	N	16,844	3,465	7,550	23,996	
HHS	Correlation Coefficient	.493	.425	-.284	-.071	1
	N	16,393	1,161	17,173	14,460	25,863

*All correlations are significant at the 0.01 level (2-tailed).

rCSI-FCS cross-tabulations, pooled dataset

		FCS (%)			Total
		Acceptable	Borderline	Poor	
rCSI (%)	Food secure	30.4	8.3	2.8	41.6
	Moderately food insecure	15.4	3.5	1.0	19.9
	Severely food insecure	21.4	10.3	6.8	38.5
Total		67.2	22.2	10.7	100.0

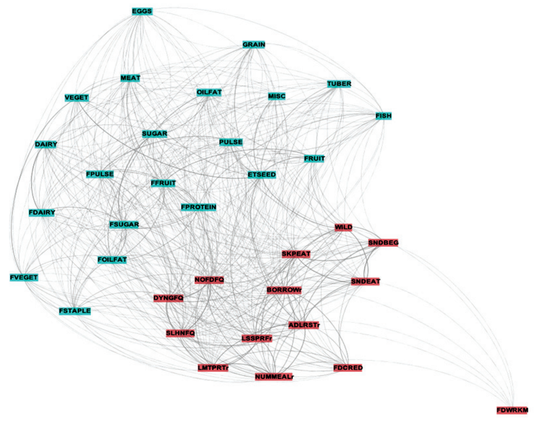
The green cells summarize cases in which both indicators place the household in the same food security category. The yellow cells summarize where the indicators are discordant by one category (one indicator classifies a household as food secure while the other shows moderate food insecurity, or one shows moderate food insecurity while the other shows severe food insecurity). The red cells summarize where the indicators are discordant by two categories (one indicator indicates food security while the other indicates severe food insecurity).

DIMENSIONALITY

To examine the food security dimensions the indicators captured, the HFCIS applied two different methodologies—network modularity analysis (NMA) and principal components analysis (PCA)—to analyze the extent to which the constituent item variables of the indicators cluster together. Both approaches rely on the variable covariance matrix to obtain results.

The NMA and PCA returned similar results in that they both identified a cluster/component comprised largely of rCSI and HHS items—a dimension that the authors interpreted to represent food consumption quantity. The two analyses differed in that the pooled dataset-based network algorithm showed a clustering of FCS and HDDS (a dimension that the authors interpreted to represent food consumption quality), but the more fine-grained PCA suggested that context mattered in determining whether diet diversity items grouped together. Beyond the first component, (comprised mostly of "quantity" of consumption items), the subsequent PCA components weakly captured the observed covariance between items.

Correlation network of food security items, two-cluster results



Network analysis suggests the existence of two distinct communities. The blue nodes are FCS and HDDS items; the red nodes are HHS and rCSI items.

CONCORDANCE & ALIGNMENT

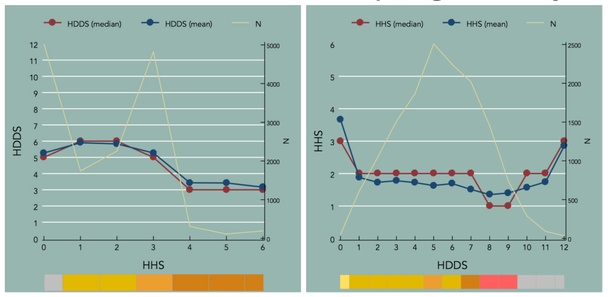
To investigate the possibility that the limited categorical concordance between indicators stems in part from 'misalignment' of the categorical thresholds across indicators and to improve any observed misalignment, the HFCIS took three steps:

- First, the authors evaluated the categorical concordance value of every possible combination of whole number thresholds for each pair of indicators.
- Second, the authors determined the expected (i.e., mean and median) continuous value of each indicator given every possible whole number value of the other indicator, and examined the data for natural cut points.
- Third, based on a practical need to have at least three categories per indicator to facilitate acute IPC analysis, and an assumption that an HHS of 5 or 6 indicates a severity of acute food insecurity equivalent to Phase 5 on the acute IPC household reference table, the authors determined all possible sets of thresholds that would result in each pair of indicators agreeing on categorical classification for at least half of observations. From that set of thresholds, the authors identified those that maximized average pairwise concordance.

Based on this analyses, the authors recommended the following for the acute IPC:

- Revision of the categorical cutoffs for the selected indicators in the household reference table to improve concordance
- Inclusion of a combination of diet diversity and experiential indicators in all acute IPC analyses
- Consideration of the range of severity the selected indicators appear to capture more and less well when converging evidence.

HDDS-HHS and HHS-HDDS relationships, alignment analysis



For every value of the indicator on the horizontal axis, we calculate the mean and median values of the indicator on the left vertical axis. The yellow line shows the number of observations (on the right vertical axis) available to evaluate the relationship. Different colors on the color bars at the bottom of the figures indicate statistically significant (p<0.1) differences between mean/median values.

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